LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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Errant Beam Baffle Installation LLO and LHO

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Abstract

Assembly details and installation procedures for the errant beam baffles in the LLO 4K, LHO 4K, and LHO 2K interferometers are presented.

1 Introduction

1.1 Background

Errant beams from rogue mirrors in the IO section of the 4K and 2K interferometers may damage the SOS and LOS suspension wires, the control wires connected to the OSEMs, and the control wires attached to connector standoffs near the OSEMs. Errant beam baffles placed in front of the susceptible suspension towers and cable standoffs will protect the wires and cables. In addition, baffles placed in the lower half of each end of the mode cleaner tube will prevent errant beams from hitting ribbon cables placed on and below the tables at lower than 3 inches above the table surface.

1.2 Scope

This document describes the assembly and the installation procedures for errant beam baffles in the LLO 4k and LHO 4k and 2k interferometers.

1.3 List of Baffles

The baffles to be installed at the LLO and LHO sites are listed in the following.

1.3.1 LLO 4K

MMT1 baffle

MMT2 baffle

MMT3 baffle

MC1 baffle

MC2 baffle

MC3 baffle

IO errant beam baffle

Tube Baffle

Table Connector Baffle

1.3.2 LHO 4K

MMT1 baffle

MMT2 baffle

MMT3 baffle

MC1 baffle

MC2 baffle

MC3 baffle

IO errant beam baffle

Tube Baffle

Table Connector Baffle

1.3.3 LHO 2K

MMT1 baffle

MMT2 baffle

MMT3 baffle

MC1 baffle

MC2 baffle

MC3 baffle

IO errant beam baffle

Tube Baffle

Table Connector Baffle

1.4 Auxiliary Alignment Equipment

The following items of auxiliary alignment equipment are required:

1. Movable surfboard platform for access to the HAM tables through the chamber door
2. Miscellaneous baffle alignment tools
3. Alignment laser for IO errant beam baffle

2 Assembly Details

2.1 LLO 4K

2.1.1 MMT1 Assembly

The MMT1 baffle assembly is shown in Figure 1. The baffle is attached to the foot listed in Table 1. The beam trap assembly that mounts to the MMT1 baffle for the misaligned RM beam is shown in Figure 2.

Baffle	Foot
MMT1	D030334

Table 1: MMT1 baffle and foot

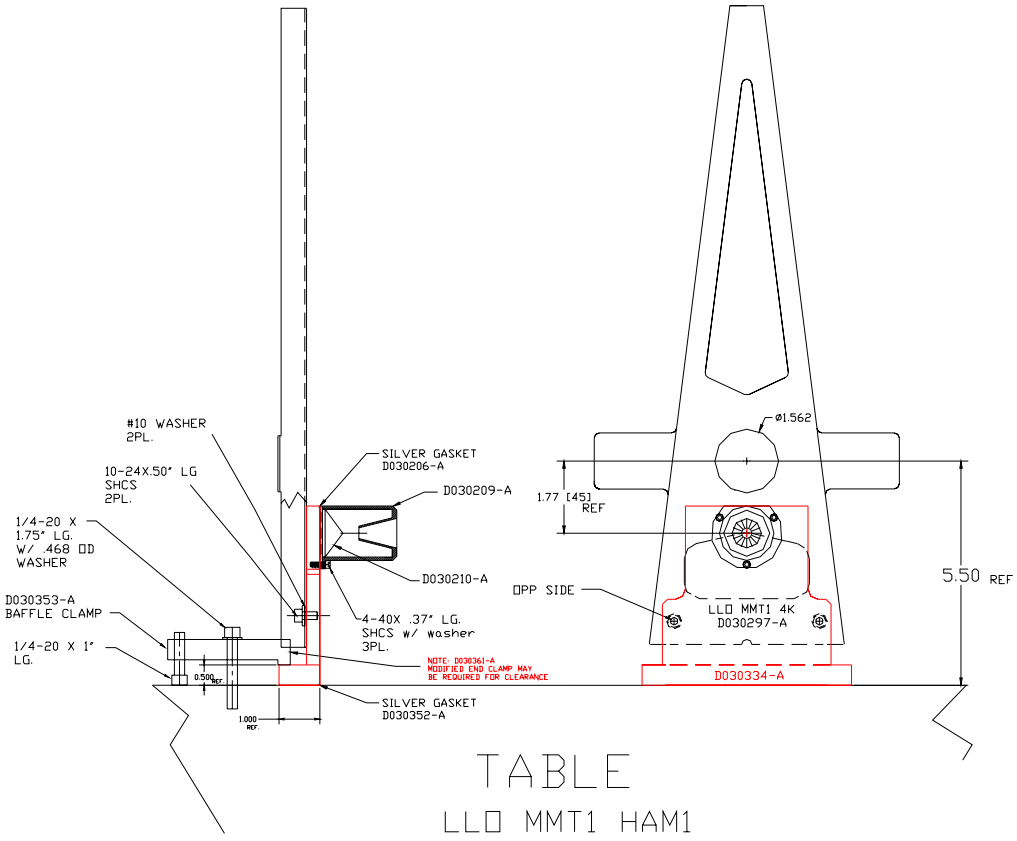

Figure 1: LLO MMT1 baffle with beam trap assembly

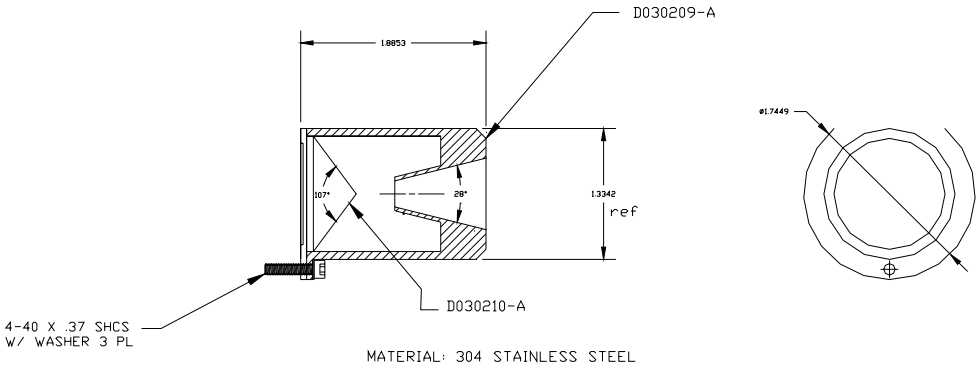

Figure 2: Beam trap assembly

2.1.2 MMT2 Assembly

The MMT2 baffle assembly is shown in Figure 3. The baffle is attached to the foot listed in Table 2.

Baffle	Foot
MMT2	D030279

Table 2: MMT2 baffle and foot

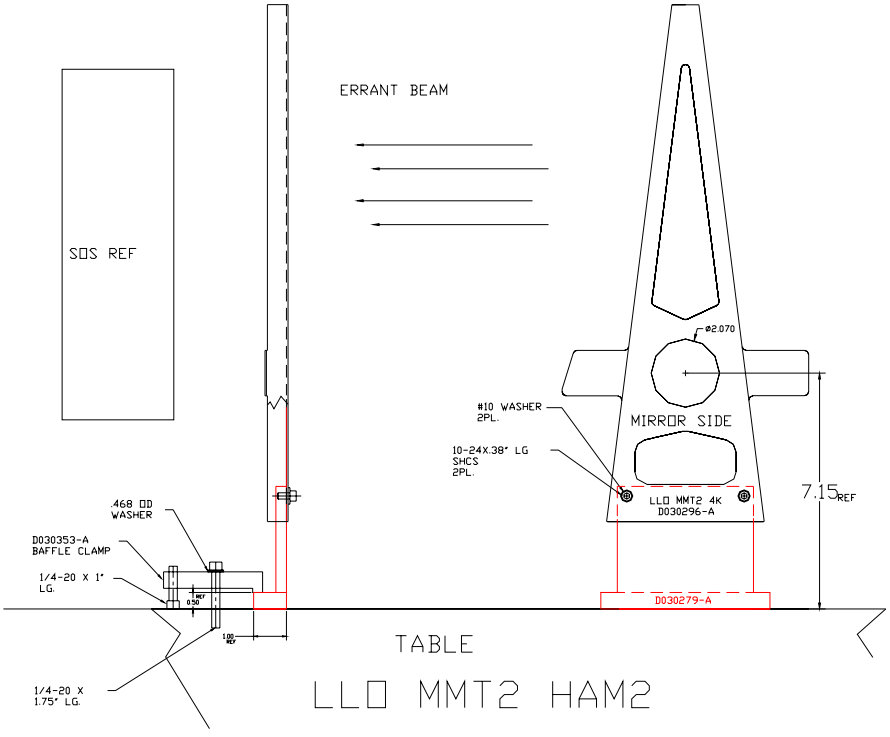

Figure 3: LLO MMT2 baffle assembly

2.1.3 MMT3 Assembly

The MMT3 baffle assembly is shown in Figure 4. The baffle is attached to the foot listed in Table 3. Note that unlike all the other baffles the diffuse surface of the MMT3 baffle is oriented toward the HAM2 chamber.

Baffle	Foot
MMT3	D030333

Table 3: MMT3 baffle and foot

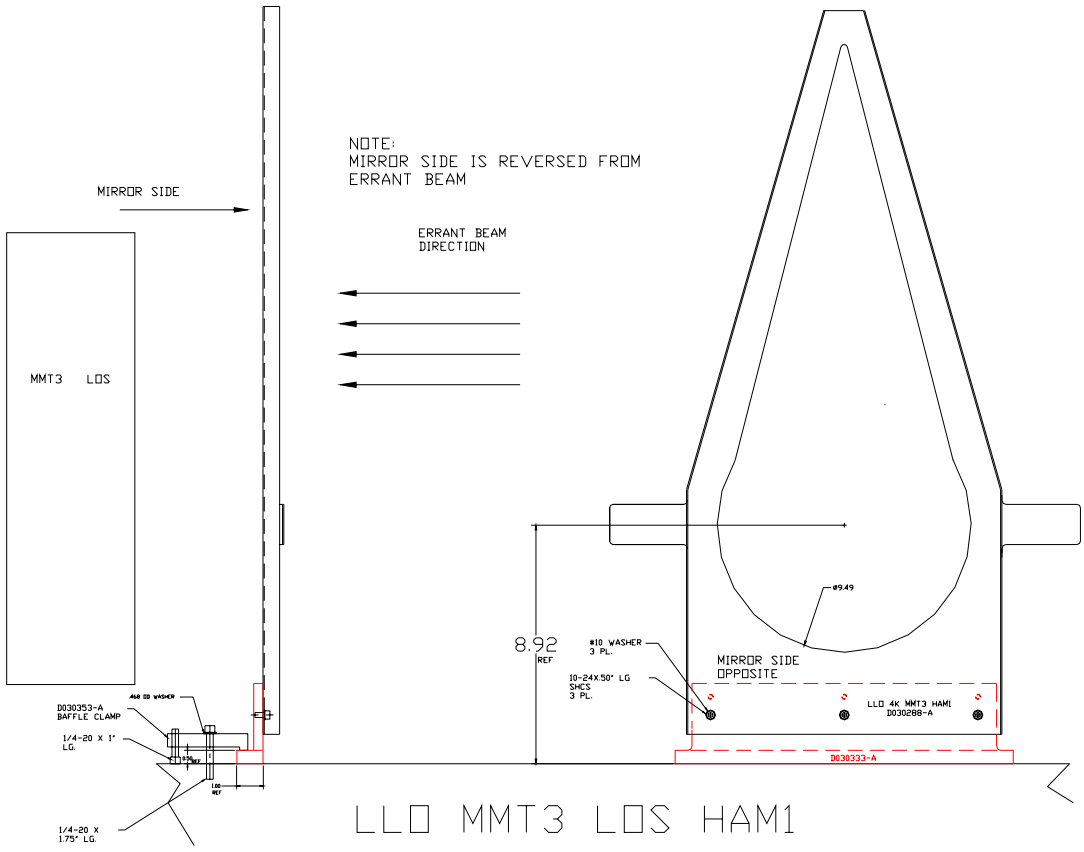

Figure 4: LLO MMT3 baffle assembly

2.1.4 MC1 Assembly

The MC1 baffle assembly is shown in Figure 5. The baffle is attached to the foot listed in Table 4.

MC1	D030218

Table 4: MC1 baffle and foot

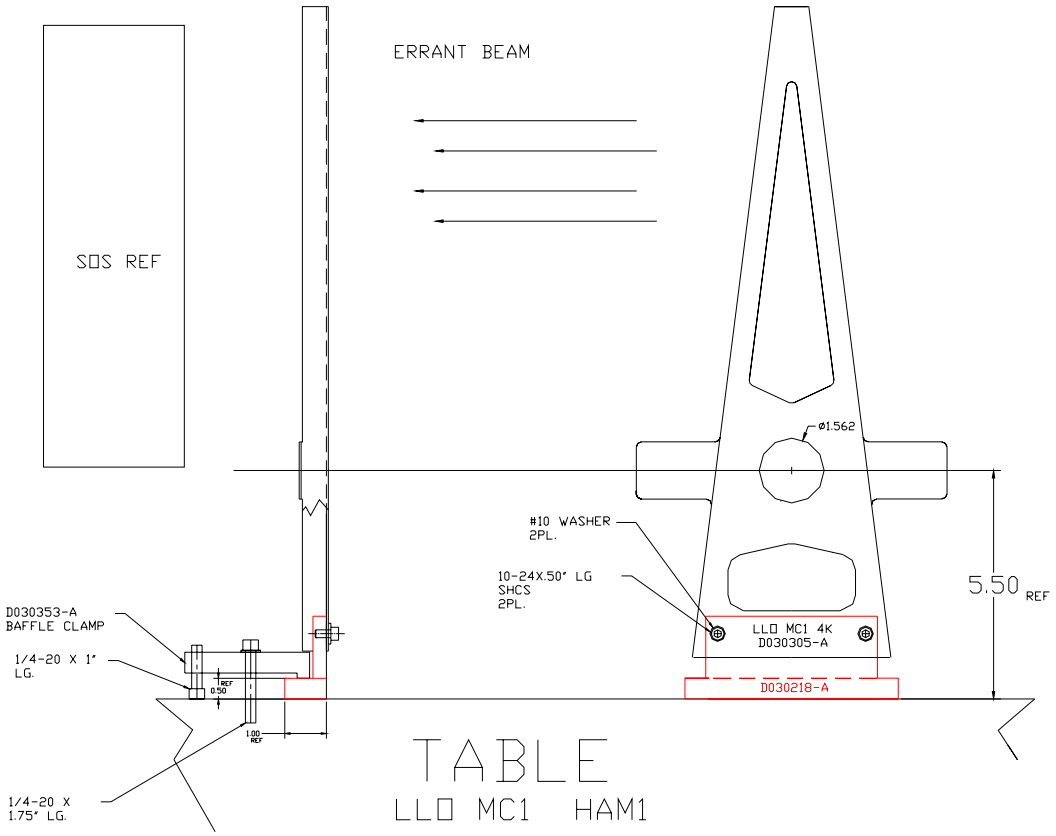

Figure 5: LLO MC1 baffle assembly

2.1.5 MC2 Assembly

The MC2 baffle assembly is shown in Figure 6. The baffle is attached to the foot listed in Table 5.

Baffle	Foot
MC2	D030218

Table 5: MC2 baffle and foot

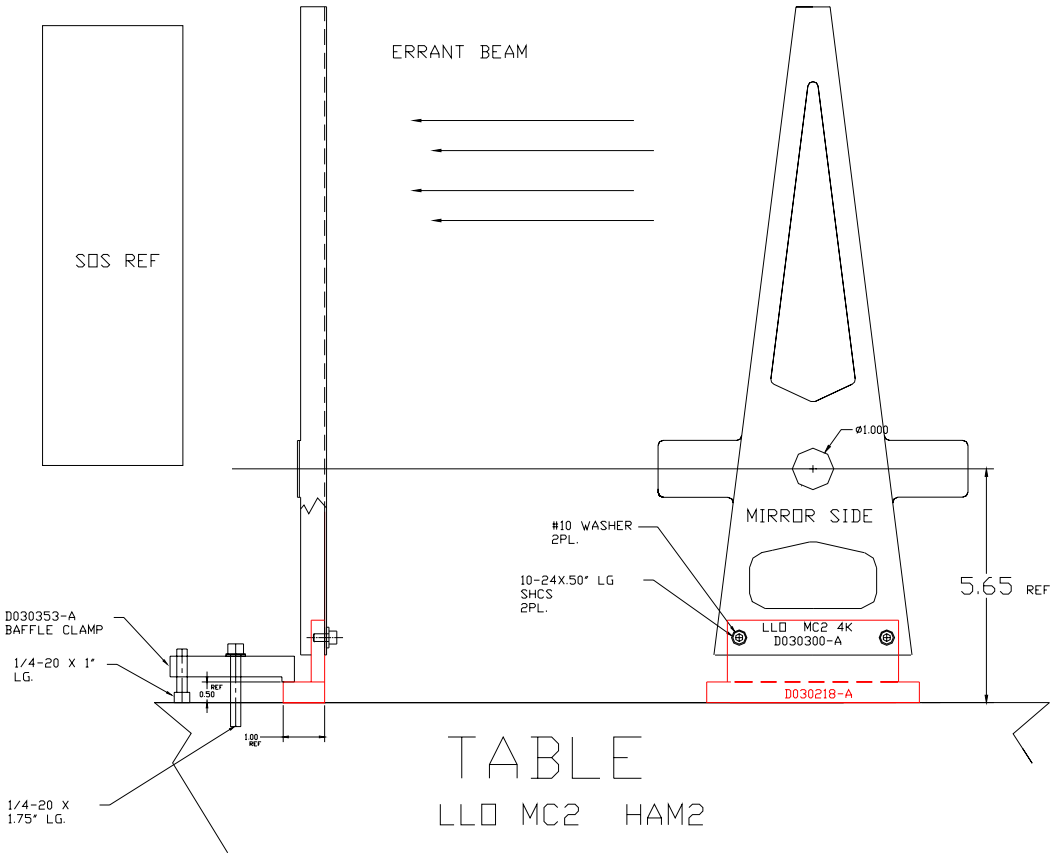

Figure 6: LLO MC2 baffle assembly

2.1.6 MC3 Assembly

The MC3 baffle assembly is shown in Figure 7. The baffle is attached to the foot listed in Table 6.

Baffle	Foot
MC3	D030218

Table 6: MC3 baffle and foot

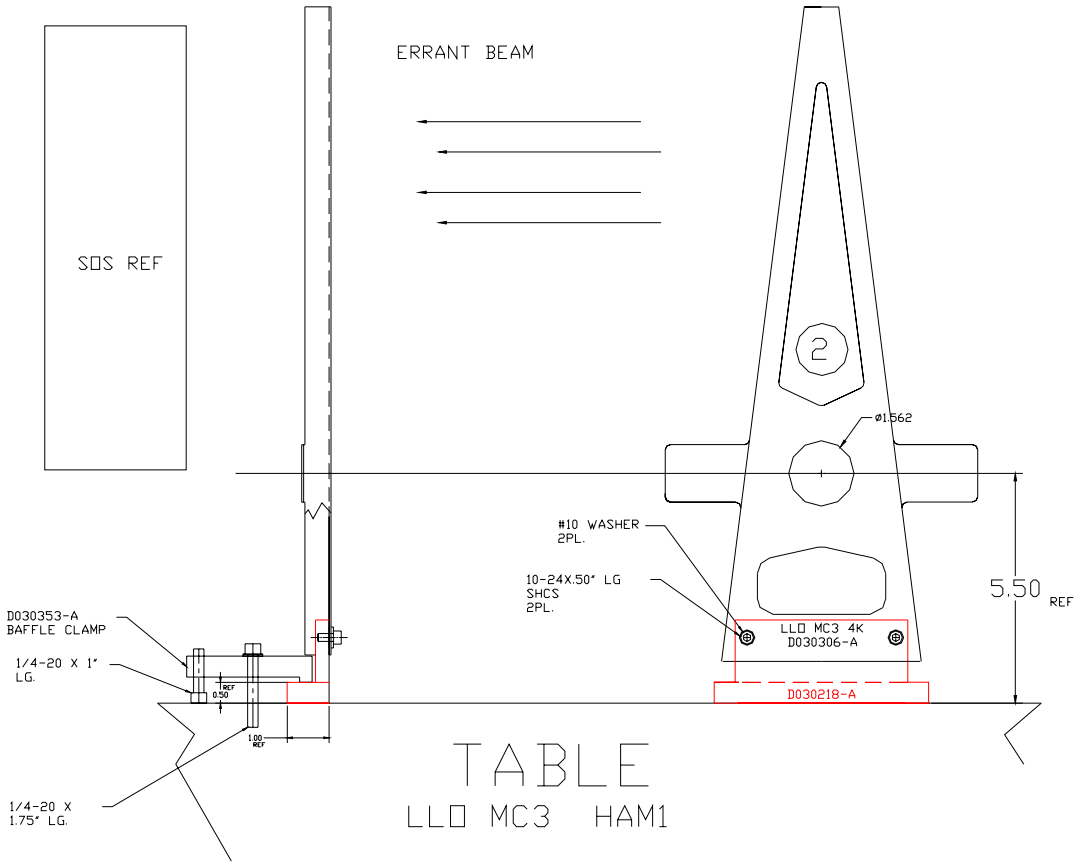

Figure 7: LLO MC3 baffle assembly

2.1.7 IO Errant Beam Baffle Assembly

The IO Errant Beam Baffle assembly is shown in Figure 10.

2.1.8 Tube Baffle Assembly

The tube baffle assembly is shown in Figure 11.

2.1.9 Table Connector Baffle Assembly

The table connector baffle assembly is shown in Figure 12.

2.2 LHO 4K

2.2.1 MMT1 Assembly

2.2.2 MMT2 Assembly

2.2.3 MMT3 Assembly

2.2.4 MC1 Assembly

2.2.5 MC2 Assembly

2.2.6 IO Errant Beam Baffle Assembly

2.2.7 Tube Baffle Assembly

2.2.8 Table Connector Baffle Assembly

2.3 LHO 2K

2.3.1 MMT1 Assembly

2.3.2 MMT2 Assembly

2.3.3 MMT3 Assembly

2.3.4 MC1 Assembly

2.3.5 MC2 Assembly

2.3.6 IO Errant Beam Baffle Assembly

2.3.7 Tube Baffle Assembly

2.3.8 Table Connector Baffle Assembly

3 Installation Procedures

3.1 LLO 4K

3.1.1 HAM1

The installation of MMT1, MMT3, MC1, and MC3 baffles is shown in Figure 8. The corresponding installation tools for locating the baffles on HAM1 are listed in Table 7. The baffles are held down with CL2 clamps.

Baffle	Tool
MMT1	D030370
MMT3	D030283
MC1	D030287
MC3	D030286

Table 7: Baffle installation tools for HAM1

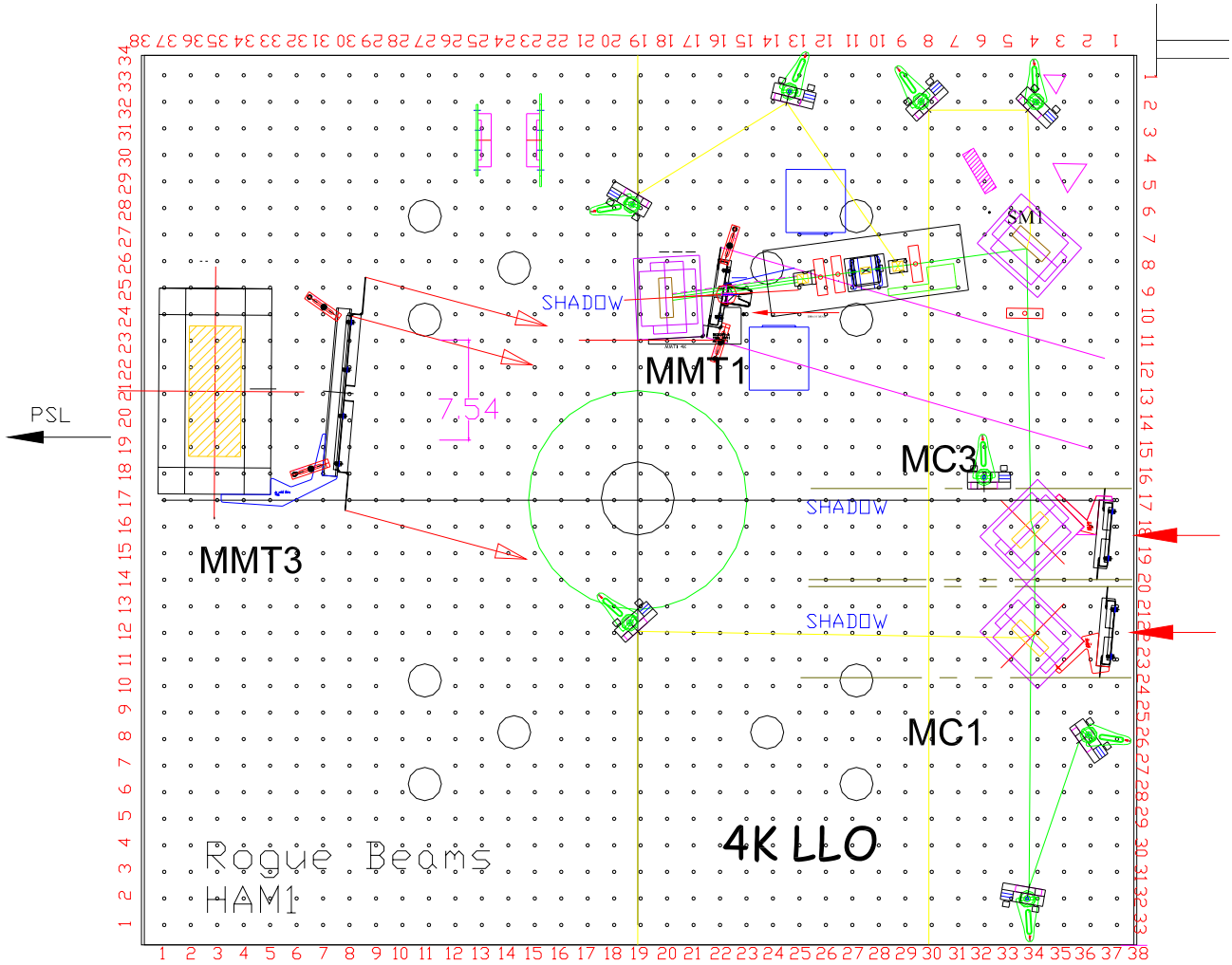

Figure 8: HAM1 assembly of MMT3 baffle, MMT1 baffle, MC1 baffle, and MC3 baffle

3.1.2 HAM2

The installation of MMT2 and MC2 baffles is shown in Figure 9. The corresponding installation tools for locating the baffles on HAM2 are listed in Table 8. The baffles are held down with CL2 clamps.

Baffle	Tool
MMT2	D030285
MC2	D030284

Table 8: Baffle installation tools for HAM2

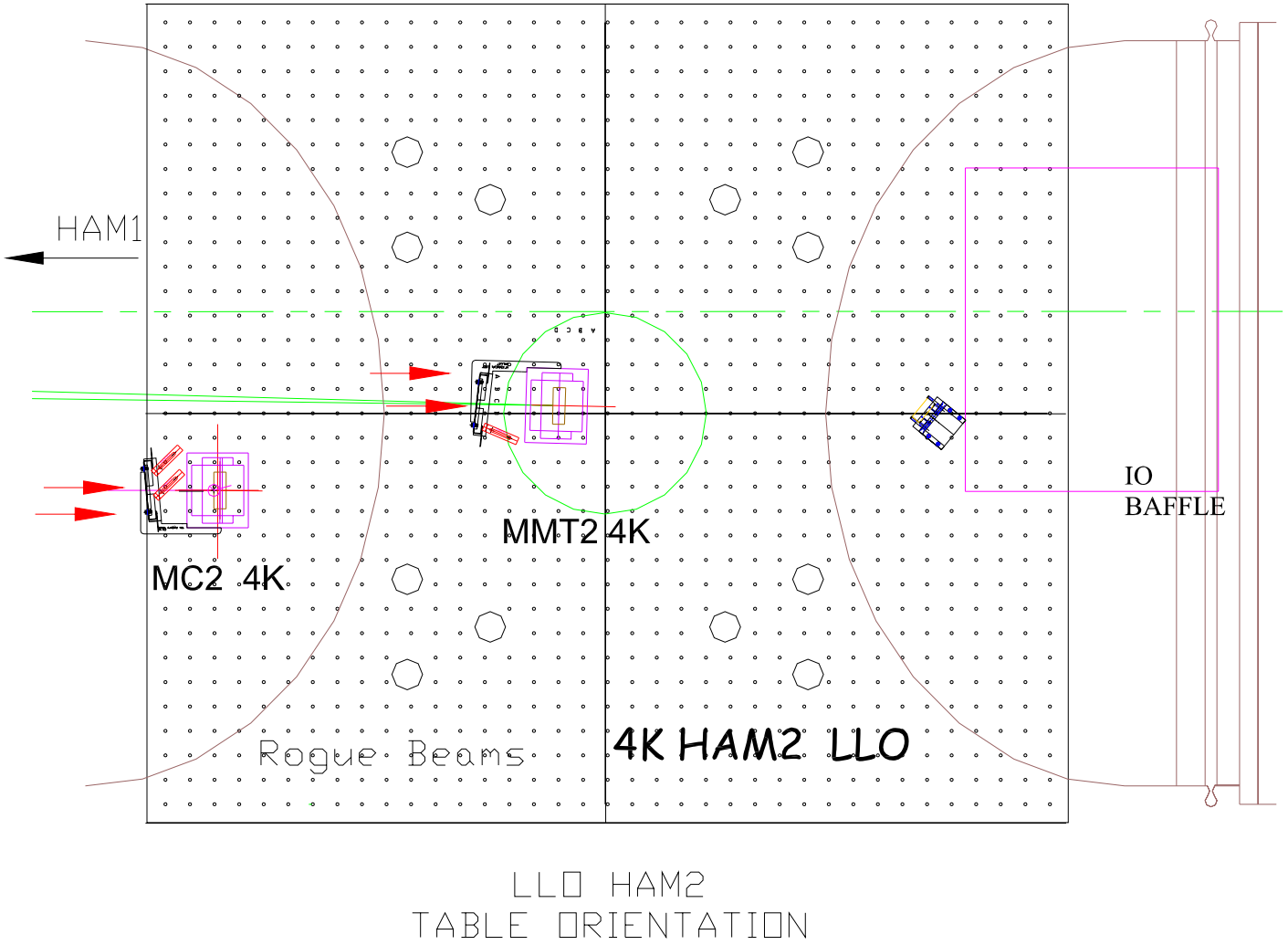

Figure 9: HAM2 assembly of MMT2 baffle and MC2 baffle

3.1.3 IO Errant Beam Baffle Installation

The IO Errant Beam Baffle is attached to the back of the existing IO baffle structure, as shown in Figure 10. The baffle will be aligned with the RM COC by means of a pointing laser directed toward the baffle from in front of the MMT3 mirror on HAM1. The baffle will be positioned so that it's shadow falls concentric with the RM mirror.

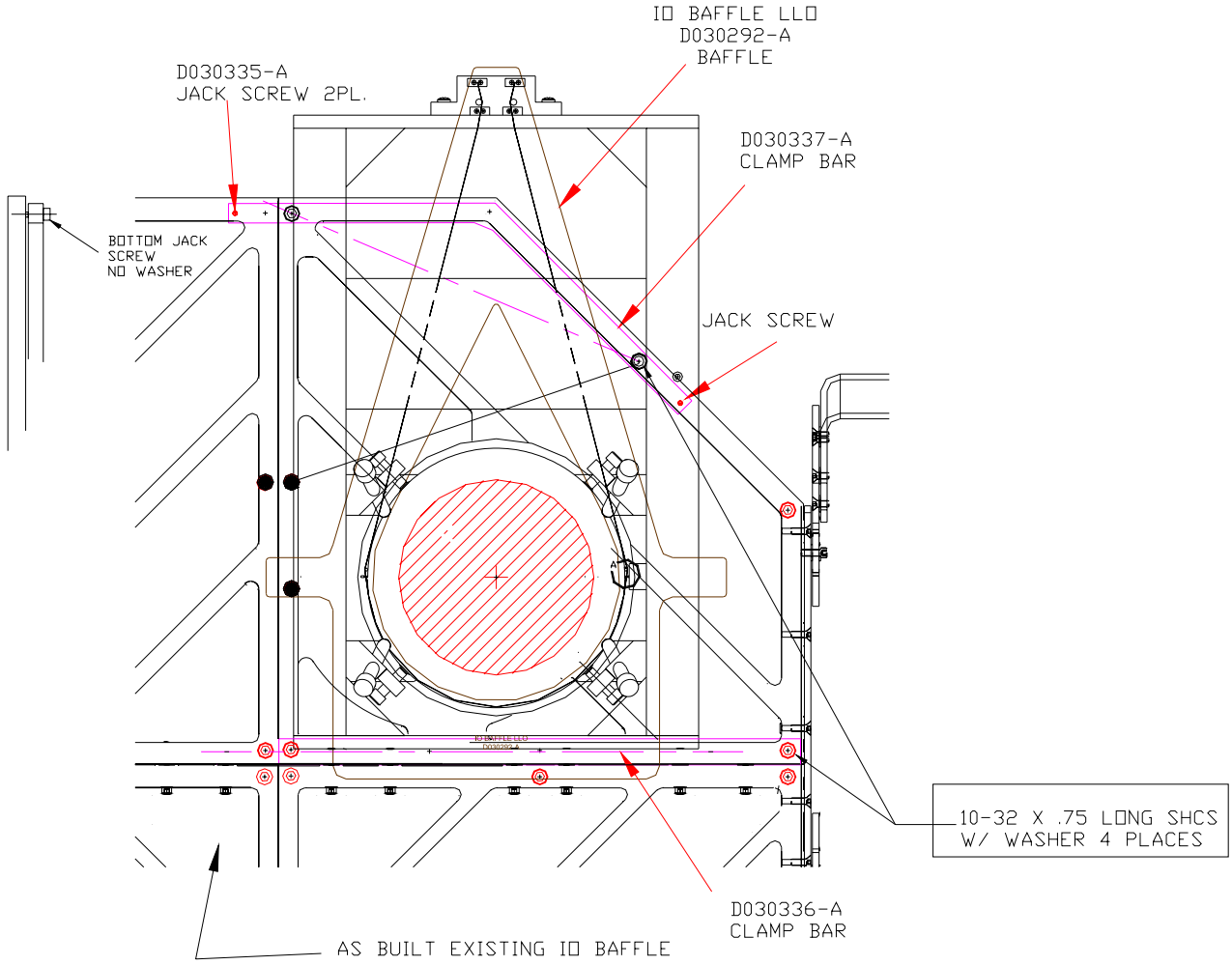

Figure 10: IO errant beam baffle installation

3.1.4 Tube Baffle Installation

Refer to Figure 11. One tube baffle will be placed in the tube section of the HAM1 chamber leading to the mode cleaner tube, with the specular side of the baffle facing HAM2. The other tube baffle will be placed in the tube section of the HAM2 chamber leading to the mode cleaner tube, with the specular side of the baffle facing HAM1. Use spacer rods during assembly of the mounting feet to space the baffle nominally 5/32 inch away from the inside diameter of the tube section. The top edge of the tube baffle should be oriented approximately horizontal. The baffle is

fastened into the tube section by means of the pointed setscrews pressing against the diameter of the tube section.

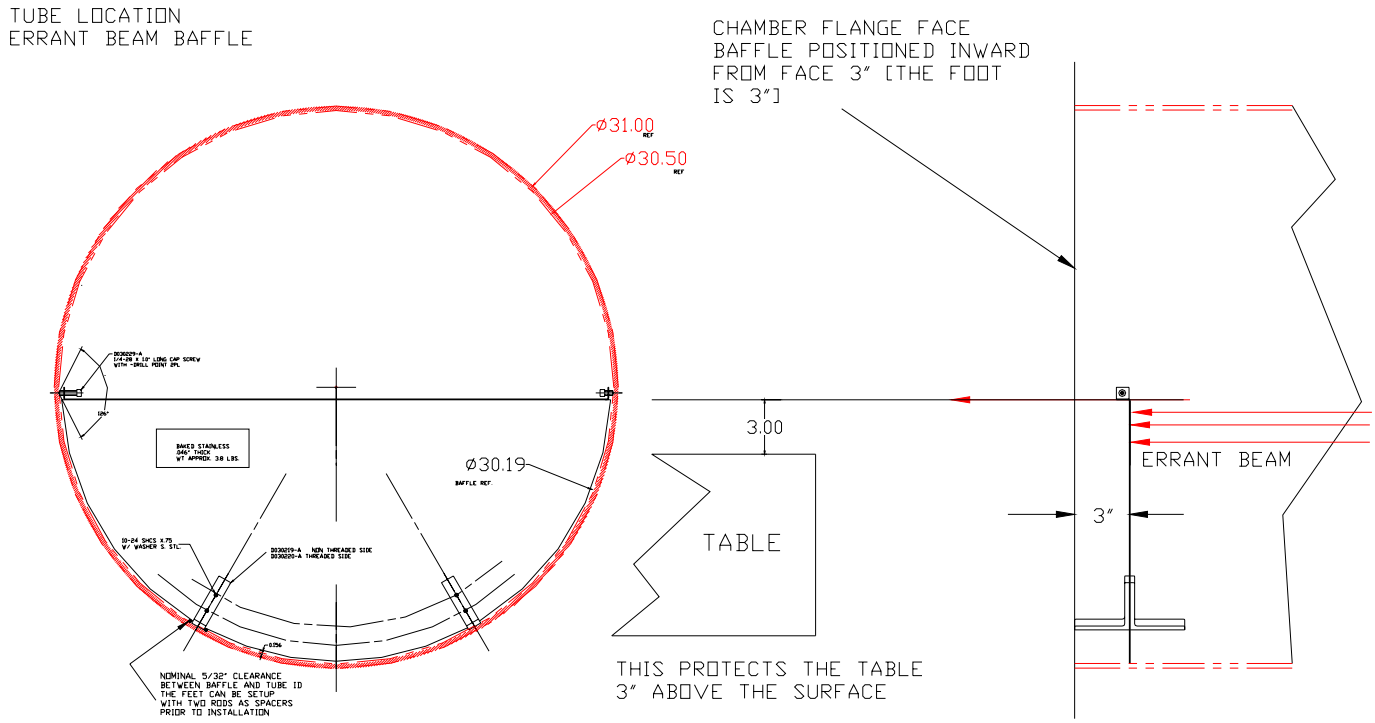

Figure 11: Tube baffle installation

3.1.5 Table Connector Baffle Installation

A table connector baffle will be placed in front of each OSEM cable connector on the table, near each suspension tower, as shown in Figure 12. The baffles placed on HAM1 will have their specular side facing HAM2, and the baffles placed on HAM2 will have their specular side facing HAM1, to shield the wires from respective errant beams from HAM1 and HAM2. The individual wires that connect from the table connector to the SUS OSEMs must be dressed so as to remain either < 3 inches above the table, or behind an SUS structure. An optional baffle clamp with spacer is available for clearing ribbon cables on the table.

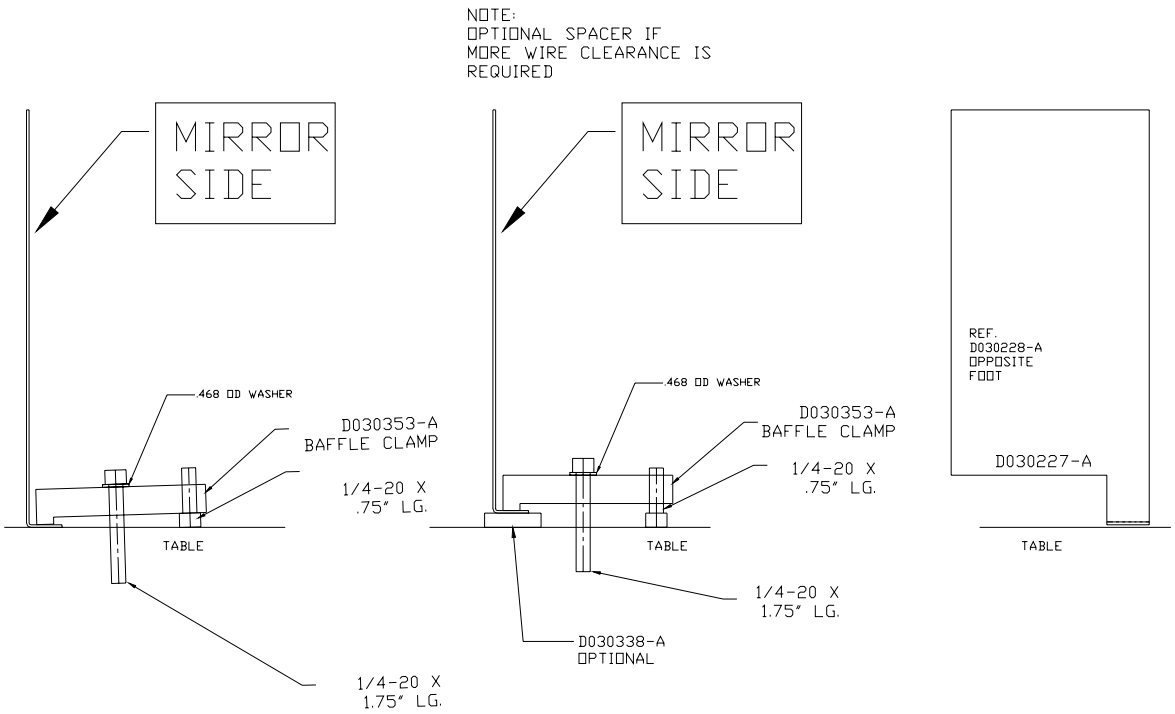

Figure 12: Table connector baffle installation

3.2 LHO 4K

3.2.1 HAM1

3.2.2 HAM2

3.2.3 IO Errant Beam Baffle Installation

3.2.4 Tube Baffle Installation

3.2.5 Table Connector Baffle Installation

3.3 LHO 2K

3.3.1 HAM7

3.3.2 HAM8

3.3.3 IO Errant Beam Baffle Installation

3.3.4 Tube Baffle Installation

3.3.5 Table Connector Baffle Installation