

## OVERVIEW OF BUILD CONFIGURATIONS

PANDA™ has been designed to accommodate multiple build configurations, housed in essentially the same overall platform with common system footprint. This design approach makes it easy to scale the system to customer needs, with common training and operations. Custom configurations are also possible for specific needs not accommodated by our standard offerings.

### GENERAL DESIGN

The PANDA build chamber employs a dual-platter design, in which a supply reservoir full of powder moves up, and the build platter (upon which the powder is melted to a build plate) moves down. For each layer, the supply platter moves up a fixed amount and the build platter moves down, and then the recoater (spreader) pushes across a fresh layer of powder to be melted by the laser. The process repeats until complete, at which point the part lies encased in unmelted powder. The build platter is then raised, with the excess powder swept into a powder catch for recycling, and the part is removed. Figure 1 illustrates the process.

For a dual-platter system, the supply reservoir must be larger than the build volume, since it must be able to completely fill the build volume, along with any overspread. PANDA uses a 1.5-to-1 ratio of supply to build volume, to allow for adequate “dosing” of powder from the supply platter across the build plate.

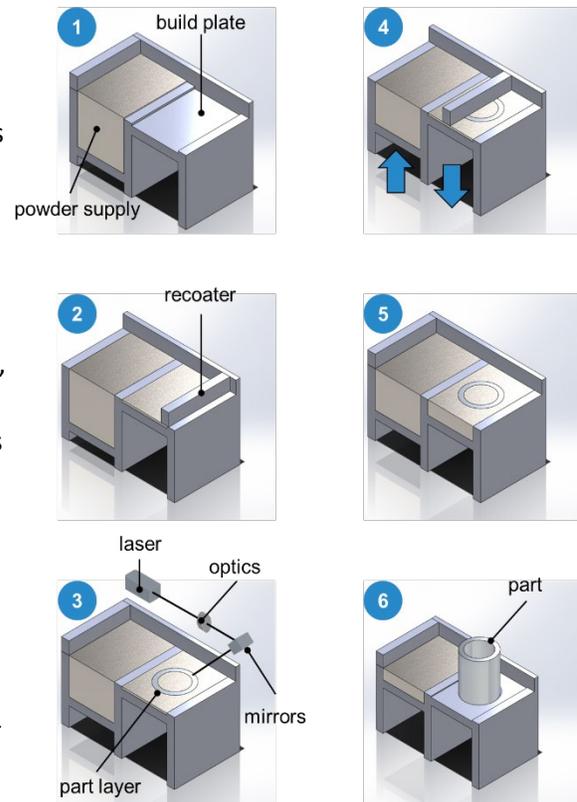


Figure 1

### BASE BUILD VOLUME

The base system price includes **6.0” × 6.0” × 9.5” build volume** (152 × 152 × 241 mm). Note that the build plate is included in the vertical dimension – e.g., use of 1” build plate would restrict height to 8.5”. This base volume provides adequate capacity for a wide range of parts, and is well suited for research, process development, and applications development. The interior chamber also provides plenty of room for part handling, add-on sensors/mechanisms, and storing hand tools and partially used powder containers. The interior chamber measures 40” W × 19” D × 12” H (1016 × 483 × 305 mm).

### LARGE BUILD VOLUME

Offered as an option, PANDA can be configured with **11.0” × 11.0” × 12.5” build volume** (280 × 280 × 318 mm). This larger volume provides significantly more capacity for production, whether larger parts or

multiple parts in one build, while still keeping the same footprint and remaining operable without heavy-lift equipment (other than a hand cart to assist with lifting of the completed build). However, the larger volume may be cost prohibitive for many research and training uses due to the larger amount of powder used and higher inert gas consumption. The large build configuration requires 4.4 times as much powder to fill the supply reservoir, compared to the base build configuration. The interior chamber still provides ample space, measuring 48" W × 23" D × 17" H (1219 × 584 × 432 mm).

## ADDITIONAL CONFIGURATIONS

PANDA can also be configured with a **removable sleeve assembly** to allow smaller areas than 6" × 6". The sleeve requires removal of the build and supply platters and some of the connecting components. A metal sleeve is then inserted into each reservoir, and smaller platters attached. The standard design includes a 2" (50 mm) circular build plate, but customer-specified dimensions between 1" and 4" are possible. As an added option, the sleeve can be configured with heating elements up to 200C. The primary purpose of this configuration is to enable R&D and prototyping involving specialty powders (e.g., research formulations in small amounts) or highly expensive powders (e.g., precious metals) for which it would be impractical to fill and spread using the base configuration.

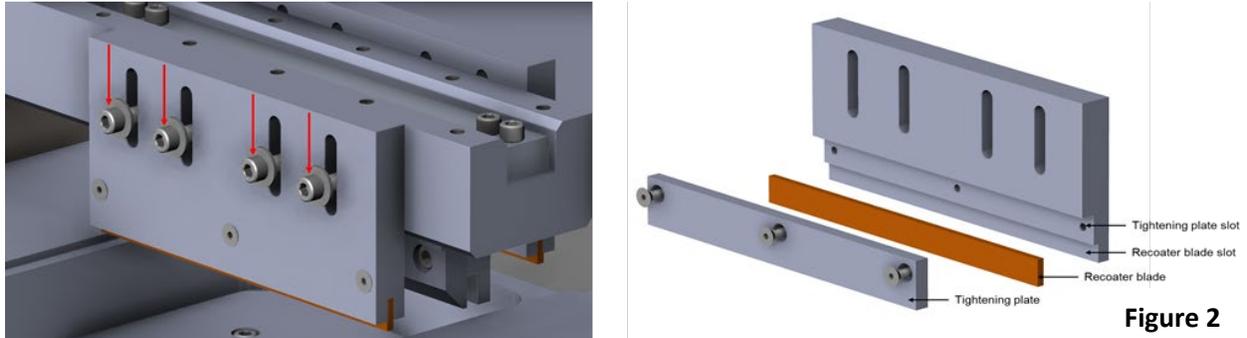
Another available option is the incorporation of an **insulated heated plate** for processing at high temperatures, up to 500C. This configuration is available only with 6" × 6" build plates. The system involves significant changes from the standard configuration to accommodate the higher temperatures. Some of these changes include larger process chamber, addition of heating controls, and different filter design capable of operating at higher temperature. This configuration is most suited for researchers investigating effects of various heating conditions on microstructural evolution. It can also be useful for building parts from exotic materials which are difficult to process under standard conditions.

While other custom configurations are possible, the **base configuration**, **large build configuration**, **removable sleeve configurations**, and **heated bed configuration** should provide an excellent array of options for most R&D, training/education, and prototyping/production uses. For applications requiring even larger volumes, Open Additive has built a prototype system with a **24" × 24" × 12" build volume** (600 × 600 × 300 mm) for use on technology and applications development projects. These efforts should pave the way for a larger-format platform to be productized in the not too distant future – something bigger and meaner than a PANDA. Please inquire if interested.

## RECOATER ASSEMBLY

The PANDA recoater assembly includes a unique 3-blade design, compatible with both hard and soft blades. The recoater is designed with versatility in mind, and the user has the ability to use one or more blades at once, raise and lower the blades to preferred heights, use alternate blade materials and geometries, and even mount add-on mechanisms to the spreader using the provided set of threaded holes. As such, PANDA is an ideal platform for process development studies for any powder. Of course, for simple "print to build" operations involving standard materials, a basic soft or hard recoater blade set at a sufficient height to push powder across the build plate is all that is needed.

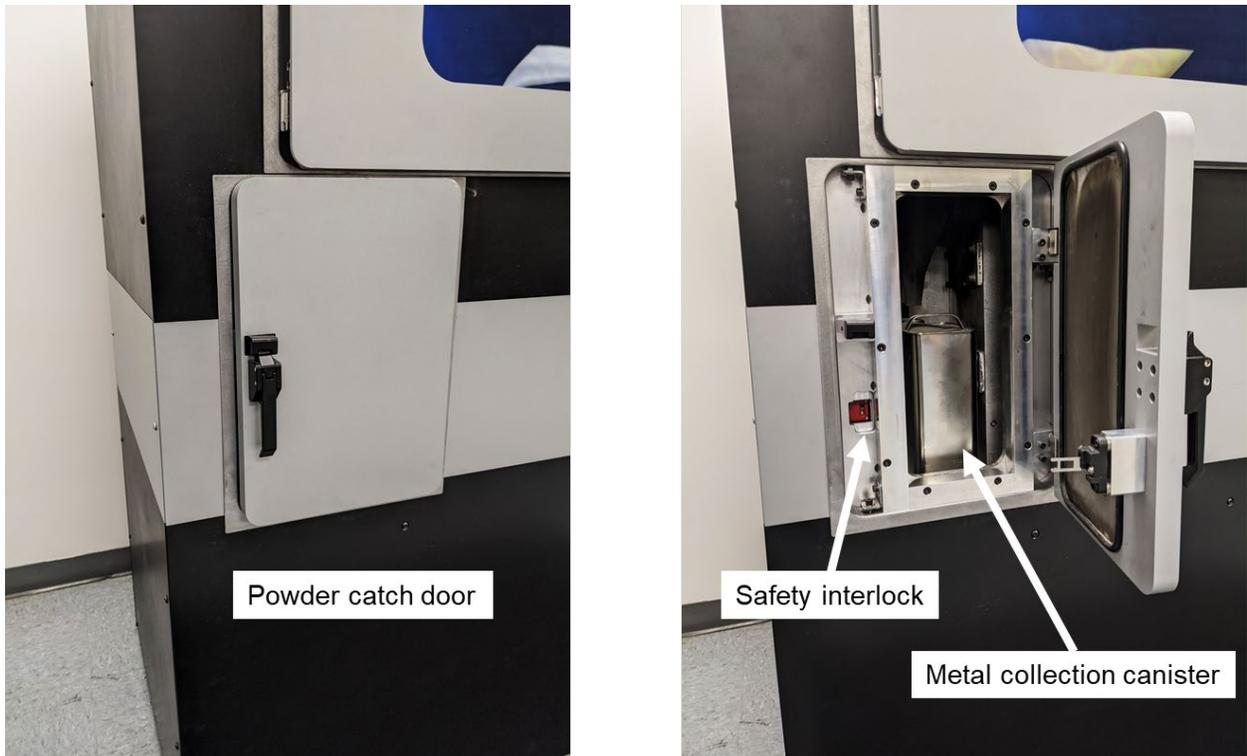
Figure 2 shows the recoater design, with left image highlighting the slot bolts for easy adjustment of blade height on outer blades, and right image showing simplicity of swapping blades. The center blade is attached to a drop-in fixture which can likewise be adjusted in height with easy-to-swap blades.



**Figure 2**

## POWDER CATCH

Another useful feature of the PANDA design is the addition of a powder catch that funnels into a container below the process chamber deck, making it easy and safer to extract unused powder (rather than hand scooping it out of a collection bin). Powder is swept into the catch, going into a metal canister with screw top and handle that can be removed and replaced using the convenient second door, as shown in Figure 3. The catch area is enclosed as part of the overall sealed chamber.

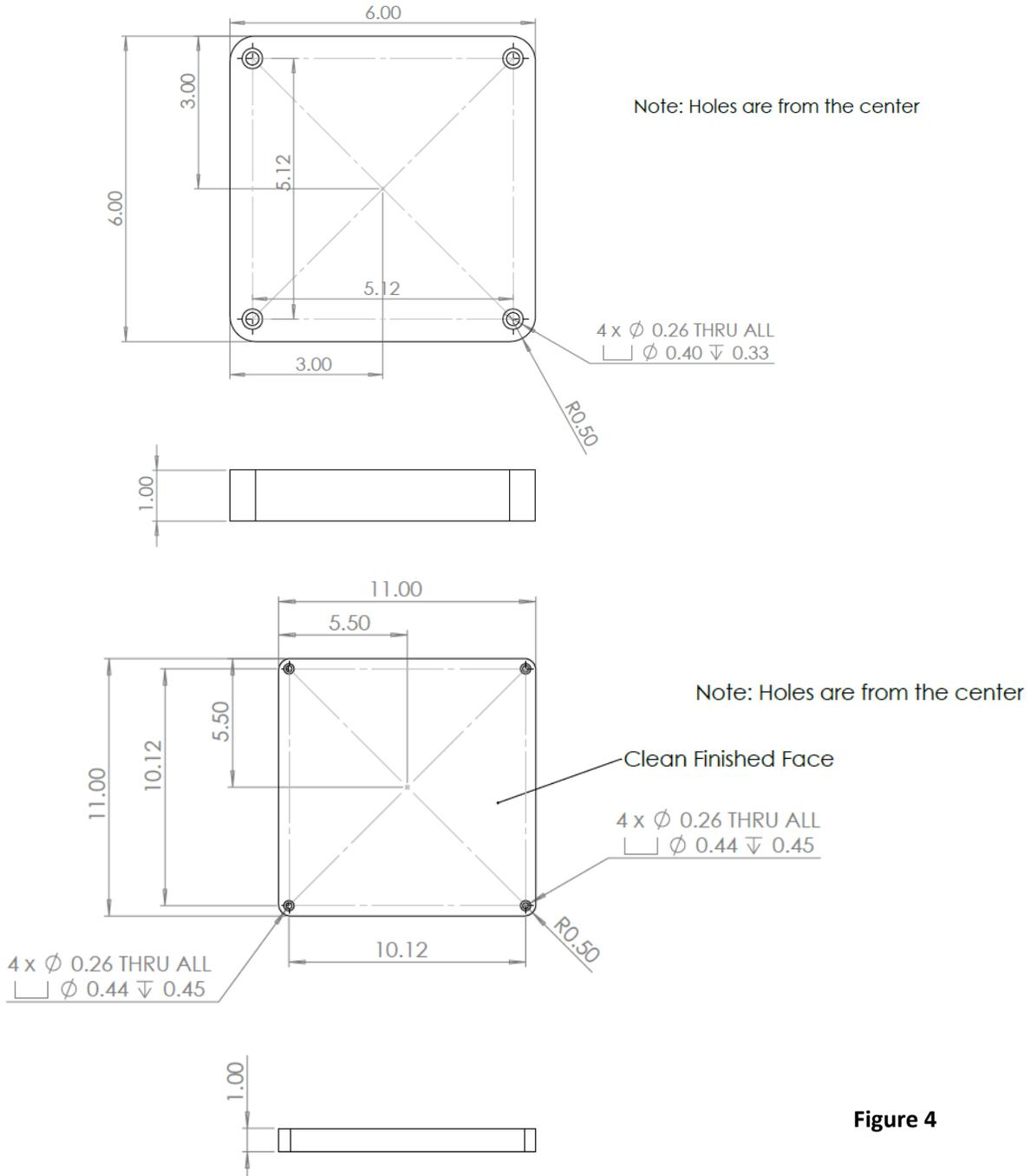


**Figure 3**

**BUILD PLATE DIMENSIONS**

Build plate CAD files are available to customers wishing to source plates independently. Open Additive also offers plates at an affordable price in low carbon steel, stainless steel, aluminum, and titanium. For 6" build plates, both 0.5" and 1.0" thicknesses are offered, while only 1" is offered for the 11" plates.

Plate schematics are shown in Figure 4, with dimensions in inches (1" = 25.4 mm).



**Figure 4**