

Table 2. Summary of Baseline and Residual Risks – D-Zero Collision Hall

Risk Tables Description		Baseline Risk	Residual Risk
2.1	Radiological – Onsite-1 Facility Worker	R: IV	R: IV
2.2	Radiological – Onsite-2 Co-located Worker	R: IV	R: IV
2.3	Radiological – MOI Offsite	R: IV	R: IV
2.4	Toxic Materials – Onsite 1 Facility Worker	R: IV, I	R: IV
2.5	Toxic Materials – Onsite 2 Co-located Worker	R: IV, I	R: IV
2.6	Toxic Materials – MOI Offsite	R: IV, II	R: IV
2.7	Flammable & Combustible Materials – Onsite-1 Facility Worker	R: I	R: IV
2.8	Flammable & Combustible Materials – Onsite-2 Co-located worker	R: I	R: IV
2.9	Flammable & Combustible Materials – MOI Offsite	R: III	R: IV
*	Electrical Energy – Onsite-1 Facility Worker	R: I *	R: IV *
*	Electrical Energy – Onsite-2 Co-located Worker	R: I *	R: IV *
*	Electrical Energy – MOI Offsite	R: I *	R: IV *
2.10	Magnetic Fields – Onsite-1 Facility Worker	R: I	R: III
2.11	Magnetic Fields – Onsite-2 Co-located Worker	R: I	R: III
2.12	Magnetic Fields – MOI Offsite	R: I	R: IV
*	Life Safety Egress – Onsite-1 Facility Worker	R: I *	R: IV *
*	Life Safety Egress – Onsite-2 Co-located Worker	R: II *	R: IV *
*	Life Safety Egress – MOI Offsite	R: N/A *	R:
<p>* This hazard has been evaluated within the common Risk Matrix table included in SAD Section I Chapter 04 <i>Safety Analysis</i>. Work in the specified areas involving this hazard implements the controls specified in the common Risk Matrix table. No unique controls are in use.</p> <p>NOTE: Per DOE-HDBK-1163-2020, Appendix C, “Risk Assessment Methodology”: “Events with an unmitigated risk value of III or IV would not require additional control assignments to provide reasonable assurance of adequate protection. Whereas, for events with an unmitigated risk value of I or II, controls would need to be assigned to either reduce the likelihood or the consequence, and therefore the overall mitigated risk. Generally, preventive controls are applied prior to a loss event – reflecting a likelihood reduction and mitigative controls are applied after a loss event – reflecting a consequence reduction. Each control is credited for a single “bin drop” either in likelihood or consequence; not both. Following a standard hierarchy of controls, controls are applied until the residual risk is acceptable – reflecting a mitigated risk value of III or IV. After controls are credited, events with a remaining unacceptable residual risk (i.e., I or II) are candidates for additional analyses and additional controls, often quantitative in nature.” For Fermilab, these controls for accelerator-specific hazards are identified as Credited Controls and further summarized in the Accelerator Safety Envelope (ASE).</p>			

Table 2.1 Radiological – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual activation	<i>Hazard: Residual activation of materials in the D-Zero collision hall results from exposure to proton antiproton collisions</i>	L: U C: N R: IV	M – Enclosure surveys to identify activated areas (nearest the beam pipe)	L: U C: N R: IV
Radioactive Sources	<i>Hazard: Exposure to calibration sources internal to the D-Zero detector</i>	L: EU C: N R: IV	M – Appropriate work planning and training will be required prior to opening of the calorimeter cryostats M – Training required prior to handle sources	L: EU C: N R: IV
Nuclear Material	<i>Hazard: Exposure to depleted uranium internal to the calorimeter cryostats</i>	L: EU C: N R: IV	M – Appropriate work planning and training will be required prior to opening of the calorimeter cryostats	L: EU C: N R: IV

Radiological Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible		Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern		Risk Matrix <table border="1"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="4">Likelihood</th> </tr> <tr> <th>A</th> <th>U</th> <th>EU</th> <th>BEU</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Consequences</th> <th>H</th> <td>I</td> <td>I</td> <td>II</td> <td>III</td> </tr> <tr> <th>M</th> <td>II</td> <td>II</td> <td>III</td> <td>IV</td> </tr> <tr> <th>L</th> <td>III</td> <td>III</td> <td>IV</td> <td>IV</td> </tr> <tr> <th>N</th> <td>IV</td> <td>IV</td> <td>IV</td> <td>IV</td> </tr> </tbody> </table>			Likelihood				A	U	EU	BEU	Consequences	H	I	I	II	III	M	II	II	III	IV	L	III	III	IV	IV	N	IV	IV	IV	IV
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Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences)	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)																																
Acronyms MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	H	C ≥ 25.0 rem	C ≥ 100 rem	C ≥ 100 rem																																
	M	25.0 rem > C ≥ 5 rem	100 rem > C ≥ 25 rem	100 rem > C ≥ 25 rem																																
	L	5 rem > C	25 rem > C	25 rem > C																																
	N	0.5 rem > C	5 rem > C	5 rem > C																																

Table 2.2 Radiological – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual activation	<i>Hazard: Residual activation of materials in the D-Zero collision hall results from exposure to proton antiproton collisions.</i>	L: U C: N R: IV	M – Enclosure surveys to identify activated areas (nearest the beam pipe)	L: U C: N R: IV
Radioactive Sources	<i>Hazard: Exposure to calibration sources internal to the D-Zero detector.</i>	L: EU C: N R: IV	M – Appropriate work planning and training will be required prior to opening of the calorimeter cryostats M – Training required prior to handle sources	L: EU C: N R: IV
Nuclear Material	<i>Hazard: Exposure to depleted uranium internal to the calorimeter cryostats.</i>	L: EU C: N R: IV	M – Appropriate work planning and training will be required prior to opening of the calorimeter cryostats	L: EU C: N R: IV

Radiological Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
Likelihood (L, of event)/year A = Anticipated ($L > 1.0E-02$) U = Unlikely ($1.0E-02 > L > 1.0E-04$) EU = Extremely Unlikely ($1.0E-04 > L > 1.0E-06$) BEU = Beyond Extremely Unlikely ($1.0E-06 > L$)	Consequence (C, of event)/year		Risk (R, Qualitative Ranking)		Risk Matrix <table border="1"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="4">Likelihood</th> </tr> <tr> <th>A</th> <th>U</th> <th>EU</th> <th>BEU</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Consequences</th> <th>H</th> <td>I</td> <td>I</td> <td>II</td> <td>III</td> </tr> <tr> <th>M</th> <td>II</td> <td>II</td> <td>III</td> <td>IV</td> </tr> <tr> <th>L</th> <td>III</td> <td>III</td> <td>IV</td> <td>IV</td> </tr> <tr> <th>N</th> <td>IV</td> <td>IV</td> <td>IV</td> <td>IV</td> </tr> </tbody> </table>			Likelihood				A	U	EU	BEU	Consequences	H	I	I	II	III	M	II	II	III	IV	L	III	III	IV	IV	N	IV	IV	IV	IV
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	L	5 rem > C	25 rem > C	25 rem > C																																
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Table 2.3 Radiological – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual activation	<i>Hazard: Residual activation of materials in the D-Zero collision hall results from exposure to proton antiproton collisions.</i>	L: EU C: N R: IV	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall	L: BEU C: N R: IV
Radioactive Sources	<i>Hazard: Exposure to calibration sources internal to the D-Zero detector.</i>	L: BEU C: N R: IV	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall	L: BEU C: N R: IV
Nuclear Material	<i>Hazard: Exposure to depleted uranium internal to the calorimeter cryostats.</i>	L: BEU C: N R: IV	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall	L: BEU C: N R: IV

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Table 2.4 Toxic Materials – Onsite 1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	<i>Hazard: Potential exposure to lead dust.</i>	L: U C: N R: IV	M – Lead handling training for workers prior to accessing lead M – PPE as prescribed by the HA	L: U C: N R: IV
Beryllium	<i>Hazard: Potential exposure to beryllium dust.</i>	L: U C: H R: I	P – Locked configuration control gate provides access control to the vicinity of the beryllium in the D-Zero detector M – Beryllium training for workers prior to accessing components containing beryllium M – PPE as prescribed by the HA	L: EU C: H R: IV

Chemical Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
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	H	C ≥ PAC-2	C ≥ PAC-3	C ≥ IDLH																																
	M	PAC-2 > C ≥ PAC-1	PAC-3 > C ≥ PAC-2	IDLH > C ≥ PEL or TLV _c																																
	L	PAC-1 > C	PAC-2 > C	PEL or TLV _c > C																																
	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																

Table 2.5 Toxic Materials – Onsite 2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	<i>Hazard: Potential exposure to lead dust.</i>	L: U C: N R: IV	M – Lead handling training for workers prior to accessing lead M – PPE as prescribed by the HA	L: U C: N R: IV
Beryllium	<i>Hazard: Potential exposure to beryllium dust.</i>	L: U C: H R: I	P – Locked configuration control gate provides access control to the vicinity of the beryllium in the D-Zero detector M – Beryllium training for workers prior to accessing components containing beryllium M – PPE as prescribed by the HA	L: EU C: N R: IV

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	H	C ≥ PAC-2	C ≥ PAC-3	C ≥ IDLH																																
	M	PAC-2 > C ≥ PAC-1	PAC-3 > C ≥ PAC-2	IDLH > C ≥ PEL or TLV _c																																
	L	PAC-1 > C	PAC-2 > C	PEL or TLV _c > C																																
	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																

Table 2.6 Toxic Materials – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	<i>Hazard: Potential exposure to lead dust.</i>	L: EU C: N R: IV	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall	L: BEU C: N R: IV
Beryllium	<i>Hazard: Potential exposure to beryllium dust.</i>	L: EU C: H R: II	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall P – Locked configuration control gate further inhibits access to the beamline M – Beryllium is not accessible prior to removing additional covers	L: BEU C: H R: IV

Chemical Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
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	H	$C \geq PAC-2$	$C \geq PAC-3$	$C \geq IDLH$																																
	M	$PAC-2 > C \geq PAC-1$	$PAC-3 > C \geq PAC-2$	$IDLH > C \geq PEL$ or TLV_c																																
	L	$PAC-1 > C$	$PAC-2 > C$	PEL or $TLV_c > C$																																
	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																

Table 2.7 Flammable and Combustible Materials – Onsite -1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible materials (cables, Boxes, Paper, wood cribbing, etc.)	<i>Hazard: Combustible materials (cables) may ignite under certain circumstances</i>	L: A C: H R: I	P – Fire department inspections M – Very Early Smoke Detectors (VESDA) with status monitored remotely M – Fire suppression systems (sprinklers) M – Fire suppression systems (Halon) M – Fire department response M – Employee evacuation training/evacuation drills	L: U C: N R: IV

Other Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
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	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual’s ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	<table border="1"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="4">Likelihood</th> </tr> <tr> <th>A</th> <th>U</th> <th>EU</th> <th>BEU</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Consequences</th> <th>H</th> <td>I</td> <td>I</td> <td>II</td> <td>III</td> </tr> <tr> <th>M</th> <td>II</td> <td>II</td> <td>III</td> <td>IV</td> </tr> <tr> <th>L</th> <td>III</td> <td>III</td> <td>IV</td> <td>IV</td> </tr> <tr> <th>N</th> <td>IV</td> <td>IV</td> <td>IV</td> <td>IV</td> </tr> </tbody> </table>			Likelihood				A	U	EU	BEU	Consequences	H	I	I	II	III	M	II	II	III	IV	L	III	III	IV	IV	N	IV	IV	IV	IV
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Table 2.8 Flammable and Combustible Materials – Onsite -2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible materials (cables, Boxes, Paper, wood cribbing, etc.)	<i>Hazard: Combustible materials (cables) may ignite under certain circumstances</i>	L: A C: H R: I	P – Fire department inspections M – Very Early Smoke Detectors (VESDA) with status monitored remotely M – Fire suppression systems (sprinklers) M – Fire suppression systems (Halon) M – Fire department response M – Employee evacuation training/evacuation drills	L: U C: N R: IV

Other Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible		Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern		Risk Matrix																															
	Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms MOI = Maximally-exposed Offsite Individual	C	Offsite (MOI)	Onsite-2 (co-located worker)		Onsite-1 (facility worker)																														
	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual’s ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	<table border="1"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="4">Likelihood</th> </tr> <tr> <th>A</th> <th>U</th> <th>EU</th> <th>BEU</th> </tr> </thead> <tbody> <tr> <th rowspan="4">Consequences</th> <th>H</th> <td>I</td> <td>I</td> <td>II</td> <td>III</td> </tr> <tr> <th>M</th> <td>II</td> <td>II</td> <td>III</td> <td>IV</td> </tr> <tr> <th>L</th> <td>III</td> <td>III</td> <td>IV</td> <td>IV</td> </tr> <tr> <th>N</th> <td>IV</td> <td>IV</td> <td>IV</td> <td>IV</td> </tr> </tbody> </table>			Likelihood				A	U	EU	BEU	Consequences	H	I	I	II	III	M	II	II	III	IV	L	III	III	IV	IV	N	IV	IV	IV	IV
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	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																

Table 2.9 Flammable and Combustible Materials – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible materials (cables, Boxes, Paper, wood cribbing, etc.)	<i>Hazard: Combustible materials (cables) may ignite under certain circumstances</i>	L: A C: L R: III	P – Fire department inspections M – Very Early Smoke Detectors (VESDA) with status monitored remotely M – Fire suppression systems (sprinklers) M – Fire suppression systems (Halon) M – Fire department response	L: U C: N R: IV

Other Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																								
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible	Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern			Risk Matrix																																			
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	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual’s ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.																																				
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	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																				

Table 2.10 Magnetic Fields – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	<i>Hazard: Exposure to fringe fields beyond allowable limits (for persons with cardiac pacemakers or any electronic medical device(s))</i>	L: A C: H R: I	P - Access control points have postings to notify workers of magnetic hazards P - Industrial hygiene conducts field surveys to establish safe field boundaries for workers. M – Work Planning and Control Job Hazard training to explicitly identify hazard	L: EU C: H R: III

Other Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.																																				
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible		Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern		Risk Matrix																															
	Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms MOI = Maximally-exposed Offsite Individual	C	Offsite (MOI)	Onsite-2 (co-located worker)		Onsite-1 (facility worker)																														
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Likelihood																																				
	A	U	EU	BEU																																
Consequences	H	I	I	II	III																															
	M	II	II	III	IV																															
	L	III	III	IV	IV																															
	N	IV	IV	IV	IV																															
	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual’s ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is permanently disabling.																																
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	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level																																

Table 2.11 Magnetic Fields – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	<i>Hazard: Exposure to fringe fields beyond allowable limits (for persons with cardiac pacemakers or any electronic medical device(s))</i>	L: A C: H R: I	P - Access control points have postings to notify workers of magnetic hazards P - Industrial hygiene conducts field surveys to establish safe field boundaries for workers. M – Work Planning and Control Job Hazard training to explicitly identify hazard	L: EU C: H R: III

Other Hazard Consequences, derived from Figure C-1, “Example Qualitative Consequence Matrix”, DOE-HDBK-1163-2020.									
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible		Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern		Risk Matrix				
	Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms MOI = Maximally-exposed Offsite Individual	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Likelihood				
	C								
	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual’s ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	H	I	I	II	III
	M	C ≥ Mild, transient adverse effects.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.	M	II	II	III	IV
	L	Mild, transient adverse effects > C	Minor injuries; no hospitalization > C	Minor injuries; no hospitalization > C	L	III	III	IV	IV
	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	N	IV	IV	IV	IV

Table 2.12 Magnetic Fields – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	<i>Hazard: Exposure to fringe fields beyond allowable limits (for persons with cardiac pacemakers or any electronic medical device(s))</i>	L: U C: H R: I	P – Access control to the D-Zero Assembly Building limits access to the D-Zero collision hall P - Access control points have postings to notify workers of magnetic hazards P - Industrial hygiene conducts field surveys to establish safe field boundaries for workers. M – D-Zero collision hall is not in a publicly accessible part of the laboratory	L: BEU C: H R: IV

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.										
Likelihood (L, of event)/year A = Anticipated (L > 1.0E-02) U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06) BEU = Beyond Extremely Unlikely (1.0E-06 > L)	Consequence (C, of event)/year H = High M = Moderate L = Low N = Negligible	Risk (R, Qualitative Ranking) I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern			Risk Matrix					
		Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms MOI = Maximally-exposed Offsite Individual	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	Likelihood		
						A		U	EU	BEU
	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual's ability to take protective action.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately life-threatening or permanently disabling.	Consequences	H	I	I	II	III
						M	II	II	III	IV
						L	III	III	IV	IV
						N	IV	IV	IV	IV
	M	C ≥ Mild, transient adverse effects.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.						
	L	Mild, transient adverse effects > C	Minor injuries; no hospitalization > C	Minor injuries; no hospitalization > C						
	N	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level	Consequences less than those for Low Consequence Level						