1.0 PURPOSE:

Metal powders are used in Selective Laser Melting (SLM), to create 3D metal parts via 3D CAD data. This SOP will outline the necessary safety precautions when using Metal Powders (Titanium Alloy, Aluminum Alloy, Cobalt Chrome, Tool Steel & Stainless Steel. IMPROPER USE OF METAL POWDER can cause serious injury or even death.

2.0 RESPONSIBILITIES:

- The operator/technician & supervisor(s) is/are fully responsible for following safety and operational protocol, as well as reporting the work and any issues involving metal powders and its applications.
- The REQUIRED safety courses to be taken include:
  - ✓ Laser
  - ✓ X-Ray
  - ✓ Radiation
  - ✓ Biohazard
  - ✓ WHIMIS
  - ✓ General lab safety
- Consult the Project Manager if there are any specific questions
- UWO Health and Safety Website:
  - http://www.uwo.ca/humanresources/facultystaff/h_and_s/training/training_idx.htm

3.0 REFERENCES:

- MSDS provided by 3D Systems:
  - Titanium Alloy
  - Aluminum Alloy
  - Cobalt Chrome
  - Tool Steel
  - Stainless Steel
- MTT SLM125 SOP: SOP_MTT SLM125.doc

4.0 SAFETY

4.1 POTENTIAL HAZARDS

- EYES: Irritation consisting of redness, swelling & pain
- SKIN: Irritation consisting of redness, swelling & pain
- INHALATION: Respiratory irritation
- INGESTION: Get medical attention if large quantities are swallowed
- CHRONIC: Allergic skin reaction (for Cobalt Chrome and Stainless Steel).

4.2 PROTECTIVE EQUIPMENT

- Tightly sealed safety goggles

- Gloves, lab coat, closed toe shoes (MUST BE anti-static)
- P2 & P3 Respiratory Masks

4.3 CHEMICAL STABILTY & REACTIVITY

4.3.1 Titanium Alloy ($TiAl_6$)

- HIGHLY reactive with WATER
- INCOMPATIBLE with alcohols, oxidizing materials, aqueous acids & bases, halogenated compounds

4.3.2 Aluminum Alloy ($AlSi_{12}$)

- HIGHLY reactive with WATER – emits EXTREMLY flammable gasses
- VIOLENT REACTIONS with strong alkalis and oxidizing agents
- INCOMPATIBLE with alcohols, amines, aqueous acids
- AVOID electrostatic charges during handling

4.3.3 Cobalt Chrome (CoCr)

4.3.4 Tool Steel

4.3.5 Stainless Steel Powder

- See MSDS for specific safety information

5.0 EMERGENCY CONTINGENCIES

5.1 FIRE

- Use a TYPE D Fire Extinguisher for ALL METAL POWDER fires.
- DO NOT USE WATER to extinguish metal powder fires.

5.2 SAMPLE STORAGE AND HOLDING TIMES:

- STORE in a COOL, DRY place
- KEEP AWAY from igniting sources (MUST be kept in flammable cabinet)
- KEEP AWAY from alcohols, amines, oxidizing materials, aqueous acids/bases, halogenated compounds

6.0 REVIEWS AND REVISIONS:

This procedure shall be reviewed for compliance and effectiveness and revised as necessary (or at a specified interval).