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 Department Area/Facility # (if applicable): Facility Wide – FRA 1	Occupancy or Use	≤once/year	≤once/month	≤once/week	≤once/shift	≥once/shift
Area/Facility Description: Facility Wide Electrical	Severity	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability
Approved by: *E. Lessard* Date: 6-30-04 Rev.#: 2	Likelihood	Impossible	Unlikely	Possible	Probable	Multiple

Reason for Revision (if applicable):
FRA number added. Standard hazard nomenclature added.

Comments:

			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	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	% 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; 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	A new computer based LOTO program was introduced to better track LOTOs. C-AD supervisors removed temporarily stored items away from disconnects and breaker panels. Technicians, engineers and electricians were trained regarding the proper use of temporary wiring. Temporary wiring installations are now tracked and when due they are removed or converted to permanent wiring. OPM 13.6.2 was modified to state that an ECN is required prior to issuing a work order for all work on the power distribution system. A drawing or a sketch and a printed label or panel directory is now issued with the work order. Supervisors now indicate that all labeling was completed. Electricians have been assigned to label existing disconnects for a few hours each week.	5	4	2	40	The likelihood of an injury was reduced but it is not impossible. Occupancy and severity do not change.
Electrical Equipment & Power Supplies BNL Class C <600 VAC; <6000 VDC	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	4	5	2	40						
Electrical Equipment & Power Supplies BNL Class C <600 VAC; <6000 VDC	Arc blast; burn	Procedures, training, PPE	4	5	2	40						
Electrical Equipment & Power Supplies BNL Class D >600 VAC; >6000 VDC	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 VAC; >6000 VDC	Arc blast; burn	Procedures, training, PPE	2	5	2	20						

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	5	4	2	40						
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	5	2	20						
Underground/Overhead Cables/Wiring	Shock or electrocution	All equipment is listed or reviewed by CEE; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; qualified electricians; postings; work planning; digging permit	2	4	4	32						
Batteries/UPS	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	3	4	3	36						
Batteries/UPS	Molten spray	PPE; procedures; training	3	3	2	18						
Batteries/UPS	Being struck by an object, such as due to hydrogen gas explosion	PPE; procedures; training	3	3	2	18						
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	5	4	2	40						
Standby Generators	Entanglement	Guards for rotating parts	5	5	2	50						
Siemens And Westinghouse MG Sets	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	5	5	2	50						
Siemens And Westinghouse MG Sets	Noise	Hearing protection	5	4	2	40						
Siemens And Westinghouse MG Sets	Becoming caught in or compressed by equipment	Crash button for shut down; guards for rotating parts	5	5	2	50	It is planned that postings be upgraded to enter Siemens MG Room or to lock the MG Room					
General Wiring; Cable Trays; Buss Work	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	5	2	50						
Buss or electrical equipment cooling water	Being struck by an object from water jet or pressure	Tier 1 inspections; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; work planning	4	2	3	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; 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	3	60						
Motor Control Centers; Panels And Wall Sockets	Arc blast; burn	PPE; training; procedures	4	5	3	60						
Electrical Disconnects And Switches	Arc blast; burn	Procedures, training, PPE	4	4	3	48						
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	4	4	3	48						
Circuit Breakers	Arc blast; flash	All equipment is listed or reviewed by CEE; PPE; procedures; training	4	3	3	36						

Appliances And Computers	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	5	3	2	30						
Vacuum Pumps	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; postings; work planning; grounding standards	3	5	3	45						
Magnets	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; postings; locked areas; guarding; work planning; grounding standards	5	4	2	40						
Magnets	Magnetic fields	Posting; fencing; warnings; magnet design reviews; field measurements; medicals; work planning; ASSRC reviews; work planning	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; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; postings; locked areas; guarding; work planning; grounding standards	3	5	2	30						
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; training; distribution drawings; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; qualified electricians and technicians; postings; locked areas; guarding; work planning; grounding standards	3	4	3	36						
Beam Components and Instrumentation	Being struck by an object, due to moving parts remotely operated	Guards for moving parts	2	3	3	18						
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	5	3	3	45						
RF Cavities	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; LOTO; Kirk keys; working hot permits; ASSRC/ESRC reviews; locked areas; guarding; work planning; grounding standards; emergency procedures	3	5	3	45						
RF Cavities	Rf field	RF gaskets; interlocked areas	3	2	2	12						
RF Cavities	Noise	Hearing protection	3	2	2	12						
RF Cavities	Radiation exposure from X-rays	Access controls; shielding; training; RCD surveys; postings; locked areas; procedures for test areas; RWP; work planning	5	4	2	40						
Confined Spaces - Metal	Increased chance of shock due of proximity to conducting surfaces	All equipment is listed or reviewed by CEE; work planning; grounding standards; GFCI	2	4	2	16						

Further Description of Controls Added to Reduce Risk: OSHA Teams visited C-AD during the period October 20 through October 31, 2003. Many electrical OSHA non-compliances were recorded. Many disconnects were found to be obstructed by large transformers, stairs, sinks, water heaters, walls, pumps, uninterruptible power supplies, fixed fire-protection equipment or building girders. Many were obstructed by temporarily stored items. Many disconnects such as circuit breakers were not labeled in English, spares were not marked, or the labels were faded. The C-AD system of labeling with numbers is not accepted by OSHA. Temporary wiring was being used where permanent wiring should have been installed. Flexible cord was being used to power fixed equipment such as work benches or ventilation systems and was being strung through walls, ceilings and doors or to power distribution boxes. Long 20-foot flexible cord was used on vibrating equipment. Flexible cord was used to feed metal outlet boxes that lay on the floor. All the OSHA items are being tracked and closed on a schedule commensurate with funding.

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