Welding, Joining, and Thermal Cutting Safety

Brief

<table>
<thead>
<tr>
<th>Title:</th>
<th>Welding, Joining, and Thermal Cutting Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication date:</td>
<td>9/10/2013</td>
</tr>
<tr>
<td>Effective date:</td>
<td>8/25/2010</td>
</tr>
</tbody>
</table>

BRIEF

Policy Summary

The Welding, Joining, and Thermal Cutting Safety Program at Berkeley Lab ensures that welding is performed safely and in conformance with applicable safety standards by qualified and authorized personnel in a manner that ensures acceptable joint quality and integrity. "Welding" includes all joining processes that use heat to join materials with or without a filler material. Examples of such processes are welding, brazing, soldering, and thermal cutting (e.g., severing or removing metal by localized melting, burning, or vaporizing of the work pieces).

Who Should Read This Policy

This policy applies to:

- Employees who need welding work performed
- Facilities personnel who will be welding
- Engineering personnel who will be welding
- Division personnel performing low-risk welding
- Facilities management overseeing welding operations
- Engineering management overseeing welding operations
- Division management overseeing low-risk welding operations

To Read the Full Policy, Go To:
The POLICY tab on this wiki page

To Read the ES&H Program Details, Go To:
http://www.lbl.gov/ehs/pub3000/CH33.html

Contact Information

Welding Subject Matter Expert
EH&S Division

Policy

<table>
<thead>
<tr>
<th>Title:</th>
<th>Welding, Joining, and Thermal Cutting Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication date:</td>
<td>9/10/2013</td>
</tr>
</tbody>
</table>
POLICY

A. Purpose

The Welding, Joining, and Thermal Cutting Safety Program at Lawrence Berkeley National Laboratory (Berkeley Lab) ensures that welding is performed safely and in conformance with applicable safety standards by qualified and authorized personnel in a manner that ensures acceptable joint quality and integrity.

“Welding” includes all joining processes that use heat to join materials with or without a filler material. Examples of such processes are welding, brazing, soldering, and thermal cutting (e.g., severing or removing metal by localized melting, burning, or vaporizing of the work pieces).

B. Persons Affected

This policy applies to:

- Employees who need welding work performed
- Facilities personnel who will be welding
- Engineering personnel who will be welding
- Division personnel performing low-risk welding
- Facilities management overseeing welding operations
- Engineering management overseeing welding operations
- Division management overseeing low-risk welding operations

C. Exceptions

This policy does not apply to:

- Subcontractors performing repairs on subcontractor-owned equipment that may be operated at Berkeley Lab. Note that other Berkeley Lab requirements apply to these same subcontractors. See the Construction Health & Safety and SJHA Process – Subcontractor Job Hazards Analysis programs in the ES&H Manual.
- Subcontractors performing welding where quality and safety requirements are specifically addressed in subcontractor requirements (e.g., structural welding, fabricating components or equipment)

D. Policy Statement

1. Requests for welding through the Facilities Division are made via the Work Request Center.
   a. The Facilities Division will follow its internal welding procedures (ADMN-070, Facilities, Welding and Brazing, and OPER-346 Facilities Welding and Brazing).

2. Requests for welding on scientific equipment are made to the Engineering Division.
   a. The Engineering Division will follow its internal welding procedure.
   b. An Engineering or Safety Note will be prepared for high-risk welds.

3. Perform a Job Hazards Analysis (JHA) and follow Integrated Safety Management (ISM) to identify hazards and controls for low-risk welding (e.g., soldering, spot welding, and torch brazing).
   a. Should a scientific division need to perform other types of welding, specific policies and procedures should be developed and implemented with the oversight of Environment, Health & Safety (EH&S) Welding Subject Matter Expert Joe Dionne (ext. 7586).

4. Obtain a Hot Work Permit for:
   a. Resistance spot welding
   b. Open-flame welding processes
   c. Arc-welding processes

5. Perform an Exposure Assessment prior to performing welds to ensure vapors, fumes, gases, heat, noise, and radiation are controlled.

6. Complete training requirements for welding to be performed.
7. Implement control measures identified in:
   a. JHA
   b. Hot Work Permit
   c. Exposure Assessment
   d. Division-specific welding procedures
8. Perform welding process according to control measures.
9. File Hot Work Permits with the Berkeley Lab Fire Department.

E. Roles and Responsibilities

Managers, supervisors, and employees have the responsibility to adhere to the provisions of this policy.

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Division Directors                | • Ensure that welding performed in their divisions is done in accordance with the Welding, Joining, and Thermal Cutting Safety Program, and only by individuals qualified and authorized to do so  
   • Ensure that documented processes are used to authorize individuals within their divisions to request welds, weld plans, assign risk categories, and/or perform welding |
| Engineering Division              | Performs high-risk welded joints on research equipment and assemblies                                                                                                                                           |
| Engineering Division Director     | • Designates qualified welding engineers (see Section 33.5, Roles and Responsibilities), or procures these services from a qualified vendor to provide welding guidance for research applications  
   • Ensures the review and approval of high-risk welding designs for research equipment or assemblies prepared by vendors and Berkeley Lab personnel |
| Facilities Division               | Responsible for high-risk joints (see Section 33.6, Definitions) performed on Berkeley Lab infrastructure (e.g., buildings, utility piping systems, seismic restraints, etc.) |
| Facilities Division Director      | • Ensures that qualified welding engineers (see Section 33.5, Roles and Responsibilities) provide welding guidance for building or infrastructure applications  
   • Ensures the review and approval of high-risk welding designs for building infrastructure, equipment, or assemblies prepared by vendors and Berkeley Lab personnel |
| Designated Welding Engineers      | Designated welding engineers specialize in relevant welding codes, welding design, welding drawing standards, material properties, and quality aspects of welds. A welding engineer may be appointed by his or her division director as a designated welding engineer. Welding engineering services can be procured from external vendors (e.g., Consolidated Engineering, Inc.).  
   Designated welding engineers are responsible for:  
   • Providing Berkeley Lab staff with advice and guidance on weld integrity and welding codes compliance  
   • Reviewing and approving welding-related designs/drawings on behalf of their respective division directors |
| Work Leads                        | Ensure that only qualified and authorized workers perform welding, and that the authorizations are documented in the JHA                                                                                   |
Environment, Health & Safety Division

- Provides guidance to Berkeley Lab staff on welding-related occupational safety and health hazards and the graded approach, and assists divisions in developing welding policies and procedures
- Assists divisions in assessing worker exposures to hazardous airborne agents and safety hazards during welding, as requested by workers and/or work leads or division safety coordinators

F. Definitions/Acronyms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-risk welded joint</td>
<td>A welded joint that, if it fails, has the potential to cause severe injury or death, and/or the release of hazardous materials. Joints on engineered seismic bracing and pressure vessels typically contain high-risk joints.</td>
</tr>
<tr>
<td>Low-risk welded joint</td>
<td>A welded joint that, if it fails, does not have a recognized potential to cause injury. The risk of property damage due to such a failure is nil to moderate. Examples include welded joints on lower-value equipment, and welding of most plumbing systems (water, nonhazardous gas, vacuum).</td>
</tr>
<tr>
<td>Welding</td>
<td>Processes that use heat to join materials with or without a filler material. Examples of such processes are welding, brazing, soldering, and thermal cutting (e.g., severing or removing metal by localized melting, burning, or vaporizing of the work pieces).</td>
</tr>
</tbody>
</table>

G. Recordkeeping Requirements

None

H. Implementing Documents

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Title</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.07.031.001</td>
<td>Welding, Joining, and Thermal Cutting Safety</td>
<td>Program</td>
</tr>
<tr>
<td>07.07.031.002</td>
<td>Work Process A, Welds Requiring a Facilities Work Request</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.003</td>
<td>Work Process B, Welds for Scientific Research Equipment</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.004</td>
<td>Work Process C, Low-Risk Welds Using ISM and JHA Processes</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.005</td>
<td>Work Process D, Hot Work Permit and Associated Controls</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.006</td>
<td>Work Process E, Exposure Assessment</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.007</td>
<td>Work Process F, Training</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.008</td>
<td>Work Process G, Hazard Control</td>
<td>Process</td>
</tr>
<tr>
<td>07.07.031.009</td>
<td>Work Process H, Safe Work Processes</td>
<td>Process</td>
</tr>
</tbody>
</table>

I. Other References

- ANSI Z49.1:1999, Safety in Welding, Cutting, and Allied Processes
- ANSI Z49.1:2005, Safety in Welding, Cutting, and Allied Processes
- ANSI/ASME Z87.1:2003, Occupational and Educational Personal Eye and Face Protection Devices
• ANSI Z87.1:1989, American National Standard Practice for Occupational and Educational Eye and Face Protection

J. Contact Information

Welding Subject Matter Expert
EH&S Division

K. Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>By whom</th>
<th>Revision Description</th>
<th>Section(s) affected</th>
<th>Change Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/10/2013</td>
<td>1.1</td>
<td>D.Best</td>
<td>Reviewed 8/29/2013</td>
<td>Publ &amp; Next Review Dates</td>
<td>Minor</td>
</tr>
<tr>
<td>1/2/2012</td>
<td>1</td>
<td>J. Dionne</td>
<td>Rewrite for wiki</td>
<td>all</td>
<td>Minor</td>
</tr>
</tbody>
</table>

Document Information

DOCUMENT INFORMATION

Title: Welding, Joining, and Thermal Cutting Safety

Document number 07.07.031.000
Revision number 1.1
Publication date: 9/10/2013
Effective date: 8/25/2010
Next review date: 9/10/2016
Policy Area: Industrial Hygiene and Safety
RPM Section (home) ESH
RPM Section (cross-reference) none
Functional Division EH&S
Prior reference information (optional) PUB-3000, Chapter 33

Source Requirements Documents

• 10 CFR 851, Worker Safety and Health Program
• 29 CFR 1910, Subpart I, Personal Protective Equipment,
• 29 CFR 1910, Subpart Q, Welding, Cutting and Brazing;
• 29 CFR 1926, Construction, Subpart J, Welding and Cutting
• 29 CFR 1926, Safety and Health Regulations for Construction, Subpart E, Personal Protective and Life Saving Equipment

Implementing Documents

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Title</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.07.031.001</td>
<td>Welding, Joining, and Thermal Cutting Safety</td>
<td>Program</td>
</tr>
<tr>
<td>Code</td>
<td>Process</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>07.07.031.002</td>
<td>Work Process A, <strong>Welds Requiring a Facilities Work Request</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.003</td>
<td>Work Process B, <strong>Welds for Scientific Research Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.004</td>
<td>Work Process C, <strong>Low-Risk Welds Using ISM and JHA Processes</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.005</td>
<td>Work Process D, <strong>Hot Work Permit and Associated Controls</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.006</td>
<td>Work Process E, <strong>Exposure Assessment</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.007</td>
<td>Work Process F, <strong>Training</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.008</td>
<td>Work Process G, <strong>Hazard Control</strong></td>
<td></td>
</tr>
<tr>
<td>07.07.031.009</td>
<td>Work Process H, <strong>Safe Work Processes</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Other References**

- ANSI Z49.1:1999, Safety in Welding, Cutting, and Allied Processes
- ANSI Z49.1:2005, Safety in Welding, Cutting, and Allied Processes
- ANSI/ASME Z87.1:2003, Occupational and Educational Personal Eye and Face Protection Devices