	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:
* This	s hazard has been evaluated within the common Risk Matrix table inclu	ded in SAD S	ection I

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

* This hazard has been evaluated within the common Risk Matrix table included in SAD Section I Chapter 04 *Safety Analysis*. Work in the specified areas involving this hazard implements the controls specified in the common Risk Matrix table. No unique controls are in use.

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; 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).

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	Hazard: Residual activation of materials in the D-Zero collision hall results from exposure to proton antiproton collisions	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	Hazard: Exposure to calibration sources internal to the D-Zero detector	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	Hazard: Exposure to depleted uranium internal to the calorimeter cryostats	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 Figu	re C	-1, "Example Qualitative	e Con	nsequence Matrix", DOI	E-HDBK-1163-2020.						
Likelihood (L, of event)/year	nsequence (C, of event)/y	uence (C, of event)/year Risk (R, Qualitative Ranking)									
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation}$ (even	t) of major concern				Like	lihood	
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}\mathbf{o}\mathbf{d}\mathbf{e}\mathbf{r}\mathbf{a}\mathbf{t}\mathbf{e}$		II = situation (even	nt) of concern		1	Α	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (eve	ent) of minor concern	es	Н	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	ent) of minimal concern	enc	М	II	II	III	IV
Control(s) Type	С	Offsite (MOI)	Onsi	te-2 (co-located worker)	Onsite-1 (facility worker)	edn	т	ш	TTT	πı	IV
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge 25.0$ rem		$C \ge 100 \text{ rem}$	$C \ge 100 \text{ rem}$	ons	L	III	III	IV	IV
$\mathbf{M} = $ Mitigative (reduces event consequences)	Μ	25.0 rem > $\mathbf{C} \ge 5$ rem	10	00 rem > $C \ge 25$ rem	100 rem > C ≥ 25 rem	0	Ν	IV	IV	IV	IV
Acronyms	L	5 rem > C		25 rem > C	25 rem > C						
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	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	Hazard: Residual activation of	L: U	M – Enclosure surveys to identify activated areas (nearest the beam pipe)	L: U
activation	materials in the D-Zero collision hall	C: N		C: N
	results from exposure to proton	R: IV		R: IV
	antiproton collisions.			
Radioactive	Hazard: Exposure to calibration	L: EU	M – Appropriate work planning and training will be required prior to	L: EU
Sources	sources internal to the D-Zero	C: N	opening of the calorimeter cryostats	C: N
	detector.	R: IV	M – Training required prior to handle sources	R: IV
Nuclear Material	Hazard: Exposure to depleted	L: EU	M – Appropriate work planning and training will be required prior to	L: EU
	uranium internal to the calorimeter	C: N	opening of the calorimeter cryostats	C: N
	cryostats.	R: IV		R: IV

Radiological Hazard Consequences, derived from Figu	re C	-1, "Example Qualitative	e Con	sequence Matrix", DOI	E-HDBK-1163-2020.									
Likelihood (L, of event)/year	Co	nsequence (C, of event)/y	<i>y</i> ear	Risk (R, Qualitative Ranking)			Risk Matrix							
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathrm{High}$		\mathbf{I} = situation (event) of major concern					Like	lihood				
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		II = situation (even	nt) of concern		1	Α	U	EU	BEU			
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (eve	ent) of minor concern	es	Н	Ι	Ι	II	III			
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	situation (event) of minimal concern		М	II	II	III	IV			
Control(s) Type	С	Offsite (MOI)	Onsit	te-2 (co-located worker)	Onsite-1 (facility worker)	edu	т	ш	ш	IV	IV			
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge 25.0$ rem		$C \ge 100 \text{ rem}$	$C \ge 100 \text{ rem}$	ous	L	III	III	11	1V			
$\mathbf{M} = $ Mitigative (reduces event consequences)	Μ	25.0 rem > $\mathbf{C} \ge 5$ rem	10	$00 \text{ rem} > \mathbb{C} \ge 25 \text{ rem}$	100 rem > $\mathbf{C} \ge 25$ rem	0	Ν	IV	IV	IV	IV			
Acronyms	L	5 rem > C		25 rem > C	25 rem > C									
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	N	$0.5 \text{ rem} > \mathbf{C}$		5 rem > C	5 rem > C									

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	Hazard: Residual activation of materials in the D-Zero collision hall results from exposure to proton	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	antiproton collisions. Hazard: Exposure to calibration sources internal to the D-Zero detector.	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	Hazard: Exposure to depleted uranium internal to the calorimeter cryostats.	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

Likelihood (L, of event)/year Consequence (C, of event)/yea				Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation}$ (even	t) of major concern				Like	lihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		II = situation (even	nt) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (eve	ent) of minor concern	es	Н	Ι	Ι	II	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	ent) of minimal concern	enc	М	II	Π	III	IV		
Control(s) Type	С	Offsite (MOI)	Onsi	te-2 (co-located worker)	Onsite-1 (facility worker)	equ	T	ш	Ш	IV	IV		
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge 25.0$ rem		$C \ge 100 \text{ rem}$	$\mathbf{C} \ge 100 \text{ rem}$	ons	L	III	III	IV	1V		
\mathbf{M} = Mitigative (reduces event consequences)	Μ	$25.0 \text{ rem} > \mathbf{C} \ge 5 \text{ rem}$	10	$00 \text{ rem} > C \ge 25 \text{ rem}$	$100 \text{ rem} > \mathbb{C} \ge 25 \text{ rem}$	C	Ν	IV	IV	IV	IV		
Acronyms	L	5 rem $>$ C		25 rem > C	25 rem > C								
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	N	0.5 rem > C		$5 \text{ rem } > \mathbf{C}$	$5 \text{ rem} > \mathbf{C}$								

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	Hazard: Potential exposure to lead dust.	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	Hazard: Potential exposure to beryllium dust.	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	Conseq	uence Matrix", DOE-	HDBK-1163-2020.								
Likelihood (L, of event)/year	C	onsequence (C, of event)/year	Risk (R, Qualitative Ranking)			Matri	X	x				
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		I = situation (eve	nt) of major concern				Like	lihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = \text{situation}$ (ev	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (ev	vent) of minor concern	es	Η	Ι	Ι	Π	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	nence	М	II	II	III	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	edu	T						
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge PAC-2$		$\mathbf{C} \ge \mathbf{PAC} - 3$	C≥IDLH	ous	L	III	III	IV	IV		
$\mathbf{M} = $ Mitigative (reduces event consequences)	М	$PAC-2 > C \ge PAC-1$	PA	$AC-3 > C \ge PAC-2$	$IDLH > C \ge PEL \text{ or } TLV_c$		Ν	IV	IV	IV	IV		
Acronyms	L	PAC-1 > C	11	$\frac{1000 \times 1000}{\text{PAC-2} > C}$	$\frac{12 \text{ EV} + C}{\text{PEL or TLV}_{c} > C}$	-							
 MOI = Maximally-exposed Offsite Individual PAC = Protective Action Criteria PEL = Permissible Exposure Limit 	N	Consequences less than those for Low Consequence Level		nsequences less than for Low Consequence Level	Consequences less than those for Low Consequence Level								
TLV _c = Threshold Limit Value (ceiling)													

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	Hazard: Potential exposure to lead dust.	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	Hazard: Potential exposure to beryllium dust.	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

Likelihood (L, of event)/year	Co	onsequence (C, of event)/year	Risk (R, Qualitative	Ranking)	Risk	Matri	x	1				
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		I = situation (eve	nt) of major concern				Like	lihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}\mathbf{o}\mathbf{d}\mathbf{e}\mathbf{r}\mathbf{a}\mathbf{t}\mathbf{e}$		II = situation (ev	ent) of concern	<u></u>		A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (ev	vent) of minor concern	es	Н	Ι	Ι	Π	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	enc	М	II	II	III	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	equences	T						
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge PAC-2$		$\mathbf{C} \ge \mathbf{PAC} - 3$	C≥IDLH	Cons	L	III	III	IV	IV		
$\mathbf{M} = $ Mitigative (reduces event consequences)	М	$PAC-2 > C \ge PAC-1$	P/	$AC-3 > C \ge PAC-2$	IDLH > $C \ge PEL$ or TLV_c	C	Ν	IV	IV	IV	IV		
Acronyms IDLH = Immediately Dangerous to Life and Health	L	PAC-1 > C		$\frac{1000 \text{ C}}{\text{PAC-2} > \text{C}}$	$\frac{12 \text{ LM}^2 + 0 \text{ LM}^2 + 0 \text{ LM}^2}{\text{PEL or TLV}_c > C}$	-							
MOI = Maximally-exposed Offsite Individual PAC = Protective Action Criteria PEL = Permissible Exposure Limit TLV _c = Threshold Limit Value (ceiling)	N	Consequences less than those for Low Consequence Level		nsequences less than 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	Hazard: Potential exposure to lead	L: EU	P – Access control to the D-Zero Assembly Building limits access to the D-	L: BEU
	dust.	C: N	Zero collision hall	C: N
		R: IV		R: IV
Beryllium	Hazard: Potential exposure to	L: EU	P – Access control to the D-Zero Assembly Building limits access to the D-	L: BEU
	beryllium dust.	С: Н	Zero collision hall	C: H
		R: II	P – Locked configuration control gate further inhibits access to the	R: IV
			beamline	
			M – Beryllium is not accessible prior to removing additional covers	

Likelihood (L, of event)/year	Co	onsequence (C, of event)/year	Risk (R, Qualitative	R, Qualitative Ranking)			X	K				
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation}$ (eve	nt) of major concern			Likelihood					
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}\mathbf{o}\mathbf{d}\mathbf{e}\mathbf{r}\mathbf{a}\mathbf{t}\mathbf{e}$		II = situation (evolution)	ent) of concern	_		Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		III = situation (ev	vent) of minor concern	es	Η	Ι	Ι	Π	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	enc	М	II	II	III	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	onsequences	т	TTT	m	TV.			
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge PAC-2$		$C \ge PAC-3$	C≥IDLH	suo	L	III	III	IV	IV		
\mathbf{M} = Mitigative (reduces event consequences)	М	$PAC-2 > C \ge PAC-1$	PA	$AC-3 > C \ge PAC-2$	IDLH > $\mathbf{C} \ge \text{PEL} \text{ or } \text{TLV}_{c}$		Ν	IV	IV	IV	IV		
Acronyms IDLH = Immediately Dangerous to Life and Health	L	$\frac{PAC-1 > C}{PAC-1 > C}$	11	$\frac{1000 \text{ PAC-2} > C}{\text{PAC-2} > C}$	1000000000000000000000000000000000000	1	-			•	•		
MOI = Maximally-exposed Offsite Individual PAC = Protective Action Criteria PEL = Permissible Exposure Limit TLV _c = Threshold Limit Value (ceiling)	Ν	Consequences less than those for Low Consequence Level		nsequences less than 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	Hazard: Combustible materials	L: A	P – Fire department inspections	L: U
materials	(cables) may ignite under certain	C: H	M – Very Early Smoke Detectors (VESDA) with status monitored remotely	C: N
(cables, Boxes,	circumstances	R: I	M – Fire suppression systems (sprinklers)	R: IV
Paper, wood			M – Fire suppression systems (Halon)	
cribbing, etc.)			M – Fire department response	
citoonig, etc.)			M – Employee evacuation training/evacuation drills	

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Conse	quence Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	C	onsequence (C, of event)/ye		2,	Risk	Matr	ix	T 'I		
$\mathbf{A} = \text{Anticipated } (L > 1.0\text{E}-02)$ $\mathbf{H} = \text{Herbitical} (1.0\text{E}-02) = 1.0\text{E}-04)$		$\mathbf{H} = \mathrm{High}$		I = situation (event) of major concern II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern			Δ	U	elihood EU	BEU
U = Unlikely (1.0E-02 > L > 1.0E-04) EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{M} = \mathbf{M}$ oderate $\mathbf{L} = \mathbf{L}$ ow				Н	I	I	II	III
$\mathbf{BEU} = \mathbf{Beyond}$ Extremely Unlikely (1.0E-04 > L > 1.0E-06) $\mathbf{BEU} = \mathbf{Beyond}$ Extremely Unlikely (1.0E-06> L)		$\mathbf{N} = \text{Negligible}$				M	П	П	Ш	IV
Control(s) Type	С	6.6	I v Shuahon (ev	Onsite-1 (facility worker)	Consequences	IVI	11	- 11	III	1V
\mathbf{P} = Preventive (reduce event occurrence likelihood)	H	. ,	N Droment working fatality	y $\mathbf{C} \ge$ Prompt worker fatality or acute injury that	nse	L	III	III	IV	IV
$\mathbf{M} = $ Mitigative (reduces event consequences)	11	$C \ge$ inteversible, C other serious effects,	$C \ge$ Prompt worker fatality or acute injury that is		ů	Ν	IV	IV	IV	IV
Acronyms MOI = Maximally-exposed Offsite Individual		or symptoms which could impair an th individual's ability to take protective action.	immediately life- hreatening or permanently disabling.	is immediately life- threatening or permanently disabling.						
			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	Minor injuries; no	Minor injuries; no						
		adverse effects $> C$	hospitalization > C	hospitalization > C						
	Ν	Consequences less	Consequences less than	Consequences less than						
			nose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

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	Hazard: Combustible materials	L: A	P – Fire department inspections	L: U
materials	(cables) may ignite under certain	C: H	M –Very Early Smoke Detectors (VESDA) with status monitored remotely	C: N
(cables, Boxes,	circumstances	R: I	M – Fire suppression systems (sprinklers)	R: IV
Paper, wood			M – Fire suppression systems (Halon)	
cribbing, etc.)			M – Fire department response	
cribbing, etc.)			M – Employee evacuation training/evacuation drills	

Other Hazard Consequences, derived from Figure C-	1, "E	xample Qualitative Conse	equence Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	C	onsequence (C, of event)/y		0,	Risk	Matr	ix			
$\mathbf{A} = \text{Anticipated} (L > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation (event) of major concern}$					lihood	DEU
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}\mathbf{o}\mathbf{d}\mathbf{e}\mathbf{r}\mathbf{a}\mathbf{t}\mathbf{e}$	$\mathbf{II} = \text{situation}$ (ev	-			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$	III = situation (ev	vent) of minor concern	ses	Н	1	I	Π	III
BEU = Beyond Extremely Unlikely $(1.0E-06 > L)$		$\mathbf{N} = $ Negligible	IV = situation (ev	vent) of minimal concern		М	II	II	III	IV
Control(s) Type	С	Offsite (MOI) C	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	L	Ш	Ш	IV	IV
\mathbf{P} = Preventive (reduce event occurrence likelihood) \mathbf{M} = \mathbf{M} = \mathbf{M} = \mathbf{M}	Н	$\mathbf{C} \ge $ Irreversible, ($C \ge Prompt$ worker fatality	$\mathbf{C} \ge \operatorname{Prompt}$ worker	Con	27				
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that		Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an t	threatening or permanently	threatening or						
		individual's ability to	disabling.	permanently disabling.						
		take protective								
		action.								
	Μ	$C \ge Mild$, transient	$C \ge$ Serious injury, no	$C \ge$ Serious injury, no						
		adverse effects.	immediate loss of life no	immediate loss of life no						
			permanent disabilities;	permanent disabilities;						
			hospitalization required.	hospitalization required.						
	L	Mild, transient	Minor injuries; no	Minor injuries; no						
		adverse effects > C	hospitalization > C	hospitalization > C						
	Ν	Consequences less	Consequences less than	Consequences less than						
	1	than those for Low the	hose for Low Consequence	those for Low						
		Consequence Level	Level	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.)	Hazard: Combustible materials (cables) may ignite under certain circumstances	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-	l, "E	xample Qualitative Conse	quence Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	C	onsequence (C, of event)/ye	ear Risk (R, Qualitative	Ranking)	Risk	Matri	ix			
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = $ situation (ever	\mathbf{I} = situation (event) of major concern				-	lihood	-
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}\mathbf{o}\mathbf{d}\mathbf{e}\mathbf{r}\mathbf{a}\mathbf{t}\mathbf{e}$	$\mathbf{II} = \text{situation}$ (eve	II = situation (event) of concern III = situation (event) of minor concern IV = situation (event) of minimal concern			Α	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$	III = situation (ev			Η	I	Ι	Π	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev			М	II	Π	III	IV
Control(s) Type	С	Offsite (MOI) 0	nsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	L	Ш	Ш	IV	IV
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$\mathbf{C} \ge $ Irreversible, \mathbf{C}	$C \ge$ Prompt worker fatality	$\mathbf{C} \geq \text{Prompt worker}$	Con					
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	0	Ν	IV	IV	IV	IV
Acronyms MOI = Maximally-exposed Offsite Individual		or symptoms which could impair an th individual's ability to take protective	immediately life- hreatening or permanently disabling.	is immediately life- threatening or permanently disabling.						
	М	action.								
	141		$C \ge$ 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	Minor injuries; no	Minor injuries; no						
		adverse effects $> C$	hospitalization > C	hospitalization > C						
	Ν	Consequences less	Consequences less than	Consequences less than						
		than those for Low the	nose for Low Consequence	those for Low						
		Consequence Level	Level	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)
	persons with cardiac pacemakers or	<u>L: A</u> <u>C: H</u>		

Other Hazard Consequences, derived from Figure	C-	l, "Example Qualitativ	e Cons	sequence Matrix", DO	DE-HDBK-1163-2020.						
Likelihood (L, of event)/year	Co	nsequence (C, of event)/year	Risk (R, Qualitative	Ranking)	Risk Matrix					
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E}-02)$	H	= High		$\mathbf{I} = \text{situation (event) o}$	of major concern						
U = Unlikely (1.0E-02> L >1.0E-04)	М	= Moderate		II = situation (event)	of concern						
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)	L =	= Low		III = situation (event)) of minor concern						
BEU = Beyond Extremely Unlikely (1.0E-06> L)	N =	= Negligible		IV = situation (event)	of minimal concern				Like	lihood	
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)			А	U	EU	BEU
P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences)	H	$\mathbf{C} \geq$ Irreversible, other		Prompt worker fatality	$\mathbf{C} \geq \text{Prompt worker fatality or}$		Н	Ι	I	Π	III
Acronyms		serious effects, or		acute injury that is	acute injury that is immediately life-threatening or		М	Π	Π	III	IV
MOI = Maximally-exposed Offsite Individual		impair an individual's		ermanently disabling.	permanently disabling.	Consequences	L	III	III	IV	IV
		ability to take protective action.					Ν	IV	IV	IV	IV
	м	C ≥ Mild, transient adverse effects.	imm per	≥ Serious injury, no nediate loss of life no manent disabilities; pitalization required.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.						
	L	Mild, transient adverse effects > C		Minor injuries; no ospitalization > C	Minor injuries; no hospitalization > C						
	Ν	Consequences less	Con	nsequences less than	Consequences less than those						
		than those for Low	those	for Low Consequence	for Low Consequence Level						
		Consequence Level		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)
	<i>Hazard: Exposure to fringe fields</i> <i>beyond allowable limits (for persons</i> <i>with cardiac pacemakers or any</i> <i>electronic medical device(s))</i>	<u>L: A</u> <u>C: H</u> <u>R: I</u>	 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 	

Other Hazard Consequences, derived from Figu	re (C-1, "Example Qualitati	ive Co	nsequence 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)	event)/year H = High			Risk (R, Qualitative I = situation (event) of II = situation (event) III = situation (event)	of major concern of concern	Risk Matrix					
BEU = Beyond Extremely Unlikely (1.0E-06>L)	L١			III = situation (event) of minor concern IV = situation (event) of minimal concern				A	Like U	lihood EU	BEU
Control(s) Type P = Preventive (reduce event occurrence	С	(-)	Onsite-2 vorker)		Onsite-1 (facility worker)		Н	I	I	II	III
likelihood) M = Mitigative (reduces event consequences)	H	$\mathbf{C} \ge$ Irreversible, other C serious effects, or		ompt worker fatality cute injury that is	$C \ge$ Prompt worker fatality or acute injury that is immediately	Consequences	M L	II III	п ш	III IV	IV IV
Acronyms MOI = Maximally-exposed Offsite Individual		symptoms which could impair an t	im	nmediately life- ning or permanently	life-threatening or permanently disabling.		N	IV	IV	IV	IV
		individual's ability to take protective action.		disabling.							
	М		immeo perm	Serious injury, no diate loss of life no nanent disabilities; talization required.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.						
	L	Mild, transient adverse effects > C		inor injuries; no spitalization > C	Minor injuries; no hospitalization > C						
	N	Consequences less than those for Low th Consequence Level		equences less than or Low Consequence Level	Consequences less than those for Low Consequence Level						

Table 2.12 Magnetic Fields – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
	<i>Hazard: Exposure to fringe fields beyond allowable limits (for persons with cardiac pacemakers or any electronic medical device(s))</i>	<u>L: U</u> <u>C: H</u> <u>R: I</u>		

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.											
Likelihood (L, of event)/year	Consequence (C, of event)/year			Risk (R, Qualitative	Risk Matrix						
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$	$\mathbf{H} = \mathrm{High}$			I = situation (event) of major concern							
U = Unlikely (1.0E-02 > L > 1.0E-04)	Μ	= Moderate		II = situation (event) of concern							
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)	L١	= Low		III = situation (event) of minor concern							
BEU = Beyond Extremely Unlikely (1.0E-06> L)	N :	= Negligible		IV = situation (event) of minimal concern					Liko	lihood	
ontrol(s) Type		Offsite (MOI)	Onsite-	-2 (co-located worker) Onsite-1 (facility worker)				А	U	EU	BEU
 P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms MOI = Maximally-exposed Offsite Individual 	Ħ	$\mathbf{C} \geq$ Irreversible, other		Prompt worker fatality	$C \ge Prompt$ worker fatality	Consequences	Н	Ι	Ι	Π	III
		serious effects, or		acute injury that is	or acute injury that is		М	II	Π	III	IV
		symptoms which could impair an individual's		ermanently disabling.	immediately life- threatening or permanently		L	Ш	III	IV	IV
		ability to take	1	disabling.	disabling.		N	IV	IV	IV	IV
		protective action.									
	М	$C \ge Mild$, transient	C ≥	≥ Serious injury, no	$\mathbf{C} \ge \mathbf{Serious}$ injury, no						
		adverse effects.	imm	nediate loss of life no	immediate loss of life no						
			per	rmanent disabilities;	permanent disabilities;						
			hosp	pitalization required.	hospitalization required.						
	L N	Mild, transient adverse	N	Minor injuries; no	Minor injuries; no						
		effects > C	hc	ospitalization > C	hospitalization $> C$						
		Consequences less than	Consec	quences less than those	Consequences less than						
		those for Low	for Lo	w Consequence Level	those for Low Consequence						
		Consequence Level			Level						