Specification for Oxidation of Polished Mirror (Super #8) Stainless Steel for aLIGO Baffles and Beam Dumps

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1 Scope

This process specification is for the process of oxidizing mirror finished (Super #8) 304 stainless steel baffles for Advanced LIGO to provide baffling for stray light beams. A high temperature furnace baking process reduces the reflectivity of the stainless steel baffle @1064nm to approx 12%. It includes material requirements and the process and preparation for oxidation. These baffles are for use in an Ultra-High Vacuum (UHV) system.

2 Manufacturing Process

2.1 Material

The sheet metal will be Super #8 mirror finished [one side] 304 stainless sheet 18 gauge thick with PVC covering. Super #8 finish can also be called a non-directional finish.

2.2 Shaping

The requirements of LIGO document E0900364 for machining, allowable machining fluids, and standard cleaning practices (post machining/stamping and forming) should be followed.

Upon approval from LIGO, this sheet metal may be water jet cut. Water jet cutter abrasive agents must be approved by LIGO. No other fluid or contaminant may be added to water without prior approval from LIGO. The cut surface quality is Q4.

Do not remove PVC covering prior to cutting and shaping. Ship parts with PVC covering intact.

Markings should be made by scribing, engraving, vibratory tool or laser marking on the non-mirrored side. DO NOT STAMP.

2.3 Baffle Parts Preparation

The PVC covering is to be carefully removed without disturbing flatness or form of the part.

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Parts shall be precision cleaned to particulate level 100 (or lower) and Non-Volatile Residue (NVR) level A/10 (or lower) per IEST-STD-CC1246D.

The baffle parts material will be cleaned with **Acetone**, then in **Liquinox**, then **De-ionized water** immediately to keep it from staining the surface. LIGO will accept suggestions from the supplier on alternate detergents or parameters used to meet the LIGO specification.

Cleanliness is to be qualified by Gravimetric testing.

Parts are to be dried and individually wrapped in **CP Stat 100** bags.

3 Baking Process & Preparation

3.1 Preparation

Make sure the area and personnel are prepared and ready for the parts to be baked and wrapped:

- No porcelain spraying in the area
- No sand blasting in the area
- Clean gloves (heavy duty cotton and latex for everyone handling the parts)
- Line up two or more tables for staging the parts
- UHV foil covered preparation tables**.**
- UHV foil ready for wrapping.
- CP Stat 100 material ready (bags and rolls)

At the baking site, a portable clean room will be erected adjacent to the furnace with several large tables inside on which to wrap the oxidized parts.

Use clean 304 stainless wire hooks to provide an attaching point to the metal furnace conveyer rail. The stainless hooks need to be attached with the long part of the hook on the backside away from the mirror side so it does not touch.

Wipe down parts with alcohol and clean room wipes for touch up cleaning prior to baking if necessary.

3.2 Processing

All parts will be baked in a continuous furnace at a temperature of 1560˚F.

Prior to running the parts, check the furnace speed and temp:

- Speed - 18 Hz or 5 linear feet per min.
- Stabilize the oven at 1560˚F [849˚C] for 15 minutes prior to running the parts.
- To try to reduce potential dust on the part the inlet fan [air door] should be turned off near the furnace.

The parts will be sent through for a total of 4 passes each.

4 Packaging for Shipment

4.1 LIGO Class A cleanliness level (only if specified)

As soon as the parts are cool enough to handle, all LIGO parts must be removed from conveyer rail and transferred into a Class 100 clean room adjacent to the firing furnace for cooling and packaging.

Tables in the clean room must be covered with UHV grade aluminum foil.

Personnel must be dressed according to Class 100. Handlers transferring parts to the clean room should be wearing clean, heavy duty cotton gloves with latex gloves over them or UHV aluminum wrapped around finger and palm areas so the cotton gloves do not touch the sheet metal.

Wipe down each part with alcohol and clean room wipes to remove airborne particulates prior to wrapping.

FTIR test should be performed on first and last items.

The parts are to be completely wrapped in UHV grade aluminum foil and then double wrapped in Ameristat bags and sealed with Kapton tape. If part is too large for the bags, a roll of CP Stat 100 should be available to wrap the part or put into custom made bags of the same material. Labels with part numbers should be placed on first layer of CP Stat 100.

4.2 Standard

Package parts for protection during shipment to prevent handling and shipping damage.