



SPECIFICATION

Procedure to Determine Process to Oxidize Mirror Finished (Super #8) Stainless Steel, In a Box Furnace

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

1 Scope

This specification is to determine the process of oxidizing mirror finished (Super #8) 304 stainless steel baffles for Advanced LIGO to provide baffling for stay light beams. A box furnace (versus a continuous furnace) will be used. 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 Q5.

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. Do not stamp. This should be done on the non-mirrored side.

2.3 Baffle parts Preparation

The baffle parts material will be cleaned at CIT in **Acetone**, then in **Liquinox**, then **De-ionized water** immediately to keep it from staining the surface, and then dried in the clean room and wrapped in **CP Stat 100** bags.



Procedure to Determine Process to Oxidize Mirror Finished (Super #8) Stainless Steel, In a Box Furnace

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 one table for staging the parts
- UHV foil covered preparation tables.
- Clean room cloths ready
- CP Stat 100 bags ready

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 a fixture that will be moved into a box furnace. 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

1. Hang 5 samples on fixture on conveyor rail, outside of box oven.
2. Preheat oven to 1560°F.
3. Once oven is hot enough, raise door and slide samples into oven.
4. Leave samples in oven while coming back up to 1560°F (15min) and an additional 5-10 min.
5. Open oven and slide 5 parts outside of oven. Leave outside until the parts are cool enough to touch. During this time close door until it reaches 1560°F.



Procedure to Determine Process to Oxidize Mirror Finished (Super #8) Stainless Steel, In a Box Furnace

6. Repeat steps 3-5.

Remove the sample #1 after 1 duration in the oven; remove sample #2 after 2 durations in the oven; remove sample #3 after 3 durations in the oven; remove sample #4 after 4 durations in the oven; remove sample #5 after 5 durations in the oven.

7. Once the last sample has been placed into the oven 5 times, test is finished.

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.

If needed, wipe down parts with alcohol and clean room wipes for touch up cleaning prior to wrapping.

The parts are to be completely wrapped in clean room cloth then double wrapped in CP Stat 100 bags and sealed with clean room tape. 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.

BRDF testing will be performed once parts return to CIT.