

Name(s) of Risk Team Members: D. Pate, J. Scott, D. Philips, R. Karol		Point Value → Parameter ↓	1	2	3	4	5				
Area/Facility Description Title: Collider-Accelerator Area/Facility # (if applicable): Area-Wide FRA 21-08		Occupancy or Use (A)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift				
Area/Facility Description: Building 912/966 E-Cooler Test Area-Wide		Severity (B)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability				
		Likelihood (C)	Extremely Unlikely	Unlikely	Possible	Probable	Multiple				
Approved by: <i>E. Lessard</i> Date: 1/23/2008      Rev.#: 0							Comments:				
Reason for Revision (if applicable):											
			Before Additional Controls				After Additional Controls				
Physical Item or Activity	Hazard(s)	Control(s)	Occupancy A	Severity B	Likelihood C	Risk* AxBxC	Control(s) Added to Reduce Risk				% Risk Reduction
Electrical Equipment & Power Supplies BNL Class A & B <250 VAC; <1000Vdc	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	5	3	2	30					
Electrical Equipment & Power Supplies BNL Class A <600 VAC; <6000 VDC (Current limit in the micro-amp range)	Shock	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	5	3	2	30					
Electrical Equipment & Power Supplies BNL Class D >600 VAC, >6000 VDC	Shock or Electrocution	All equipment is listed and reviewed by CEE or designee, Tier I, PPE, inspections, disconnected cable policy, installations comply with applicable codes, procedures, training, distribution drawings, LOTO, kirk keys, working hot permits, ASSRC/ESSRC reviews, qualified electricians and technicians, cabinet interlocks, arc flash postings for required PPE, locked areas, guarding, work planning,	2	4	2	16					

Electrical Equipment & Power Supplies BNL Class D >600 VAC, >6000 VDC	Shock or Electrocution	All equipment is listed and reviewed by CEE or designee, Tier I, PPE to NFPA 70E+, inspections, disconnected cable policy, installations comply with applicable codes, procedures, training, distribution drawings, LOTO, kirk keys, working hot permits, ASSRC/ESSRC reviews, qualified electricians and technicians, cabinet interlocks, arc flash postings for required PPE, locked areas, guarding, work planning,	2	4	2	16					
Electrical Disconnects And Switches	Arc blast; burn	Procedures, PPE, NFPA 70E PPE training and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	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; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	24					
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; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	24					
Motor Control Centers; Panels And Wall Sockets	Arc blast; burn	PPE; procedures; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	24					
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	3	2	2	12					
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	3	2	2	12					
RF cavities and devices	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; Kirk keys; working hot permits; ASSRC/ESSRC reviews; postings; grounding standards; work planning; NFPA 70E+; locked areas, guarding; UL or equivalent approval of equipment	3	4	2	24					
RF cavities and devices	RF Field	RF gaskets, interlocked areas, monitoring to verify field strengths	3	2	2	12					
RF cavities and devices	Noise	Hearing protection, IH surveys, postings, medical surveillance.	3	2	2	12					
RF cavities and devices	Radiation exposure from X-rays	Access controls, shielding, training, RCD surveys, postings, locked areas, procedures for test area, work planning.	5	3	2	30					

Primary beam	Unshielded electron beam, external radiation	ACS, security sweeps, postings, crash button, and chords, C-AD area classification, shielding, dosimetry, training, RWP, ASSRC/ESSRC reviews.	1	5	1	5					
Secondary beam	Unshielded electron beam, external radiation	ACS, postings, C-AD classification, shielding, dosimetry, training, locked areas, RCD surveys, RWP, work planning, procedures, ASSRC\ESSRC reviews	1	4	2	8					
General area radiation	External radiation	Postings, training, shielding, RCD surveys, dosimetry as required, RCD oversight, RWP if required, work planning, monitoring program.	5	1	4	20					
Magnets	Magnetic fields	Postings, field measurements, magnet design review, medical surveillance, ACS, work planning, ASSRC/ESSRC reviews, procedures, PPE as required.	2	3	3	18					
Capacitors\inductors	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	24					
Beam components and instrumentation	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; 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; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	3	4	2	24					
Beam components and instrumentation	Being struck by an object due to moving parts remotely controlled	Guards or shielding for moving parts, PPE, posting and labeling as required	2	3	3	18					
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	1	4	1	4					
Vacuum	Being struck by an object, such as flying debris from a broken vacuum window	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	1	4	1	4					
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	2	3	2	12					
Lighting	Falls on same level due to poor visibility	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	5	2	3	30					

Lighting	Being struck against an object, such as a carpenter walking into a door frame due to poor visibility	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	5	2	3	30					
Material Handling Equipment	Becoming caught in or compressed by equipment	Training, work planning, inspections, independent PE inspections, Tier 1 inspections, PPE	2	4	2	16					
Material Handling Equipment	Falls to lower level, such as falling from a ladder or over a railing	Fall protection training, approved scaffolding and platforms, approved fall protection harnesses, Tier 1 inspections, PPE, PE maintenance.	2	4	2	16					
Material Handling	Being struck by an object, such as from improperly secured material	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	2	2	2	8					
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	2	2	2	8					
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	2	2	2	8					
Manual Material Handling	Overexertion – injuries caused by excessive lifting, pushing, pulling, holding, carrying or throwing of an object	Gloves; hardhat; handcarts; dollies; training; safety shoes; ergonomic reviews of work, effective supervision at the job site; maximum 44 lbs lifting limit.	3	2	3	18					
Manual Material Handling	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Use of dollies to eliminate manual material handling tasks, use of portable lighting to increase visibility at job site, ergonomic reviews of work, effective supervision at the job site, training	3	2	3	18					
Use Of Hand Tools	Being struck by an object, such as flying chips	PPE; training; maintenance; Tier 1 inspections; UL listed equipment; pre-inspections	3	2	2	12					
Use Of Hand Tools	Being struck against an object, such as sharp surfaces	PPE; training; guarding	3	2	2	12					
Use Of Hand Tools	Being struck by an object, such rotating parts	Equipment specific training; guarding; PPE; postings	3	2	2	12					

Walking – Working Surfaces	Falls on same level	PPE; Tier 1; enhanced work planning (moderate hazard); P.E. scheduled maintenance; internal and external audits; posting; labeling; training; barriers; communication; lessons learned; snow shovels & salt available for emergency use; Walking and Working Surfaces safety checklist; housekeeping policy.	5	4	2	40					
Walking Surfaces	Falls on same level from uneven walkways	Maintenance of walkways and landings; housekeeping policy	5	3	3	45					
Working Environment	Poor air quality; mold	HVAC; facility maintenance; Tier 1 inspections; PE maintenance and repairs; housekeeping policy	5	2	2	20					
Transformer And Switch Yards	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; installations comply with applicable codes; procedures; LOTO; qualified electricians; postings; locked areas; work planning; grounding standards; emergency procedures; grounding before work start; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	2	4	2	16					
Transformer And Switch Yards	Arc blast	PPE; procedures; qualified electricians; NFPA 70E PPE, training, and posting requirements for all personnel, UL or equivalent approval of all equipment required or on site experts to approve it.	2	4	2	16					
Limited access areas	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; housekeeping policy.	2	1	3	6					
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 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					
Computer And Office Machine Usage	Repetitive motion	BNL SHSD ergonomic reviews; training; use of ergonomically designed equipment	5	3	2	30					
Lasers	Non-ionizing radiation	Barriers; interlock systems; postings; training; LSO review; work planning; PPE; procedures; Tier 1 inspections; warning systems	4	4	2	32					

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