

SLAC AREA HAZARD ANALYSIS

Location(s): IR-2 and immediate support buildings & seatrains (B620, B620A, B624, B625, B628, B629, B632)

Date: 30 May 04

Processes / Equipment in Area	Hazards	Recommended Controls & Actions
BaBar Detector: Experimental apparatus in active use while PEP-II beam is on, In standby mode during access periods	Various (see below for details)	<ul style="list-style-type: none"> • SLD has HEEC approval to address hazards not covered by consensus standards. • All those who work in the B620 IR Hall must receive the IR-2 General Safety Training before work begins. Contact the Research Division Safety Coordinator at ext. 5300 or the EFD Safety Coordinator at ext.2686 for more information.
HIGH VOLTAGE and STORED ELECTRICAL ENERGY in supply systems and racks, modulators, power supplies, servers, capacitors, distribution chassis, circuit breakers, motor drivers, CAMAC crates, monitors, transformers, and associated distribution equipment.	<ul style="list-style-type: none"> • Electric shock • Arc flash/explosion • Fire 	<ul style="list-style-type: none"> • HAZARDOUS VOLTAGE MAY EXIST INSIDE and POWER FOR THIS EQUIPMENT IS FED FROM BREAKER BXXXX-YYYY signs are posted on devices to help avoid contact with exposed electrical and permit lockouts. • Work on most equipment is limited to PCD engineers and techs who are high-V trained (course #274) or those under their immediate escort. • Follow Equipment Lockout Procedure (ELP) posted on equipment. (Contact PCD, ext. 2083, if you can't find an ELP.) • De-energize and verify before working on systems >50V, or get and follow administrative and PPE provisions of electrical hot-work permit issued for that specific activity. (See http://www.slac.stanford.edu/esh/forms/hotwork.pdf .) • Use safe work practices covered in high-V training: lock tag, hot work, controlled areas, etc.
HIGH CURRENT 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"> • Electric shock • Arc flash/explosion • Fire 	<ul style="list-style-type: none"> • High-current beam-component terminals are protected by lexan covers marked with warning stickers. Do not remove covers. • Beam components are de-energized during access periods by the PEP-II Personnel Protection System (PPS) except during Remote Access Safety Key (RASK) work. RASK work requires approval from MCC and extensive engineering, administrative, and PPE controls. • De-energize and verify before working on systems, or get and

		<p>follow administrative and PPE provisions of electrical hot-work permit issued for that specific activity. (See http://www.slac.stanford.edu/esh/forms/hotwork.pdf .)</p> <ul style="list-style-type: none"> • Follow Equipment Lockout Procedure (ELP) posted on equipment. (Contact PCD, ext. 2083, if you can't find an ELP.) • Use safe work practices covered in high-V training: lock tag, hot work, controlled areas, etc.
Machine tools (chop saws, drill press, grinding wheel) and their by-products (turnings, burrs). <i>IR-2 Machine shop only</i>	<ul style="list-style-type: none"> • Eye injury from flying objects • Cuts, lacerations, abrasions, crushing, or amputation from body part caught in machine • Injury from unexpected machine restart after power outage 	<ul style="list-style-type: none"> • Use of machine tools allowed by only shop personnel or designees according to manufacturer's requirements. • Wear safety glasses while operating. • Use point-of-operation guards on all tools. • While operating, do not wear gloves or clothing that could be caught in moving parts. • All tools are on dead-man switches which prevent restarting after a power outage. • Dispose of waste promptly
Flammable liquids (isopropanol, spray paint) in B624, IR-2 machine shop, and IR-2 proper	<ul style="list-style-type: none"> • Fire • Inhalation 	<ul style="list-style-type: none"> • Kept in flammable storage cabinets when not in use. • Smoking prohibited in building. • Use sparingly and away from ignition sources. • Fire extinguishers are found in every indoor area. • RECOMMENDED: Fire extinguisher training for regular occupants of area. • Liquid containers are labeled with manufacturer's label or SLAC NFPA diamonds.
Motors with fast-moving rotating and reciprocation parts (HAVC system on rooftops)	<ul style="list-style-type: none"> • Cuts, lacerations, abrasions, crushing, or amputation from body part caught in moving parts 	<ul style="list-style-type: none"> • Guards kept in place over moving parts prevent access of body parts. • Use lock/tag procedures when working on motors
Uninterruptible power supplies containing lead-acid battery bank (B620, NE corner on ground level)	<ul style="list-style-type: none"> • Electric shock • Arc flash • Fire • Burns to eyes or body from sulfuric acid from batteries 	<ul style="list-style-type: none"> • Work on battery banks requires Electrical Safety Training (#274) • Eyewash is located just north of the B620 roll-up door. Assure path to eyewash is clear before beginning work on battery bank. • Wear eye protection (minimum: goggles; recommended: face shield) and latex or neoprene gloves during work on banks.
Walking and working surfaces, general: unsecured material, objects in path,	<ul style="list-style-type: none"> • Slips, trips, and falls over fixed and temporary objects: support structures, 	<ul style="list-style-type: none"> • Wearing open-toed shoes is not permitted in the IR hall

temporary storage, protruding objects, unexpected and changing working surface configurations	containments, hoses, cords, cables, fixtures, tools, slings, etc.	<ul style="list-style-type: none"> • Remove trip hazards to keep designated aisles clear. • Clean up spills immediately. • Walk with great care. Do not run. • Keep eyes on path. • Do not walk on loose objects.
General working environment: emergencies	<ul style="list-style-type: none"> • Emergency response: injury during or after fire or earthquake 	<ul style="list-style-type: none"> • Buildings and BaBar are equipped with sprinklers and smoke detectors connected to building alarms. EVACUATE when alarm sounds. Evacuation meeting point for the IR-2 area is the parking lot SE of B620. • <i>Fire extinguisher</i> sign above fire extinguisher kept all around indoor areas. • <i>Safety eyewash</i> sign above eyewash (just north of the B620 roll-up door). • Dial 9-911 from any SLAC phone during emergencies. UNLESS YOU ARE IN IMMEDIATE DANGER stay on the line and answer all questions until the responder hangs up.
Compressed gases (oxygen, acetylene, nitrogen, air, argon, helium) stored in cylinders	<ul style="list-style-type: none"> • Fire from uncontrolled oxygen/acetylene release • Injury from flying material after catastrophic failure after dropping, tipping, or other physical insult of cylinders 	<ul style="list-style-type: none"> • Oxygen and acetylene cylinders in storage are separated with caps in place • All cylinders are double chained to prevent tipping
Portable arc- and oxyacetylene welding rigs	<ul style="list-style-type: none"> • Fire • Unexpected arc flash 	<ul style="list-style-type: none"> • Inspect all rig cables, lines, cords, and connections before use. • Welders must be experienced and follow manufacturer's instructions for proper use of rigs. • Wear welding mask, gloves, and other PPE during use • 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.
Sump and lift station NE of B621	<ul style="list-style-type: none"> • Entrapment 	<ul style="list-style-type: none"> • Entry is bolted shut and posted NO ENTRY – PERMIT REQUIRED CONFINED SPACE
Elevated areas: roofs, BaBar surfaces, scaffolds	<ul style="list-style-type: none"> • Injury from fall • Injury from being struck by falling object 	<ul style="list-style-type: none"> • Most commonly-used elevated areas are protected with standard rails and toeboards to prevent falls and falling objects. • Work within 6 feet of an unprotected edge from which a fall of

		<p>more than four feet is possible must be performed in a harness secured with a lanyard and/or inertial reel</p> <ul style="list-style-type: none"> • The IR-2 Hall is a hard-hat area. Bins filled with hard hats are found at each entrance. • RECOMMENDED: Stairway and Ladder Safety training, Course 293
Portable and fixed ladders	<ul style="list-style-type: none"> • Injury from fall • Injury from being struck by falling object 	<ul style="list-style-type: none"> • Extension ladders used in IR-2 shall be secured (“tied-off”) to a solid object before use. • The IR-2 Hall is a hard-hat area. Bins filled with hard hats are found at each entrance. • RECOMMENDED: Stairway and Ladder Safety training, Course 293 • Avoid ladder footprint areas when ladders are in use • Carry items up ladders such that both hands are free
<i>Fluorinert</i> used in Barrel Calorimeter’s circulating radioactive source system	Poisoning from inhalation of Fluorinert decomposition products. (At very-high temperatures Fluorinert decomposes into toxic PFIB.)	System components containing Fluorinert are labeled WARNING – CONTAINS FLUORINERT – NO WELDING ON THIS SYSTEM.
50-T overhead bridge crane 10-T overhead bridge crane	<ul style="list-style-type: none"> • Struck by moving or falling load or load component • Fall from bridge or trolley during servicing 	<ul style="list-style-type: none"> • Crane riggers and operators must receive SLAC H&R certification (training course #280 et seq.) for bridge cranes of like capacity. See http://www.slac.stanford.edu/esh/training/trainops/280.html . • The IR hall is a hard-hat area. Bins filled with hard hats are found at all entry portals. • Access to bridge is locked. Access is only granted to qualified elevator workers. Contact the EFD Safety Coordinator at ext. 2686 for more information. • Crane maintenance personnel wear fall-protection harnesses while within 6 feet of any unprotected edge from which a fall of >4 feet is possible.
Gas systems in Gas Shack contain non-life supporting (carbon dioxide CO ₂ , argon, helium) and flammable (isobutene) gases.	<ul style="list-style-type: none"> • Oxygen deficiency hazard (ODH) and asphyxiation from collection of gas in IR Hall after supply-system rupture • Isobutane fire or explosion 	<ul style="list-style-type: none"> • Gas Shack equipped with hazardous atmosphere detectors and forced air ventilation • Monitors will activate alarms and warning signals both inside and outside Shack. • Do not enter Gas Shack if panel over door reads <i>DO NOT ENTER</i>.

Gas system for RPC/LST: contains mixture of carbon dioxide (CO ₂), argon, and isobutane.	<ul style="list-style-type: none"> • Oxygen deficiency hazard (ODH) and asphyxiation from collection of gas in IR Hall after supply-system rupture • Isobutane fire or explosion 	<ul style="list-style-type: none"> • Flow to RPC's is extremely low: buildup of explosive or asphyxiating concentrations of RPC gas is prevented by use of a critical flow orifice at the BaBar Gas Shack • Gas-bearing lines are labeled at regular intervals for content • If you accidentally break any gas line, evacuate immediately
Gas system for Drift Chamber (contains isobutane in helium)	<ul style="list-style-type: none"> • Insidious and deadly oxygen deficiency hazard (ODH) and asphyxiation from He/Isobutane in BaBar DIRC tunnel (backward end) • Isobutane fire or explosion 	<ul style="list-style-type: none"> • Flow to Drift Chamber is changed to air during access periods. • Access to DIRC tunnel is considered a permit required confined space entry. For details contact the PRCS coordinator at x3517. • Gas-bearing lines are labeled at regular intervals for content • If you accidentally break any gas line, evacuate immediately
Radiation: Prompt	Ill health effects of radiation exposure	<ul style="list-style-type: none"> • Exposure to prompt radiation is prevented by the PPS, which stops beam upon compromise of any PEP-II door seal. • PPS undergoes rigorous periodic verification.
Radiation: Residual	Ill health effects of radiation exposure	ES&H Division OHP personnel perform surveys prior to access periods and label areas requiring RWT I training for entry.

	Print Name	Date
Area Responsible Person:		
Participants:		