

**General:**

The Naval Research Laboratory is seeking to purchase a three-dimensional printing machine that can produce fully-functional metal *and* ceramic parts directly from CAD files that have been prepared in widely-used standard formats. The machine (and any associated devices) must be installed at NRL in Washington DC in a completely turnkey manner: the purchase must include everything necessary for the end user to be able to immediately begin using the machine, including (but not limited to) all necessary hardware, software and licenses, operating manuals and technical documentation, sample materials to begin test printing, and cleaning materials to begin initial operations. The vendor, as part of the purchase, will survey the installation site at NRL, and work with NRL scientists and staff to formulate plans for the installation and initial operation of this device. Once NRL has prepared the site, the vendor will install the device, demonstrate that all parts are in full working order, and then train NRL employees in all aspects of operation of the machine and any accessories. (This entire installation/demonstration/training period should take no more than 5 work days of time to accomplish.) Once installed and operational, under conditions of normal use the purchase must include 12 months parts and labor warranty: the vendor must consent to work closely and expediently with NRL employees to resolve warranty-related issues.

In addition to the above general requirements, NRL also has the following detailed specifications that must be met or exceeded.

**3D Printer Specifications:**

- Build footprint must be at least 400mm x 250mm, and the build height must be at least 250mm
- Build speed must be no longer than 60 seconds/layer for coarser build materials (>30 micron powder), and no longer than 120 seconds/layer for finer build materials (<30 micron powder)
- The print resolution in each of the horizontal directions (X- and Y-directions) must be no greater than 0.635mm
- The print resolution in the vertical direction (Z-direction) must be no greater than 0.1mm
- The external dimensions must fit into a working volume no larger than 6ft x 6ft x 6ft (Width x Length x Height), and must weight no more than 4500 lbs
- The unit must operate on either 110-120V or 208-240V, single phase or 3 phase electrical supply
- If the system requires a compressed air supply, this must operate at no more than 95 psi
- The data interface must seamlessly accept a minimum of SLC, CLI, and STL file types
- The printer must be able to print models in the following materials
  - 420 Stainless Steel

- 316 Stainless Steel
- Inconel 625
- Tungsten
- Iron
- Bronze
- Soda lime glass
- Sand
- Ceramics
- Casting media
- The material powders must come in a range of particle sizes, ranging from 15 microns or less, up to 50 microns.
- NRL also requires the following accessories as part of this procurement:
  - Depowder station to vacuum up the loose unused material powder from the box where the printed model is created, and recycle it back into the printer powder container. This must operate on a standard 120V wall outlet.
  - Job box transfer cart to transport printed models from the printer to the curing oven.
  - Powder recovery system to recycle unused powder within the printer back into the system silo. This must operate on a standard 120V wall outlet. If this system also uses compressed air, it must operate at no more than 95 psi.
  - Curing oven to initially fuse the printing powder and the support materials. The internal dimensions must at least be able to accommodate a printed model that is of the largest possible dimensions the printer is able to produce. This printing oven will ideally operate on a 3 phase/480 V/15 amps power supply. Under no circumstances can it operate on a supply voltage above 480V.
  - Powder Reloader system to automatically resupply material powder to the printer.

Machines that can meet or exceed the above requirements and specifications are commercially available to the public at large, and many are currently in operation around the USA. They are known to seamlessly accept CAD drawings in standard formats and repeatedly print them out in a reliable manner. NRL requires such a proven track record of performance for this current purchase. Under no circumstances can NRL consider the purchase of a prototype machine or new model that cannot demonstrate a track record of reliable performance.