

# DRAFT SLAC AREA HAZARD ANALYSIS

Location(s): B750 (Collider Hall)

Date: 15 June 04

Processes / Equipment in Area	Hazards	Recommended Controls & Actions
SLAC Large Detector (SLD): Experimental apparatus in standby mode	Various (see below for details)	SLD has HEEC approval to address hazards not covered by consensus standards.
General	<ul style="list-style-type: none"> <li>• Various</li> </ul>	<ul style="list-style-type: none"> <li>• All those who work in the Collider Hall must attend the 8:30 Collider Hall meeting each day before work begins. Contact the EFD Safety Coordinator at ext. 2686 for more information.</li> <li>• Building is kept locked at all times to prevent casual access.</li> </ul>
<b>HIGH VOLTAGE and STORED ELECTRICAL ENERGY</b> in supply systems and racks, modulators, power supplies, servers, capacitors, distribution chassis, circuit breakers, motor drivers, CAMAC crates, monitors, transformers, ion pumps and associated distribution equipment.	<ul style="list-style-type: none"> <li>• Electric shock</li> <li>• Arc flash/explosion</li> <li>• Fire</li> </ul>	<ul style="list-style-type: none"> <li>• <i>HAZARDOUS VOLTAGE MAY EXIST INSIDE and POWER FOR THIS EQUIPMENT IS FED FROM BREAKER BXXXX-YYYY</i> signs are posted on devices to help avoid contact with exposed electrical and permit lockouts.</li> <li>• Work on most equipment is limited to PCD engineers and techs who are high-V trained (course #274) or those under their immediate escort.</li> <li>• Follow Equipment Lockout Procedure (ELP) posted on equipment. (Contact PCD, ext. 2083, if you can't find an ELP.)</li> <li>• <b>De-energize</b> and <b>verify</b> before working on systems &gt;50V, or get and follow administrative and PPE provisions of electrical hot-work permit issued for that specific activity. (See <a href="http://www.slac.stanford.edu/esh/forms/hotwork.pdf">http://www.slac.stanford.edu/esh/forms/hotwork.pdf</a>.)</li> <li>• Use safe work practices covered in high-V training: lock tag, hot work, controlled areas, etc.</li> </ul>
<b>HIGH CURRENT</b> in modulators, power supplies, distribution chassis, circuit breakers, motor drivers, transformers, and associated distribution equipment for beam components in and around the BaBar Detector.	<ul style="list-style-type: none"> <li>• Electric shock</li> <li>• Arc flash/explosion</li> <li>• Fire</li> </ul>	<ul style="list-style-type: none"> <li>• High-current SLC beam components are powered down indefinitely.</li> <li>• <b>De-energize</b> and <b>verify</b> before working on systems, or get and follow administrative and PPE provisions of electrical hot-work permit issued for that specific activity. (See <a href="http://www.slac.stanford.edu/esh/forms/hotwork.pdf">http://www.slac.stanford.edu/esh/forms/hotwork.pdf</a>.)</li> <li>• Follow Equipment Lockout Procedure (ELP) posted on equipment. (Contact PCD, ext. 2083, if you can't find an ELP.)</li> </ul>

		<ul style="list-style-type: none"> <li>• Use safe work practices covered in high-V training: lock tag, hot work, controlled areas, etc.</li> </ul>
Ground level machine shop: Machine tools (chop saws, drill press, grinding wheels, mills, lathes, table saw, band saw) and their by-products (turnings).	<ul style="list-style-type: none"> <li>• Eye injury from flying objects</li> <li>• Cuts, lacerations, abrasions, crushing, or amputation from body part caught in machine</li> <li>• Cuts from contact with sharp turnings</li> <li>• Injury from unexpected machine restart after power outage</li> </ul>	<ul style="list-style-type: none"> <li>• Use of machine tools allowed by only shop personnel or designees</li> <li>• Tools are used according to manufacturer's requirements.</li> <li>• Wear safety glasses while operating.</li> <li>• Use point-of-operation guards on all tools.</li> <li>• While operating, do not wear gloves or clothing that could be caught in moving parts.</li> <li>• Tools are on dead-man switches which prevent restarting after a power outage.</li> <li>• Clean up turnings immediately</li> <li>• Dispose of waste promptly</li> </ul>
Ground level machine shop: Flammable liquids (isopropanol, acetone, MEK, spray paint)	<ul style="list-style-type: none"> <li>• Fire</li> <li>• Inhalation</li> </ul>	<ul style="list-style-type: none"> <li>• Kept in flammable storage cabinets when not in use.</li> <li>• Smoking prohibited in building.</li> <li>• Use sparingly and away from ignition sources.</li> <li>• Fire extinguishers are found in every indoor area.</li> <li>• <b>RECOMMENDED:</b> Fire extinguisher training for regular occupants of area.</li> <li>• Liquid containers are labeled with manufacturer's label or SLAC NFPA diamonds.</li> </ul>
HVAC system on rooftops, DC motor in elevator shaft: Motors with fast-moving rotating and reciprocation parts	<ul style="list-style-type: none"> <li>• Cuts, lacerations, abrasions, crushing, or amputation from body part caught in moving parts</li> </ul>	<ul style="list-style-type: none"> <li>• Access to roof is locked. Access is only granted to qualified HVAC workers. Contact the EFD Safety Coordinator at ext. 2686 for more information.</li> <li>• Guards kept in place over moving parts prevent access of body parts.</li> <li>• Access to elevator is locked. Access is only granted to qualified elevator workers. Contact the EFD Safety Coordinator at ext. 2686 for more information.</li> <li>• Use lock/tag procedures when working on motors</li> </ul>
Uninterruptible power supplies containing lead-acid battery bank (B750 NE corner on ground level)	<ul style="list-style-type: none"> <li>• Electric shock</li> <li>• Arc flash</li> <li>• Fire</li> <li>• Burns to eyes or body from sulfuric acid from batteries</li> </ul>	<ul style="list-style-type: none"> <li>• Work on battery banks requires Electrical Safety Training (#274)</li> <li>• Work on banks requires portable 6-gallon eyewash to be placed within an unobstructed 15 feet of work. <b>Workers must provide eyewash.</b></li> <li>• Wear eye protection (<b>minimum: goggles; recommended: face shield</b>) and latex or neoprene gloves during work on batteries.</li> </ul>

<p>Walking and working surfaces, general: unsecured material, objects in path, temporary storage, protruding objects, unexpected and changing working surface configurations</p>	<ul style="list-style-type: none"> <li>• Slips, trips, and falls over fixed and temporary objects: support structures, containments, hoses, cords, cables, fixtures, tools, slings, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Wearing open-toed shoes is not permitted in B750.</li> <li>• Remove trip hazards to keep designated aisles clear.</li> <li>• Clean up spills immediately.</li> <li>• Walk with great care. Do not run.</li> <li>• Keep eyes on path.</li> <li>• Do not walk on loose objects.</li> </ul>
<p>Compressed gases (oxygen, acetylene, nitrogen, air, helium) stored in cylinders</p>	<ul style="list-style-type: none"> <li>• Fire from uncontrolled oxygen/acetylene release</li> <li>• Injury from flying material after catastrophic failure after dropping, tipping, or other physical insult of cylinders</li> </ul>	<ul style="list-style-type: none"> <li>• Oxygen and acetylene cylinders in storage are separated with caps in place</li> <li>• All cylinders are double chained to prevent tipping</li> <li>• Cylinders are stored upright and capped when not in use</li> </ul>
<p>Portable arc- and oxyacetylene welding rigs</p>	<ul style="list-style-type: none"> <li>• Fire</li> <li>• Unexpected arc flash</li> </ul>	<ul style="list-style-type: none"> <li>• Inspect all rig cables, lines, cords, and connections before use.</li> <li>• Welders must be experienced and follow manufacturer's instructions for proper use of rigs.</li> <li>• Wear welding mask, gloves, and other PPE during use</li> <li>• Welding in non-designated welding areas requires a Hot Work Permit from Palo Alto Fire Department. Contact the building manager to identify welding areas. Contact PAFD at ext. 2776.</li> </ul>
<p>Elevated areas: roofs, SLD surfaces</p>	<ul style="list-style-type: none"> <li>• Injury from fall</li> <li>• Injury from being struck by falling object</li> </ul>	<ul style="list-style-type: none"> <li>• Most commonly-used elevated areas are protected with standard rails and toeboards to prevent falls and falling objects.</li> <li>• Work within 6 feet of an unprotected edge from which a fall of more than four feet is possible must be performed in a harness secured with a lanyard and/or inertial reel</li> <li>• The B750 pit is a hard-hat area. Bins filled with hard hats are found at the ground-floor elevator.</li> <li>• <b>RECOMMENDED:</b> Stairway and Ladder Safety training, Course 293</li> </ul>
<p>50-T overhead bridge crane 10-T overhead bridge crane</p>	<ul style="list-style-type: none"> <li>• Struck by moving or falling load or load component</li> <li>• Fall from bridge or trolley during servicing</li> </ul>	<ul style="list-style-type: none"> <li>• Crane riggers and operators must receive SLAC H&amp;R certification (training course #280 et seq.) for bridge cranes of like capacity. See <a href="http://www.slac.stanford.edu/esh/training/trainops/280.html">http://www.slac.stanford.edu/esh/training/trainops/280.html</a> .</li> <li>• The B750 pit is a hard-hat area. Bins filled with hard hats are found at the ground-floor elevator.</li> <li>• Access to bridge is locked. Access is only granted to qualified</li> </ul>

		<p>crane maintenance workers. Contact the EFD Safety Coordinator at ext. 2686 for more information.</p> <ul style="list-style-type: none"> <li>Crane maintenance personnel wear fall-protection harnesses while within 6 feet of any unprotected edge from which a fall of &gt;4 feet is possible.</li> </ul>
Gas system for SLD calorimeter (contains argon)	<ul style="list-style-type: none"> <li>Insidious and deadly <b>oxygen deficiency hazard</b> (ODH) and asphyxiation from collection of argon in pit after calorimeter or supply-system rupture</li> <li>Argon is denser than air and will settle into the pit</li> </ul>	<ul style="list-style-type: none"> <li>Gas-bearing argon lines are labeled at regular intervals</li> <li>Pit and areas nearby are equipped with 18 oxygen sensors that will sound a building alarm and activate fresh-air blowers should oxygen levels fall below 19.5%</li> <li>Many sensors are placed at shin level to detect argon settling</li> <li><b>EVACUATE</b> when any alarm sounds. <b>USE THE STAIRS, NOT THE ELEVATOR. (Building elevators are automatically shut down during ODH alarms.)</b></li> <li>The gas system and ODH detection measures have been approved by the Hazardous Experimental Equipment Committee.</li> <li>If you accidentally break any gas line, evacuate immediately</li> </ul>
Gas system for SLD drift chamber (contains 8% isobutene in helium)	<ul style="list-style-type: none"> <li>Insidious and deadly <b>oxygen deficiency hazard</b> (ODH) and asphyxiation from He/Isobutane in pit should the drift chamber or its supply system be ruptured</li> <li>Isobutane fire or explosion</li> </ul>	<ul style="list-style-type: none"> <li>Gas-bearing DCh lines are labeled at regular intervals</li> <li>Pit and areas nearby are equipped with 18 oxygen sensors that will sound a building alarm and activate fresh-air blowers should oxygen levels fall below 19.5%</li> <li><b>EVACUATE</b> when any alarm sounds. <b>USE THE STAIRS, NOT THE ELEVATOR. (Building elevators are automatically shut down during ODH alarms.)</b></li> <li>Gas-bearing drift-chamber gas lines are labeled at regular intervals. The gas system and ODH detection measures have been approved by the Hazardous Experimental Equipment Committee.</li> <li>If you accidentally break any gas line, evacuate immediately</li> </ul>
Compressed “shop” air	<ul style="list-style-type: none"> <li>Material blown into eye</li> <li>Injection of air into bloodstream by deadending</li> </ul>	<ul style="list-style-type: none"> <li>Wear safety eyewear with sideshields while using compressed air</li> <li>All nozzle ported to prevent deadending</li> </ul>
Radiation: Residual, in beam dumps of N and S arcs	Ill health effects of radiation exposure	<ul style="list-style-type: none"> <li>Access to beam dumps are locked. Access only granted to RWT 1 and RWT 2 workers. Contact the EFD Safety Coordinator at ext. 2686 for more information.</li> <li>ALARA/RWT radiation work controls apply to all beam dump</li> </ul>

		work: reduce exposure with time, distance, and shielding.
Radiation: Contamination, in beam dumps of N and S arcs	Ill health effects of radiation exposure	<ul style="list-style-type: none"> <li>• Access to beam dumps are locked. Access only granted to RWT 1 and RWT 2 workers. Contact the EFD Safety Coordinator at ext. 2686 for more information.</li> <li>• ALARA/RWT radiation work controls apply to all beam dump work: reduce exposure with time, distance, and shielding.</li> <li>• SLAC ES&amp;H/OHP Technicians rope off and label contamination areas. Only RWT 2 workers are allowed inside contamination areas.</li> </ul>
SLD door alignment system: laser	Eye damage from exposure to laser light	Laser is low-energy (Class 1). Do not stare into beam.
SLD Inner Cylinder: pure beryllium tube	Chronic beryllium disease from exposure to beryllium	Inner cylinder runs through the center of SLD and is not accessible without great disassembly efforts. Any SLD disassembly must be approved by the Research Division Associate Director.
Shielding around SLC beam components in arcs	Lead poisoning from chronic exposure to lead	<p>Wear gloves while handling lead.</p> <p>Wash hands after handling lead.</p> <p>Those who handle leads more than 30 days per year for more than 30 minutes per day must contact SHA at x4105.</p>
Ship ladders used to access tunnel entrances from pit floor.	<p>Fall from ladder</p> <p>Struck by object dropped by climber</p>	<p>Keep hands free while climbing and descending stairs</p> <p>Pit floor is a hard hat area.</p>
General working environment: emergencies	<ul style="list-style-type: none"> <li>• Emergency response: injury during or after fire or earthquake</li> </ul>	<ul style="list-style-type: none"> <li>• Building is equipped with sprinklers and smoke detectors connected to building alarms.</li> <li>• <b>EVACUATE when any alarm sounds. USE STAIRS, NOT THE ELEVATOR. (Building elevators are automatically shut down during fire alarms.)</b> Evacuation meeting point for the B750 area is at the NW end of the access drive to the building.</li> <li>• <i>Fire extinguisher</i> sign above fire extinguisher kept all around indoor areas.</li> <li>• <i>Safety eyewash</i> sign above eyewash (just north of the B620 roll-up door).</li> <li>• Dial 9-911 from any SLAC phone during emergencies. <b>UNLESS YOU ARE IN IMMEDIATE DANGER</b> stay on the line and answer all questions until the responder hangs up.</li> </ul>

	Print Name	Date
<b>Area Responsible Person:</b>	Sandy Pierson	15 June 04

<b>Participants:</b>	J. Kenny	17 June 04