



SPECIFICATION

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

AUTHOR(S)	DATE	Document Change Notice, Release or Approval
Heidy Kelman, Jeff Lewis, Mike Smith		see LIGO DCC record Status

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 14-18 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 shall 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 shall 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.

Parts shall be precision cleaned to particulate level 100 (or lower) and Non-Volatile



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

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

Prepare the area 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.

Wipe down parts with alcohol and clean room wipes for touch up cleaning prior to baking if necessary. Attach the parts to the metal furnace conveyer rail with clean 304 stainless wire hooks. 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 the mirror side.

Personnel will be prepared to remove the parts from the conveyor as soon as possible and transport into the clean room for final processing and wrapping

3.2 Processing

3.2.1 Continuous Furnace

Bake parts in a continuous furnace at a temperature of 1560°F.



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

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

- Speed - 5 linear feet per min (18 Hz setting).
- Stabilize the oven at 1560°F [849°C] for 15 minutes prior to running the parts.
- Turn off inlet fan [air door] near the furnace to reduce the potential dust on the part.

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

3.2.2 Box Furnace

Prior to loading parts, pre-heat box furnace to temp:

- Stabilize the furnace at 1510°F [821°C] for 15 minutes.

Bake parts in box furnace at a temperature of 1510°F:

- Open the furnace door and load the parts
- Close furnace door and wait until the oven temperature returns to 1510°F [821°C]
- Bake the parts in the oven at 1510°F [821°C] for an additional 15 minutes
- Immediately open door and remove parts for cooling

4 Packaging for Shipment

4.1 LIGO Class A cleanliness level (only if specified)

When parts are cool enough to handle, they are to be removed from conveyer rail and transferred into a Class 100 clean room adjacent to the firing furnace for 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 must 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 shall be performed on all parts.

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

The parts are to be completely wrapped in C3 cloth or approved lint free cloth. Do not wrap parts in UHV grade aluminum foil. Then double wrap in Ameristat bags and seal with Cleanroom tape. If part is too large for the bags, a roll of CP Stat 100 will 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.