



Advanced LIGO Air Bake Oven Qualification Process Specification

APPROVALS	DATE	REV	DCN NO.	BY	CHECK	DCC	DATE
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1 Scope

This specification covers aspects important to the installation and qualification of the new oven at the Caltech High Vacuum Baking Facility.

This specification is meant to be a guide for cleaning and testing procedures to be used to qualify this oven for air baking suspension parts for Advanced LIGO.

2 General Requirements

2.1 Receiving of oven from manufacturer

When the oven arrives inspect for package damage while on the truck, unload it and place it in a covered area.

Remove the packing and boxing and inspect again to determine if there is any damage and to make sure all of the parts are present.

2.2 Initial Cleaning

Wipe the oven down on the outside only with a clean damp cloth.

Repeat the procedure, changing the cloth after each wipe down, until the cloth comes out clean

2.3 Protection from contamination

Wrap the oven in plastic until it is moved to the Bake Lab.

Effort should be taken to prevent smoke and vehicle exhaust from contaminating the oven while it is being moved into the Bake Lab.

3 Specific Requirements

3.1 Installation in CIT Bake oven Lab

When the oven has been placed in the Bake Lab, remove plastic sheeting only in the places that need to be removed to install electrical and venting connections.

3.2 Leveling and stabilization

Check to insure that the oven is level and secure.

Make corrections as needed.

3.3 Electrical

Make electrical connections, take precaution not to contaminate the inside of the oven.



Advanced LIGO Air Bake Oven Qualification Process Specification

Clean any wires that have been lubricated with conduit lube.
Do not use solder connections.

3.4 Ventilation

The venting installation should be done in a manner that does not permit construction dust or dirt to enter the oven intake or outlet vents.

The oven intake and outlet vents will be cleaned with methanol before installation of vent pipes.

Vent pipes will be cleaned with lint free wipes and methanol before installation.

3.5 Access

A tack mat will be placed to access the front of the oven.

The oven operator will change his/her booties each time just before entering the oven to place parts inside. (MUST NOT WALK AROUND THE ROOM IN BOOTIES THAT WILL BE ENTERING THE OVEN)

The oven operator will be fully clean room dressed.

Fans and blowers in the room must be turned off before opening the oven doors.

4 Cleaning

4.1 Method

LIGO E-960022 cleaning methods for stainless steel will be used for cleaning the inside of the air bake oven.

Take special precautions to clean blind holes, welded joints and overlapping joints.

4.2 Detail

Clean small sections of the oven interior one at a time.

Cleaning must be done with clean room wipes and methanol.

Repeat cleaning at least twice to ensure that the oven wall is free of contaminants.

Precautions should be taken to ventilate the oven well while cleaning with methanol. **DO NOT BREATHE METHANOL VAPORS!**

Turn the oven on, set at 120 degrees C for 12 hours.

Increase temperature to 200 degrees C and bake for 48 hours.

Let the oven cool to room temperature.

Repeat cleaning.

Turn on the oven and set at just below maximum temperature.

Bake over night.

WARNING: DO NOT TURN ON OVEN WHEN EXPLOSIVE VAPERS ARE PRESENT!

Perform inspections described in section 4.4



Advanced LIGO Air Bake Oven Qualification Process Specification

4.3 Solutions / Liquids and Materials

Solutions / Liquids and Materials to be used are as follows.

DI Water 18 meg. ohm
Methanol reagent grade
Acetone reagent grade
Clean room wipes
Stainless steel bottle brush

4.4 Inspections

Inspection will be performed in sections one at a time with the unaided eye to determine if there is any gross contamination.

A black light inspection will be done using a 360nm black light.

Look for any fluorescing contaminants.

4.5 Tests and final approval

Fabricate two identical aluminum plates

Clean one aluminum plate following LIGO-E960022-B-E "LIGO Vacuum Compatibility, Cleaning Methods and Qualification Procedures".

Vacuum bake one aluminum disk following LIGO vacuum bake procedures.

Obtain a Quadra pole mass spectrometer scan on the Vacuum baked aluminum plate.

The second Aluminum plate send to JPL to have them make a "Fire Plate" out of it.

Then Air Bake the "Fire Plate in the New Air Bake Oven at 120 C for 48 Hrs.

Wrap the Air Baked aluminum plate in UHV aluminum foil and place in a stat 100 bag, purge with nitrogen and sealed then place that bag in a second stat 100 bag and seal.

Have an analysis done by Diffuse Reflectance/ Fourier Transform Infrared (DRIFT/FTIR) spectroscopy that will provide chemical functional group information for quantitative analysis and qualitative identification of materials.

Submit both sets of data for approval.

5 Maintenance and Tests

5.1 Inspections

Inspect oven after each bake load for visual contamination.

5.2 Scheduled maintenance

Perform PM checks on oven quarterly.

If repairs are done, inspect for contamination.

If contamination is found, perform cleaning. (Section 4.2)

Perform a bake out at just below maximum temperature for 48 hours.

Obtain approval to resume normal operation.

Keep a log on the oven repairs.



**Advanced LIGO Air Bake Oven
Qualification Process Specification**

This can be done by starting a traveler on the oven it's self.

6 Appendix A: Sources

1. Acetone ---- Caltech VWR Stockroom
2. Methanol----Caltech VWR Stockroom
3. Clean room Wipes—Caltech VWR Stockroom
4. Booties, Caps, Gowns, Masks and Gloves-----Caltech VWR Stockroom
5. Stat 100 bags ---- CP Stat 100 ESD Bags, CALTEX PLASTICS INC.
PO Box 58546, 2380 E. 51st St., Los Angeles, Ca 90058
213-583-4140

7 Appendix B: Abbreviations

DI	Deionized
C	Centigrade
LIGO	Laser interferometer Gravitational-wave Observatory
DRIFT/FTIR	Diffuse Reflectance/ Fourier Transform Infrared
PM	Preventive Maintenance
JPL	Jet Propulsion Laboratory