**XTOD Wall 1 and Wall 2 Shielding Requirements**

<table>
<thead>
<tr>
<th>Author</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Peter Stefan</td>
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<td>2008/8/15</td>
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**Brief Summary:** This document collects requirements previously settled between LCLS XTOD and SLAC Radiation Physics pertaining to the XTOD role in completing the shielding in Wall 1 and Wall 2.

**Change History Log**

<table>
<thead>
<tr>
<th>Rev Number</th>
<th>Revision Date</th>
<th>Sections Affected</th>
<th>Description of Change</th>
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<tbody>
<tr>
<td>000</td>
<td>2008/2/7</td>
<td>All</td>
<td>Initial Version</td>
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<tr>
<td>1</td>
<td>2008/8/12</td>
<td>2.2.1.1</td>
<td>Different penetration diameters in Wall 2 steel for hard x-ray and soft x-ray branch beam lines.</td>
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1. Introduction

The shielding design for Wall 1 (at the downstream end of the Electron Beam Dump), and Wall 2 (at the downstream end of the Front End Enclosure) has only been obtained after considerable, ongoing, iterative discussions between SLAC Radiation Physics and several groups at the LCLS, including Conventional Facilities, Photon Systems, and XTOD. Each of these LCLS groups has a specific role in the completion of the Wall 1 and Wall 2 shielding. This document collects requirements previously settled between LCLS XTOD and SLAC Radiation Physics pertaining to the XTOD role in completing the shielding in Wall 1 and Wall 2.

2. Specific Requirements

2.1. Wall 1:

2.1.1. Opening through Wall 1: The penetration through Wall 1 shall have a maximum diameter of 3.75 inches.

2.1.2. Upstream Fill: In the Steel portion of Wall 1

2.1.2.1. Material: The stepped steel opening in Wall 1 shall be filled with steel, except for the portion of this region occupied by the wall penetration.

2.1.2.2. Extent: The total thickness of the added fill material along the beam direction (z-direction) shall be at least equal to that of the steel in the original stepped steel opening.

2.1.2.3. Shielding Gaps: These are significant, sheet or plate-like air spaces between the added fill material and the original stepped opening, and between component pieces of the added fill material. They are characterized by one short dimension and additional, substantially-larger dimensions. Such spaces become significant when they present substantial length parallel to the beam direction, the z-direction, and can thus permit un-attenuated passage of incident radiation. Such air spaces, so oriented, are denoted as "shielding gaps".

2.1.2.3.1. Shielding Gaps shall be minimized in number.

2.1.2.3.2. The short dimension characterizing a shielding gap shall not exceed 0.2 inches.

2.1.2.3.3. The extent of a shielding gap parallel to the z-direction shall not exceed 12 inches.
2.1.3. Downstream Fill: In the Normal Concrete portion of Wall 1
   2.1.3.1. Material: The concrete opening in Wall 1 shall be filled with heavy or normal concrete, except for the portion of this region occupied by the wall penetration.
   2.1.3.2. Extent: The total thickness of the added fill material along the beam direction (z-direction) shall be at least equal to that of the concrete in the original stepped concrete opening.
   2.1.3.3. Shielding Gaps:
      2.1.3.3.1. Shielding Gaps shall be minimized in number.
      2.1.3.3.2. The short dimension characterizing a shielding gap shall not exceed 0.2 inches.
      2.1.3.3.3. The extent of a shielding gap parallel to the z-direction shall not exceed 12 inches.

2.2. Wall 2:
   2.2.1. Opening through Wall 2:
      2.2.1.1. The penetration through the steel portion of Wall 2:
         2.2.1.1.1. Shall have a maximum diameter of 1.50 inches for the hard x-ray branch beam line.
         2.2.1.1.2. Shall have a maximum diameter of 3.00 inches for the soft x-ray branch beam lines.
      2.2.1.2. The penetration through the concrete portion of Wall 2 shall have a maximum, unfilled diameter of 3.00 inches.
   2.2.2. Upstream Fill: In the Steel portion of Wall 2
      2.2.2.1. Material: The stepped steel opening in Wall 2 shall be filled with steel, except for the portion of this region occupied by the wall penetration.
      2.2.2.2. Extent: The total thickness of the added fill material along the beam direction (z-direction) shall be at least equal to that of the steel in the original stepped steel opening.
      2.2.2.3. Shielding Gaps:
         2.2.2.3.1. Shielding Gaps shall be minimized in number.
         2.2.2.3.2. The short dimension characterizing a shielding gap shall not exceed 0.2 inches.
         2.2.2.3.3. The extent of a shielding gap parallel to the z-direction shall not exceed 12 inches.
   2.2.3. Downstream Fill: In the Normal-Concrete portion of Wall 2
      2.2.3.1. Material: The concrete opening in Wall 2, should it exceed the maximum, unfilled penetration diameter specified in Section 2.2.1.2
above, shall be filled with normal concrete, except for the portion of this region occupied by the wall penetration.

2.2.3.2. Extent: The total thickness of the added fill material along the beam direction (z-direction) shall be at least equal to the thickness of the original concrete wall.

2.2.3.3. Shielding Gaps:
   2.2.3.3.1. Shielding Gaps shall be minimized in number.
   2.2.3.3.2. The short dimension characterizing a shielding gap shall not exceed 0.2 inches.
   2.2.3.3.3. The extent of a shielding gap parallel to the z-direction shall not exceed 12 inches.