

Name(s) of Risk Team Members: P. Cirnigliaro, A. Etkin, R. Karol, E. Lessard, J. Maraviglia, D. Passarello, A. Piper, R. Savage, J. Scott, M. Van Essendelft			Point Value → Parameter ↓		1	2	3	4	5			
Area/Facility Description Title: Collider-Accelerator			Occupancy or Use		≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift			
Area/Facility # (if applicable): Area-Wide FRA 12			Severity		First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability			
Area/Facility Description: STAR Area-Wide			Likelihood		Impossible	Unlikely	Possible	Probable	Multiple			
Approved by: <i>E. Lessard</i> Date: 7/14/04 Rev.#: 1												
Reason for Revision (if applicable): FRA number added. Uniform hazard nomenclature added.							Comments:					
			Before Additional Controls				After Additional Controls					
Physical Item or Activity	Hazard(s)	Control(s)	Before Additional Controls				Control(s) Added to Reduce Risk	After Additional Controls				% Risk Reduction
			Occupancy A	Severity B	Likelihood C	Risk* AxBxC		Occupancy A	Severity B	Likelihood C	Risk* AxBxC	
Primary Beam	High hazard ionizing radiation	ACS; PASS; postings; crash buttons and chords; C-AD area classification; shielding; dosimeters; training; RSC reviews	1	5	2	10						
General Area Radiation Residual Radiation, External Radiation	Ionizing radiation	Postings, training, shielding, RCD surveys, RCD oversight, RWP, work planning	4	1	2	8						
Hydraulics	Being struck by an object, due to a pressure release	Design reviews, ESRC/ASSRC reviews, pressure testing, LOTO, work planning, PPE, training, procedures, posting labeling	3	4	2	24						
Hydraulics	Falls on same level	Design reviews, ESRC/ASSRC reviews, pressure testing, LOTO, work planning, Tier 1 inspections	3	4	3	36						
Hydraulics	Fire	Design reviews, ESRC/ASSRC reviews, proof testing, LOTO, work planning, PPE, training, Fire/Rescue Group response	3	4	2	24						
Electrical Equipment & Power Supplies BNL Class A & B <250 V AC; <1000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures	5	4	2	40						
Electrical Equipment & Power Supplies BNL Class C <600 V AC; <6000 V DC	Arc blast; burn	Procedures, training, PPE	3	5	2	30						

Electrical Equipment & Power Supplies BNL Class C <600 V AC; <6000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; two-person rule for hot work	2	5	2	20					
Electrical Equipment & Power Supplies BNL Class D >600 V AC; >6000 V DC	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; safety watch for hot work	2	5	2	20					
Electrical Equipment & Power Supplies BNL Class D >600 V AC; >6000 V DC	Arc blast; burn	Procedures, training, PPE	2	5	2	20					
Electrical Disconnects And Switches	Arc blast; burn	Procedures, training, PPE	2	4	3	24					
Electrical Disconnects And Switches	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; two-person rule for hot work	2	5	2	20					
Motor Control Centers; Panels And Wall Sockets	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards	4	5	2	40					
Motor Control Centers; Panels And Wall Sockets	Arc blast; burn	PPE; training; procedures	4	4	2	32					
Electrical Powered Hand Tools	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; procedures; training; labeling; work planning; GFCI; grounding standards; double insulation	4	3	3	36					
Extension Chords; Temporary Wiring And Power Strips	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; qualified electricians and technicians; GFCI; grounding standards	4	3	3	36					
Vacuum	Ear damage	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; use of industry standards; design reviews	3	4	2	24					
Vacuum	Being struck by an object such as flying debris	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; ; use of industry standards; design reviews	3	4	2	24					

Magnetic Field	Adverse mechanical force exerted on ferromagnetic objects and or to electronic/medical implants.	Barriers; warning systems; postings; training; ESRC review; work planning; procedures; Tier 1 inspections; magnetic safety reviews; medical exams	1	4	2	8					
Flammable /Explosive Gases	Fire, smoke and heat	Fire detection & suppression systems; procedures; training; equipment protective systems; ASSRC/ESRC reviews; Fire Hazards Analysis; Tier 1 inspections; maintenance; emergency procedures; BNL Fire Rescue; ASE requirements; volume controls; segregation controls; labeling; area posting; gas detection interlock systems	4	4	2	32					
Gasses	Oxygen deficiency	ODH analyses; ODH controls; training; remote/local audible/visible alarms; emergency response; work planning; MSDS; LOTO; postings; flammable gas alarms; cylinder storage controls; cylinder labels; gas volume limits; inspections; cylinder hydrostatic testing	4	5	2	40					
Lighting	Being struck against an object, such as a carpenter walking into a door frame due to poor lighting	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	2	3	18					
Lighting	Falls on same level	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	3	3	27					
Lighting	Being struck by an object due to a material handling mishaps	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	2	3	3	18					
Material Handling Equipment	Falls to lower level, such as falling from a ladder or over a railing	Training, work planning, inspections, independent PE inspections and approval of equipment, fall protection training, approved scaffolding and platforms, approved fall protection harnesses, Tier 1 inspections, PPE, PE maintenance	3	4	3	36					
Material Handling	Being struck by an object due to improperly secured material or loss of control	Work planning; equipment specific training; work area barricades and controls; PPE; clamps; straps; vices; fixtures	3	3	3	27					
Chemical Handling	Eye exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	4	2	24					
Chemicals	Inhalation exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	3	2	18					
Chemicals	Fire; explosions	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	2	2	12					
Manual Material Handling	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Gloves; hardhat; use of handcarts and dollies; training; non-slip safety shoes	4	3	3	36					

Remotely Operated Equipment	Personnel entanglement in mechanisms.	Postings; barriers; guards; maintenance; training; work planning; procedures; Tier 1 inspections; ASSRC reviews	2	4	2	16						
Use Of Hand Tools	Being struck by an object, such as flying chips	PPE; training; maintenance; Tier 1 inspections; UL listed equipment; pre-inspections	4	2	3	24						
Use Of Hand Tools	Being struck against an object, such as a sharp surface	PPE; training; guarding	4	2	3	24						
Use Of Hand Tools	Becoming caught in or compressed by equipment	Equipment specific training; guarding; PPE; postings	4	2	3	24						
Machining Materials	Becoming caught in or compressed by equipment	Equipment specific training; machine guards; PPE; postings; maintenance; Tier 1 inspections	2	3	3	18						
Machining Materials	Being struck by an object, such as flying chips or debris	Equipment specific training; machine guards; PPE; postings; maintenance; Tier 1 inspections	2	3	3	18						
Machining Materials	Non-rad airborne particulates	PPE; ventilation; maintenance; work planning	2	1	2	4						
Walking – Working Surfaces	Falls on same level	PPE; Tier 1; work planning; P.E. scheduled maintenance; internal and external audits; posting; labeling; training; barriers; communication; lessons learned	5	4	3	60	A safety checklist: Walking and Working Surfaces was distributed to staff. C-A O.P.M. 2.28.d was updated to indicate that work performed with risk factors of slipping and falling shall be classified at a minimum as a moderate hazard job and will require additional review and an Enhance Work Permit.	5	4	2	40	33%
Work At Heights	Falls to lower level, such as falling from a ladder or over a railing	Postings; barriers; fall protection; maintenance; training; work planning; procedures; Tier 1 inspections; PPE; approved scaffolding and platforms; approved ladders; anti-slip surfaces	3	5	3	45						
Working Environment	Poor air quality; mold	HVAC; facility maintenance; Tier 1 inspections	5	2	2	20						
Water	Being struck by an object due to a pressure release	Postings; maintenance; PPE; training; work planning; ASSRC review; procedures; Tier 1 inspections; PLC monitoring and interlocks	4	1	3	12						
Water	Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns	Postings; maintenance; PPE; training; work planning; ASSRC review; procedures; Tier 1 inspections	4	1	2	8						
Tours	Internal or external radiation	Postings; trained escorts; RCD concurrence to enter radiation areas; RWP; work planning; training waiver; red TLD; BNL minors policy	3	1	2	6						
Transformer And Switch Yards	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; installations comply with applicable codes; procedures; training; LOTO; qualified electricians; postings; locked areas; work planning; grounding standards; emergency procedures; grounding before work start	2	5	2	20						
Transformer And Switch Yards	Arc blast	PPE; procedures; training; qualified electricians	2	4	2	16						

Standby Generators	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards; emergency procedures	2	5	2	20					
Standby Generators	Noise	Hearing protection	2	4	2	16					
Radioactive Sources	Internal or external radiation	Training; BNL and C-AD source custodians; source inventory; shielding; locked boxes; leak checks; posting; dosimeters; Chipmunk calibration procedures; locked cage for Chipmunk source	2	1	2	4					
Pressurized Systems	Being struck by an object due to a pressure release	Postings; PPE; maintenance; training; work planning; ESRC reviews; procedures; interlock systems; certification/testing of pressure related equipment; Tier 1 inspections; LOTO; C-AD Chief ME reviews; codes and standards usage	2	2	2	8					
Noise	Hearing loss	Training; hearing protection; noise surveys; procedures; postings; medicals; engineered noise reduction; work planning; locked areas with limited access to authorized personnel only	2	4	2	16					
Egress	Impaired egress	Tier 1; work planning; skill of craft; P.E. scheduled maintenance; internal and external audits; posting; labeling; training; barriers; communication; internal processes; lessons learned; life safety codes; emergency preparedness	5	3	3	45					
Cryogenic	Being struck by an object due to a pressure release	Postings; maintenance; training; work planning; LOTO; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; interlock systems; Tier one inspection; pressure testing	4	2	2	16					
Cryogenic	Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns	Postings; maintenance; training; work planning; LOTO; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; interlock systems; Tier 1 inspection	4	3	2	24					
Confined Spaces	Entrapment	Barriers; postings; training; Confined Spaces Permits; work planning; procedures; Tier 1 inspections	1	3	2	6					
Computer And Office Machine Usage	Repetitive motion resulting in muscular-skeletal injury	BNL SHSD ergonomic reviews; training; use of ergonomically designed equipment	5	3	3	45					
Batteries/UPS	Molten spray	PPE; procedures; training	4	2	2	16					
Limited Access Areas	Impaired egress	Tier 1; work planning; skill of craft; training; barriers;	2	1	3	6					
Lasers	Eye damage	Barriers; interlock systems; postings; training; LSO review; work planning; PPE; procedures; Tier 1 inspections; warning systems	2	4	3	24					

Further Description of Controls Added to Reduce Risk:

*Risk:	0 to 20	21 to 40	41-60	61 to 80	81 or greater
	Negligible	Acceptable	Moderate	Substantial	Intolerable