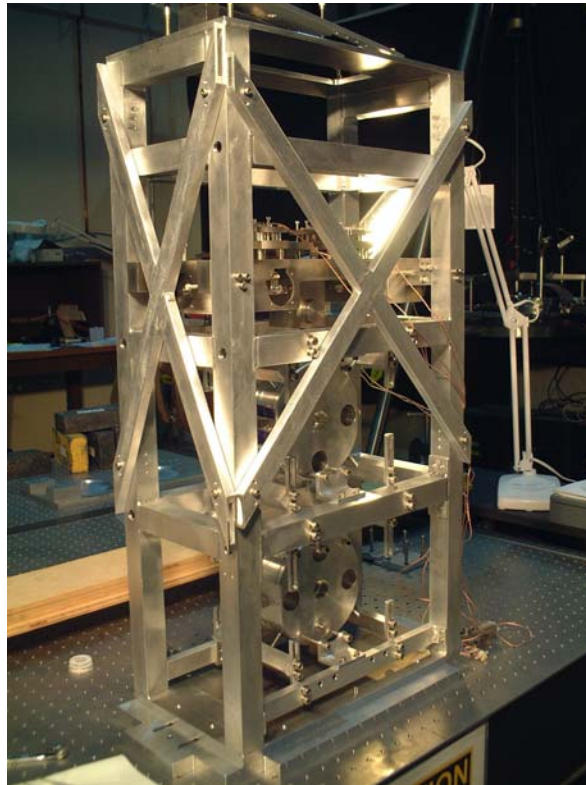


**E030568-01-D**  
**Mass Catcher Design for Mode Cleaner Controls Prototype**

**Product Design Specification (PDS)**

*Revision 00: Original specification released for Glasgow SUS summit (RAJ, Aug 03)*

*Revision 01: Updated specification following comments from LIGO SUS group and LIGO 1 alignment team (Jan 04)*



**1.0 Performance**

**Positioning:**

- There should be some mechanical/optical assistance to optimise the positional accuracy of the masses (and in turn the silica ears) for welding
- Datum points on the Catcher and Structure for precision mounting

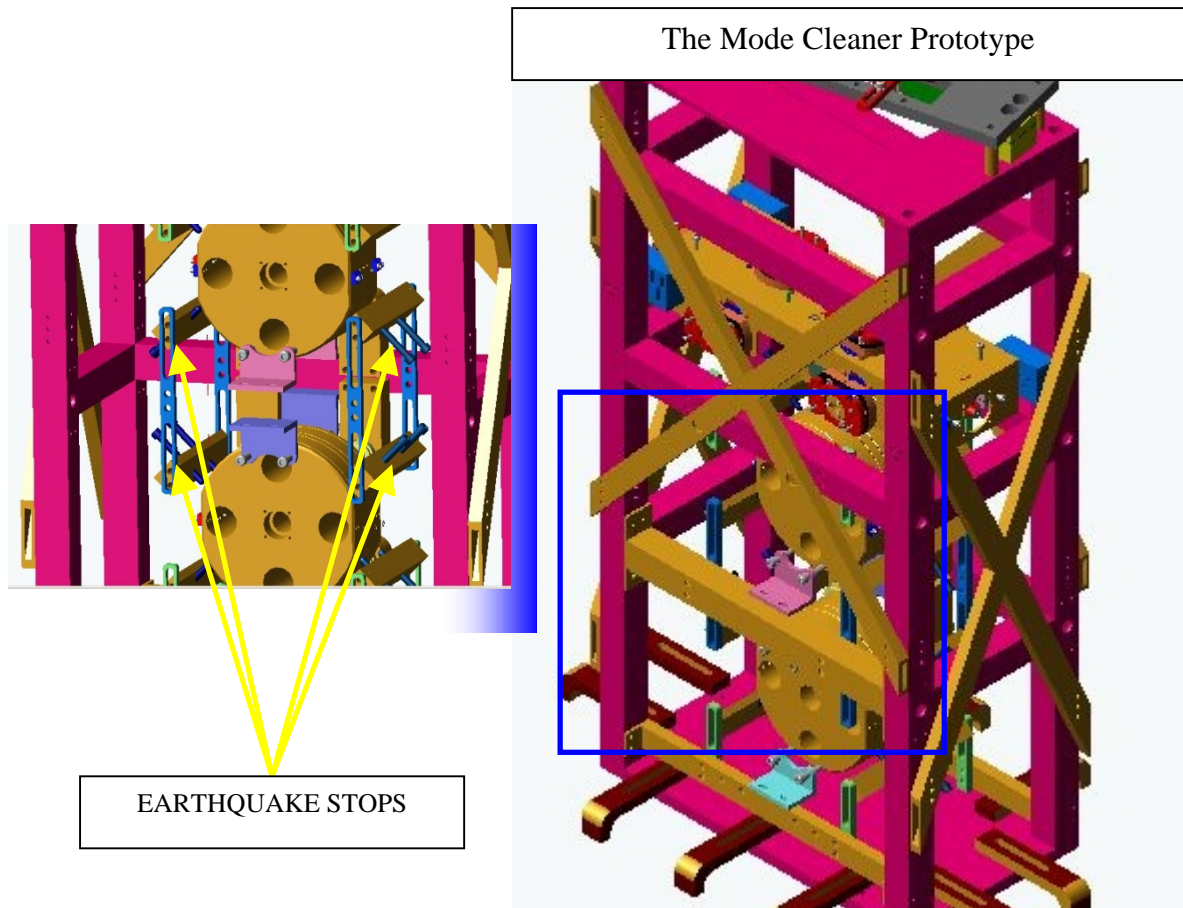
**Clamping:**

- The Catcher must clamp the masses rigidly and define a centre-to-centre separation of 222mm
- Clamping forces must ensure that the masses are evenly clamped and with a consistent force
- The chosen clamping force must ensure that the masses are clamped rigidly to assist safe transportation.
- The clamping force must not overstress the barrel of the silica mass

**Interface with Mode Cleaner structure:**

- The design must be fixable to the Mode Cleaner (MC) Structure

- The design must include mechanical stops that limit free motion at the lower stages of the suspension<sup>1</sup>.



- The design must be have a high stiffness

## 2.0 Environment

- The final form of the Mass Catcher must operate in UHV conditions<sup>2</sup>

## 3.0 Size and weight

- The catcher must have outer dimensions that are no bigger than:
  - Width: 255mm
  - Depth: 111mm
  - Height: 440mm
- The Catcher must accommodate the Mode Cleaner masses:
  - Radius: 75mm
  - Thickness: 75mm
- The centre-to-centre separation of the masses must be 222mm exactly
- The mass of the system (as left inside the vacuum tank) should not exceed.....kg...tbd.

<sup>1</sup> LIGO-E021000-01 Earthquake and Safety Stop Requirements (LIGO 1)

<sup>2</sup> LIGO-E960050 Vacuum Compatible Materials List

#### **4.0 Assembly and Installation**

- Product assembly method must ensure maximum stiffness
- No critical components should be overstressed during assembly or use
- Parts should be standardised where possible
- The design must maintain the modularity of the GEO Mass Catcher Design in order to ensure ease of assembly and more importantly disassembly (inside the vacuum tank)

#### **5.0 Installation**

- The design must include a form of ‘jack’ (or similar concept) that will facilitate the connection of the upper mass and intermediate mass via steel wires.

#### **6.0 Materials**

- All materials must be UHV compatible where being left as part of the final assembly<sup>2</sup>
- Material selection should minimise possibility of cold welding
- Materials that are to be used in close proximity to the mirrors should be chosen carefully to avoid build up of electrostatic charge
- Materials in close proximity to welding zones should be protected if it is deemed necessary

#### **7.0 Ergonomics**

- The design should compliment the chosen welding process as efficiently as is possible given special constraints (e.g. access for welding must be maximised)
- Clamping mechanisms should be easy to operate
- All sharp edges/corners should be removed to avoid personal injury
- Final disassembly operations should be achievable in one direction, as is the case in the GEO Mass Catcher Design

#### **8.0 Quantity**

- Supply of “x” catchers....tbd.

#### **9.0 Maintenance**

- The design should operate on a ‘fit and forget’ basis, until such time as it is called upon to ‘catch’ a broken suspension

#### **10.0 Quality and Standards**

- Manufacturing drawings must conform to industry standards (e.g. BS8888)

#### **11.0 Safety**

- An appropriate factor of safety must be incorporated into all critical design components

#### **12.0 Disposal**

- The design should be easily disassembled to enable part material to be either re-used or recycled where possible
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