Table 8 Summary of Baseline and Residual Risks – MiniBooNE Detector

	Risk Tables Description	Baseline Risk	Residual Risk
8.1	Flammable & Combustible Materials – Onsite-1 Facility Worker	R: *	R: *
8.2	Flammable & Combustible Materials – Onsite-2 Co-located worker	R: *	R: *
8.3	Flammable & Combustible Materials – MOI Offsite	R: *	R: *
8.4	Thermal Energy – Onsite-1 Facility Worker	R: *	R: *
8.5	Thermal Energy – Onsite-2 Co-located Worker	R: *	R: *
8.6	Thermal Energy – MOI Offsite	R: *	R: *
8.7	Kinetic Energy – Onsite-1 Facility Worker	R: *	R: *
8.8	Kinetic Energy – Onsite-2 Co-located Worker	R: *	R: *
8.9	Kinetic Energy – MOI Offsite	R: *	R: *
8.10	Potential Energy- Onsite-1 Facility Worker	R: *	R: *
8.11	Potential Energy – Onsite-2 Co-located Worker	R: *	R: *
8.12	Potential Energy – MOI Offsite	R: *	R: *
8.13	Other Hazards – Onsite-1 Facility Worker	R: *	R: *
8.14	Other Hazards – Onsite-2 Co-located Worker	R: *	R: *
8.15	Other Hazards – MOI Offsite	R: *	R: *
8.16	Access & Egress – Onsite-1 Facility Worker	R: *	R: *
8.17	Access & Egress – Onsite-2 Co-located Worker	R: *	R: *
8.18	Access & Egress – MOI Offsite	R: *	R: *
8.19	Environmental Hazards	R: *	R: *

<sup>\*</sup> 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 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).

 ${\bf Table~8.1~Flammable~and~Combustible~Materials-Onsite~-1~Facility~Worker}$ 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
materials		C:		C:
(cables, Boxes,		R:		R:
Paper, wood				
cribbing, etc.)				
Flammable	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Materials		C:		C:
(Flammable gas,		R:		R:
cleaning				
materials, etc.)				

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)	/year	Risk (R, Qualitative	Ranking)	Risk	Matri	X					
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (event) of major concern									
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = \text{situation (ev}$	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \text{Low}$		<b>III</b> = situation (event) of minor concern			Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		<b>IV</b> = situation (ev	vent) of minimal concern	ences	M	II	II	Ш	IV		
Control(s) Type  P = Preventive (reduce event occurrence likelihood)  M = Mitigative (reduces event consequences)  Acronyms  MOI = Maximally-exposed Offsite Individual	C	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	ī	III	III	IV	IV		
	Н	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual's ability to take protective action.	or	Prompt worker fatality acute injury that is immediately life- tening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately lifethreatening or permanently disabling.	Cons	N	IV	IV	IV	IV		
		C ≥ Mild, transient	C	≥ Serious injury, no	C ≥ Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								

			permanent disabilities;	permanent disabilities;
			hospitalization required.	hospitalization required.
I	L	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> C$	hospitalization $> C$	hospitalization $> \mathbf{C}$
N	N	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table 8.2 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: N/A	L:	See Section 1, Chapter 4.	L:
materials		C:		C:
(cables, Boxes,		R:		R:
Paper, wood				
cribbing, etc.)				
Flammable	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Materials		C:		C:
(Flammable gas,		R:		R:
cleaning				
materials, etc.)				

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)	/year	Risk (R, Qualitative	Ranking)	Risk	Matri	X					
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (event) of major concern									
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = \text{situation (ev}$	ent) of concern		ı	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \text{Low}$		<b>III</b> = situation (ev	<b>III</b> = situation (event) of minor concern			I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		<b>IV</b> = situation (ev	vent) of minimal concern	ences	M	II	II	Ш	IV		
Control(s) Type  P = Preventive (reduce event occurrence likelihood)  M = Mitigative (reduces event consequences)  Acronyms  MOI = Maximally-exposed Offsite Individual	C	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	ī	III	III	IV	IV		
	H	C ≥ Irreversible, other serious effects, or symptoms which could impair an individual's ability to take protective action.	or	Prompt worker fatality acute injury that is immediately life-tening or permanently disabling.	C ≥ Prompt worker fatality or acute injury that is immediately lifethreatening or permanently disabling.	Cons	N	IV	IV	IV	IV		
		C ≥ Mild, transient	C	≥ Serious injury, no	C ≥ Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								

			permanent disabilities;	permanent disabilities;
			hospitalization required.	hospitalization required.
I	L	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> C$	hospitalization $> C$	hospitalization $> \mathbf{C}$
N	N	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table 8.3 Flammable and Combustible Materials – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
materials		C:		C:
(cables, Boxes,		R:		R:
Paper, wood				
cribbing, etc.)				
Flammable	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Materials		C:		C:
(Flammable gas,		R:		R:
cleaning				
materials, etc.)				

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)	/year	Risk (R, Qualitative	Ranking)	Risk	Matri	X					
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (event) of major concern									
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{H} = \text{situation (ev}$	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \text{Low}$		<b>III</b> = situation (ev	vent) of minor concern	ences	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		$\mathbf{N} = \mathbf{Negligible}$		<b>IV</b> = situation (ev	V = situation (event) of minimal concern			II	II	Ш	IV		
Control(s) Type P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences) Acronyms	C	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	ī	III	III	IV	IV		
	H	C ≥ Irreversible, other serious effects, or symptoms which	other serious effects, or acute injury that is		C ≥ Prompt worker fatality or acute injury that is immediately life-	Cons	N	IV	IV	IV	IV		
MOI = Maximally-exposed Offsite Individual		could impair an threatening or permanently		threatening or									
		individual's ability to take protective action.		disabling.	permanently disabling.								
	M	C ≥ Mild, transient adverse effects.		≥ Serious injury, no nediate loss of life no	C ≥ Serious injury, no immediate loss of life no								

			permanent disabilities;	permanent disabilities;
			hospitalization required.	hospitalization required.
I	L	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> C$	hospitalization $> C$	hospitalization $> \mathbf{C}$
N	N	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table~8.4~Thermal~Energy-Onsite-1~Facility~Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Hot Work	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)	/year Risk (R.	, Qualitative	Ranking)	Risk Matrix							
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$	I =	<b>I</b> = situation (event) of major concern					Likelihood				
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	II =	situation (ev	ent) of concern		ı	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low	III	= situation (e	vent) of minor concern	uces	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV:	= situation (ev	vent) of minimal concern	I	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-loca	ted worker)	Onsite-1 (facility worker)	nbəs		***		***			
<b>P</b> = Preventive (reduce event occurrence likelihood)	H	C ≥ Irreversible,	C ≥ Prompt wo	rker fatality	C ≥ Prompt worker	Cons	L	III	III	IV	IV		
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,	or acute inju	-	fatality or acute injury that	ŭ	N	IV	IV	IV	IV		
Acronyms		or symptoms which	immediate	•	is immediately life-				•				
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an	threatening or p	•	threatening or								
		individual's ability to	disabli	•	permanently disabling.								
		take protective		Z.									
		action.											
	M	C ≥ Mild, transient	C ≥ Serious i	injury, no	C ≥ Serious injury, no								
		adverse effects.	immediate los	s of life no	immediate loss of life no								
			permanent di	sabilities;	permanent disabilities;								
			hospitalizatio	n required.	hospitalization required.								
	L	Mild, transient	Minor inju	ries; no	Minor injuries; no								
		adverse effects $> \mathbf{C}$	hospitalizat	ion > C	hospitalization > C								
	N	Consequences less	Consequences	s less than	Consequences less than								
		than those for Low	those for Low C	Consequence	those for Low								
		Consequence Level	Leve	el	Consequence Level								

Table 8.5 Thermal Energy – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Hot Work	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	C	onsequence (C, of event)/ye	ear Risk (R, Qualitative	Ranking)	Risk	Matri	ix					
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	I = situation (eve	nt) of major concern				Like	lihood			
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	<b>II</b> = situation (even	ent) of concern	_	ı	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low	<b>III</b> = situation (ev	vent) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	<b>IV</b> = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	nsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	,	TTT	TTT	13.7	TX /		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible, C	C ≥ Prompt worker fatality	C ≥ Prompt worker	ons	L	III	III	IV	IV		
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	N	IV	IV	IV	IV		
Acronyms		or symptoms which immediately life-		is immediately life-								
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an th	reatening or permanently	threatening or								
		individual's ability to	disabling.	permanently disabling.								
		take protective										
		action.										
	M	$C \ge Mild$ , transient	C ≥ 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 $> \mathbf{C}$								
	N	Consequences less	Consequences less than	Consequences less than								
		than those for Low th	ose for Low Consequence	those for Low								
		Consequence Level	Level	Consequence Level								

**Table 8.6 Thermal Energy – MOI Offsite** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Hot Work	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	Co	onsequence (C, of event)/y	year Risk (R, Qualitative	Ranking)	Risk Matrix							
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	I = situation (eve	ent) of major concern				Like	lihood			
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{H} = \text{situation (ev}$	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \text{Low}$	$III = situation (e^{-1})$	vent) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (evaluation)	vent) of minimal concern	enc	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	_	***	***	77.7	***		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C ≥ Prompt worker fatality	C ≥ Prompt worker	suo	L	III	III	IV	IV		
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	ŭ	N	IV	IV	IV	IV		
Acronyms		or symptoms which	immediately life-	is immediately life-								
<b>MOI</b> = Maximally-exposed Offsite Individual		• •	threatening or permanently	threatening or								
		individual's ability to	disabling.	permanently disabling.								
		take protective	8.	r and y and a								
		action.										
	M	C ≥ Mild, transient	C ≥ Serious injury, no	C ≥ 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 $> \mathbf{C}$	hospitalization > C	hospitalization $> \mathbf{C}$								
	N	Consequences less	Consequences less than	Consequences less than								
		than those for Low	those for Low Consequence	those for Low								
		Consequence Level	Level	Consequence Level								

**Table 8.7 Kinetic Energy – Onsite-1 Facility Worker** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Power tools	Hazard: N/A	L: C:	See Section 1, Chapter 4.	L: C:
		R:		R:
Pumps and	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Motors		C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)/	equence (C, of event)/year   Risk (R, Qualitative Ranking)			Risk Matrix							
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (eve	I = situation (event) 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)		$\mathbf{L} = \text{Low}$		III = situation (e	vent) of minor concern	S	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (e	vent) of minimal concern	ences	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located worker)		Onsite-1 (facility worker)	nbəs		***	***	77.7	TV /		
<b>P</b> = Preventive (reduce event occurrence likelihood)		C ≥ Irreversible,	C ≥ Pr	ompt worker fatality	C ≥ Prompt worker	ous	L	III	III	IV	IV		
<b>M</b> = Mitigative (reduces event consequences)	ntive (reduce event occurrence likelihood) H $C \ge I$ rreversible other serious effe					S	N	IV	IV	IV	IV		
Acronyms		or symptoms which		nmediately life-	is immediately life-					•			
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an		ening or permanently	threatening or								
		individual's ability to		disabling.	permanently disabling.								
		take protective		C	, ,								
		action.											
	M	C ≥ Mild, transient	<b>C</b> ≥	Serious injury, no	C ≥ Serious injury, no								
		adverse effects.	imme	ediate loss of life no	immediate loss of life no								
			perm	nanent disabilities;	permanent disabilities;								
			hospi	italization required.	hospitalization required.								
	L	Mild, transient	M	inor injuries; no	Minor injuries; no								
		adverse effects > C	hos	spitalization > C	hospitalization $> \mathbf{C}$								

N	Cor	nsequences less	Consequences less than	Consequences less than
	thar	n those for Low	those for Low Consequence	those for Low
	Con	nsequence Level	Level	Consequence Level

**Table 8.8 Kinetic Energy – Onsite-2 Co-located Worker** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Power tools	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Pumps and Motors	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	C	onsequence (C, of event)	year Risk (R, Qualitative	Ranking)	Risk Matrix							
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	I = situation (even	ent) of major concern				Like	lihood			
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{H} = \text{situation (ev}$	vent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \text{Low}$	III = situation (e	vent) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (e	vent) of minimal concern	ences	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	nbee	T .	Ш	Ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C ≥ Prompt worker fatality	C ≥ Prompt worker	, Suo,	L	111	111	1 V	1 V		
$\mathbf{M} = \mathbf{Mitigative}$ (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that		N	IV	IV	IV	IV		
Acronyms		or symptoms which	immediately life-	is immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an	threatening or permanently	threatening or								
		individual's ability to	disabling.	permanently disabling.								
		take protective										
		action.										
	M	$C \ge Mild$ , transient	$C \ge Serious injury, no$	C ≥ 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 $> \mathbf{C}$	hospitalization $> C$	hospitalization > C								

**Table 8.9 Kinetic Energy – MOI Offsite** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Power tools	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Pumps and Motors	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	C	onsequence (C, of event)/y	year	Risk (R, Qualitative Ranking)			Risk Matrix					
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (eve	ent) 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)		$\mathbf{L} = \mathbf{Low}$		$III = situation (e^{-1})$	vent) of minor concern	ces	Н	I	I	II	III	
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	en	M	II	II	III	IV	
Control(s) Type	C	Offsite (MOI)	Onsite-	-2 (co-located worker)	Onsite-1 (facility worker)	edn	,	***	***	***	***	
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	<b>C</b> ≥ P <sub>1</sub>	rompt worker fatality	C ≥ Prompt worker	Cons	L	III	III	IV	IV	
<b>M</b> = Mitigative (reduces event consequences)		other serious effects, or ac		acute injury that is	fatality or acute injury that is immediately life-	5	N	IV	IV	IV	IV	
Acronyms				mmediately life-			•					
<b>MOI</b> = Maximally-exposed Offsite Individual		J 1		ening or permanently	threatening or							
		individual's ability to		disabling.	permanently disabling.							
		take protective		· ·								
		action.										
	M	C ≥ Mild, transient	<b>C</b> ≥	Serious injury, no	C ≥ Serious injury, no							
		adverse effects.	imme	ediate loss of life no	immediate loss of life no							
			perr	manent disabilities;	permanent disabilities;							
			hosp	oitalization required.	hospitalization required.							
	L	Mild, transient	M	Inor injuries; no	Minor injuries; no							
		adverse effects > C	ho	ospitalization > C	hospitalization > C							

Table 8.10 Potential Energy – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Crane Operations	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Compressed Gasses	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Material Handling	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	Co	onsequence (C, of event)/	year R	kisk (R, Qualitative	Ranking)	Risk	Matri	X				
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (event) of major concern					Like	lihood		
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = situation (evolution (evolution for evolution $	ent) of concern			A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$		<b>III</b> = situation (ev	vent) of minor concern	es	Н	I	I	II	III	
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV	
Control(s) Type	C	Offsite (MOI)	Onsite-2 (	(co-located worker)	Onsite-1 (facility worker)	Consequences		TIT	TIT	17.7	13.7	
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C ≥ Pron	mpt worker fatality	C ≥ Prompt worker	ons	L	III	III	IV	IV	
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,	or acute injury that is		fatality or acute injury that	၁	N	IV	IV	IV	IV	
Acronyms		or symptoms which		nediately life-	is immediately life-			•		•		
<b>MOI</b> = Maximally-exposed Offsite Individual		• 1	threatening or permanently		threatening or							
		individual's ability to	(	disabling.	permanently disabling.							
		take protective										
		action.										
	M	C ≥ Mild, transient	C ≥ Se	erious injury, no	C ≥ Serious injury, no							
		adverse effects.	immedi	iate loss of life no	immediate loss of life no							
			permar	nent disabilities;	permanent disabilities;							
			hospital	dization required.	hospitalization required.							

L	,	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> \mathbf{C}$	hospitalization $> \mathbf{C}$	hospitalization $> \mathbf{C}$
N	ſ	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table 8.11 Potential Energy – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Crane Operations	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Compressed Gasses	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Material Handling	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1	l, "E	Example Qualitative Cons	sequenc	e Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	Co	onsequence (C, of event)/y	year 1	Risk (R, Qualitative	Ranking)	Risk	Matri	X			
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (eve	I = situation (event) of major concern				Like	lihood	
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = situation (evolution (evolution for evolution $	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low		III = situation (ev	vent) of minor concern	es	Н	I	I	II	III
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		$\mathbf{N} = $ Negligible		IV = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV
Control(s) Type	C	C Offsite (MOI) Onsite-2		2 (co-located worker)	Onsite-1 (facility worker)	sednences	ī	III	III	IV	IV
P = Preventive (reduce event occurrence likelihood)  M = Mitigative (reduces event consequences)	Н	C ≥ Irreversible, other serious effects,	C ≥ Prompt worker fatality or acute injury that is		$C \ge Prompt worker$ fatality or acute injury that	Cons	N	IV	IV	IV	IV
Acronyms MOI = Maximally-exposed Offsite Individual		or symptoms which i		nmediately life- ning or permanently	is immediately life- threatening or						
		individual's ability to	disabling.		permanently disabling.						
		take protective action.									
	M	C ≥ Mild, transient	<b>C</b> ≥ S	Serious injury, no	C ≥ Serious injury, no						
		adverse effects.	immed	diate loss of life no	immediate loss of life no						
			perm	anent disabilities;	permanent disabilities;						
			hospit	talization required.	hospitalization required.						

L	,	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> \mathbf{C}$	hospitalization $> \mathbf{C}$	hospitalization $> \mathbf{C}$
N	ſ	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

**Table 8.12 Potential Energy – MOI Offsite** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Crane	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Operations		C:		C:
		R:		R:
Compressed	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Gasses		C:		C:
		R:		R:
Material	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Handling		C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	C	onsequence (C, of event)/y	year   Risk (R, Qualitative	Ranking)	Risk	Matri	X					
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	I = situation (eve	<b>I</b> = situation (event) of major concern				Like	lihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{II} = \text{situation (ev}$	vent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low	III = situation (e	event) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	<b>IV</b> = situation (e	vent) of minimal concern	ences	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	ī	Ш	III	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	H	$C \ge Irreversible$ ,	$C \ge Prompt$ worker fatality	$\mathbf{C} \ge \text{Prompt worker}$	Jon S							
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that		N	IV	IV	IV	IV		
Acronyms		or symptoms which	immediately life-	is immediately life-								
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an	threatening or permanently	threatening or								
		individual's ability to	disabling.	permanently disabling.								
		take protective										
		action.										
	M	C ≥ Mild, transient	C ≥ Serious injury, no	C ≥ 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 $> \mathbf{C}$	hospitalization $> \mathbf{C}$	hospitalization $> \mathbf{C}$
N	ſ	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

 $Table\ 8.13\ Other\ hazards-Onsite-1\ Facility\ Worker$ 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Spaces		C: R:		C: R:
Noise	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Silica	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Ergonomics	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Working at Heights	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.														
Likelihood (L, of event)/year	C	Consequence (C, of event)/year		Risk (R, Qualitative	k (R, Qualitative Ranking)			Risk Matrix						
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (eve	= situation (event) of major concern				Likelihood					
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = \text{situation (ev}$	ent) of concern			A	U	EU	BEU			
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low		<b>III</b> = situation (e	vent) of minor concern	es	Н	I	I	II	III			
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		<b>IV</b> = situation (ev	vent) of minimal concern	ences	M	II	II	III	IV			
Control(s) Type	$\mathbf{C}$	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	l ba		***						
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C > F	Prompt worker fatality	C ≥ Prompt worker	ous	L	III	III	IV	IV			
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,		acute injury that is	fatality or acute injury that	ప	N	IV	IV	IV	IV			
Acronyms		or symptoms which		immediately life-	is immediately life-		1							
MOI = Maximally-exposed Offsite Individual		could impair an			is miniculatory fife									

		individual's ability to take protective action.	threatening or permanently disabling.	threatening or permanently disabling.
N	М	$C \ge Mild$ , transient adverse effects.	C ≥ Serious injury, no immediate loss of life no permanent disabilities;	C ≥ Serious injury, no immediate loss of life no permanent disabilities;
			hospitalization required.	hospitalization required.
I	L	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> \mathbf{C}$	hospitalization $> C$	hospitalization $> \mathbf{C}$
1	Z	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table 8.14 Other hazards – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Spaces		C: R:		C: R:
Noise	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Silica	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Ergonomics	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Working at Heights	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Con	sequei	nce Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	C	onsequence (C, of event)	/year	Risk (R, Qualitative	Ranking)	Ris	k Matr	ix			
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (eve	<b>I</b> = situation (event) of major concern				Likelihoo		
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = \text{situation (ev}$	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low		<b>III</b> = situation (ex	vent) of minor concern	ses	Н	I	I	II	III
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		<b>IV</b> = situation (ev	vent) of minimal concern	enc	M	II	II	Ш	IV
Control(s) Type	C	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	edn	_	TTT	TTT	13.7	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible.	C > F	Prompt worker fatality	C ≥ Prompt worker	ons	L	III	III	IV	1V
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,		acute injury that is	fatality or acute injury that	S	N	IV	IV	IV	IV
Acronyms		or symptoms which		immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an		·							

		individual's ability to	threatening or permanently	threatening or
		take protective	disabling.	permanently disabling.
		action.		
M	1	$C \ge Mild$ , transient	C ≥ 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.
$\mathbf{L}$	. 1	Mild, transient	Minor injuries; no	Minor injuries; no
		$adverse\ effects > C$	hospitalization $> \mathbf{C}$	hospitalization $> \mathbf{C}$
N	1	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

**Table 8.15 Other hazards – MOI Offsite** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined	Hazard: N/A	L:	See Section 1, Chapter 4.	L:
Spaces		C: R:		C: R:
Noise	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Silica	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Ergonomics	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Working at Heights	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Con	sequei	nce Matrix", DOE-HD	BK-1163-2020.								
Likelihood (L, of event)/year	C	onsequence (C, of event).	/year	Risk (R, Qualitative	Ranking)	Risk Matrix							
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (event) of major concern				Likelihood					
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)		L = Low		<b>III</b> = situation (ev	vent) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		<b>IV</b> = situation (ev	vent) of minimal concern	ences	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	bə				***	***		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C > F	Prompt worker fatality	C ≥ Prompt worker	ous	L	III	III	IV	IV		
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,		acute injury that is	fatality or acute injury that	ت	N	IV	IV	IV	IV		
Acronyms		or symptoms which		immediately life-	is immediately life-				ı				
MOI = Maximally-exposed Offsite Individual		could impair an			is immediately life								

		individual's ability to take protective action.	threatening or permanently disabling.	threatening or permanently disabling.
N	М	$C \ge Mild$ , transient adverse effects.	C ≥ Serious injury, no immediate loss of life no permanent disabilities;	C ≥ Serious injury, no immediate loss of life no permanent disabilities;
			hospitalization required.	hospitalization required.
I	L	Mild, transient	Minor injuries; no	Minor injuries; no
		adverse effects $> \mathbf{C}$	hospitalization $> C$	hospitalization $> \mathbf{C}$
1	Z	Consequences less	Consequences less than	Consequences less than
		than those for Low	those for Low Consequence	those for Low
		Consequence Level	Level	Consequence Level

Table 8.16 Access & Egress – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Life Safety Egress	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.										
Likelihood (L, of event)/year	Co	onsequence (C, of event)/y	sequence (C, of event)/year Risk (R, Qualitative Ranking)							
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	$\mathbf{I} = \text{situation (eve}$	ent) of major concern					lihood	
U = Unlikely (1.0E-02> L>1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{II} = \text{situation (ev}$	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low	<b>III</b> = situation (ex	vent) of minor concern	es	Н	I	I	II	III
<b>BEU</b> = Beyond Extremely Unlikely $(1.0E-06>L)$		$\mathbf{N}$ = Negligible	IV = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	T	III	III	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	$C \ge Prompt worker fatality$	C ≥ Prompt worker	Ons	L	111	111	1 V	1 V
$\mathbf{M}$ = Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	$^{\circ}$	N	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an	hreatening or permanently	threatening or						
		individual's ability to	disabling.	permanently disabling.						
		take protective								
		action.								
	M	$C \ge Mild$ , transient	$C \ge Serious injury, no$	C ≥ 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 $> \mathbf{C}$						
	N	Consequences less	Consequences less than	Consequences less than						
		than those for Low the	hose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

Table 8.17 Access & Egress – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Life Safety Egress	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.													
Likelihood (L, of event)/year	C	onsequence (C, of event)/	/year Ri	isk (R, Qualitative	Ranking)	Risk Matrix							
$\mathbf{A} = \text{Anticipated (L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathbf{High}$		I = situation (even)	nt) of major concern					lihood			
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = situation (evolution (evolution for evolution $	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low		III = situation (ev	vent) of minor concern	es	Н	I	I	II	III		
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV		
Control(s) Type	C	Offsite (MOI)	Onsite-2 (d	co-located worker)	Onsite-1 (facility worker)	sedneuces	_	***	***	***	77.7		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C ≥ Prom	npt worker fatality	C ≥ Prompt worker	Cons	L	III	III	IV	IV		
$\mathbf{M} = \mathbf{Mitigative}$ (reduces event consequences)		other serious effects,		te injury that is	fatality or acute injury that	၁	N	IV	IV	IV	IV		
Acronyms		or symptoms which		nediately life-	is immediately life-								
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an		ng or permanently	threatening or								
		individual's ability to	Ċ	disabling.	permanently disabling.								
		take protective											
		action.											
	M	C ≥ Mild, transient	C ≥ Se	erious injury, no	C ≥ Serious injury, no								
		adverse effects.	immedia	ate loss of life no	immediate loss of life no								
			perman	nent disabilities;	permanent disabilities;								
			hospital	lization required.	hospitalization required.								
	L	Mild, transient	Mino	or injuries; no	Minor injuries; no								
		adverse effects > C	hospi	italization > C	hospitalization > C								
	N	Consequences less	Consequences less Consequences		Consequences less than								
		than those for Low	those for l	Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

**Table 8.18 Access & Egress – MOI Offsite** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Life Safety Egress	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Cons	sequence Matrix",	DOE-HD	BK-1163-2020.							
Likelihood (L, of event)/year	C	onsequence (C, of event)/	year Risk (R, Q	ualitative	Ranking)	Risk Matrix						
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$	$\mathbf{I} = \operatorname{sitt}$	ation (eve	nt) of major concern				Like	lihood		
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{II} = \mathbf{si}$	tuation (ev	ent) of concern			A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low	III = s	ituation (ev	vent) of minor concern	es	Н	I	I	II	III	
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = s	ituation (ev	vent) of minimal concern	enc	M	II	II	III	IV	
Control(s) Type	C	Offsite (MOI)	Onsite-2 (co-located	worker)	Onsite-1 (facility worker)	sedneuces	т	TIT	TIT	TV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C ≥ Irreversible,	C ≥ Prompt worke	r fatality	C ≥ Prompt worker	Cons	L	III	III	IV	1 V	
<b>M</b> = Mitigative (reduces event consequences)		other serious effects,	or acute injury	•	fatality or acute injury that	0	N	IV	IV	IV	IV	
Acronyms		or symptoms which	immediately		is immediately life-							
<b>MOI</b> = Maximally-exposed Offsite Individual		could impair an	threatening or peri	nanently	threatening or							
		individual's ability to	disabling.		permanently disabling.							
		take protective										
		action.										
	M	$C \ge Mild$ , transient	C ≥ Serious inju	ıry, no	C ≥ Serious injury, no							
		adverse effects.	immediate loss o	f life no	immediate loss of life no							
			permanent disab	ilities;	permanent disabilities;							
			hospitalization re	equired.	hospitalization required.							
	L	Mild, transient	Minor injuries	s; no	Minor injuries; no							
		adverse effects > C	hospitalization	1 > C	hospitalization > C							
	N	Consequences less	Consequences le		Consequences less than							
		than those for Low	those for Low Con	sequence	those for Low							
		Consequence Level	Level		Consequence Level							

**Table 8.19 Environmental Hazards** 

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Hazard to Air	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Hazard to Water	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:
Hazard to Soil	Hazard: N/A	L: C: R:	See Section 1, Chapter 4.	L: C: R:

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 Ranking)			Matri	X				
$\mathbf{A} = \text{Anticipated } (L > 1.0E-02)$		$\mathbf{H} = \mathbf{High}$		<b>I</b> = situation (event) of major concern					Like	lihood		
U = Unlikely (1.0E-02> L > 1.0E-04)		$\mathbf{M} = \mathbf{Moderate}$		$\mathbf{II} = situation (evolution (evolution for evolution $	ent) of concern			A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		L = Low		III = situation (ev	vent) of minor concern	es	Н	I	I	II	III	
<b>BEU</b> = Beyond Extremely Unlikely (1.0E-06> L)	$\mathbf{N} = \text{Negligible}$			IV = situation (ev	vent) of minimal concern	enc	M	II	II	III	IV	
Control(s) Type  P = Preventive (reduce event occurrence likelihood)  M = Mitigative (reduces event consequences)	C H	Offsite (MOI)	Onsite-2	2 (co-located worker)	Onsite-1 (facility worker)	sednences	I.	III	III	IV	IV	
		C ≥ Irreversible, other serious effects,	C ≥ Prompt worker f or acute injury tha		C ≥ Prompt worker fatality or acute injury that	Cons	N	IV	IV	IV	IV	
Acronyms  MOI = Maximally-exposed Offsite Individual		or symptoms which could impair an	immediately life- threatening or permanently disabling. is immediately life- threatening or permanently disabling.									
		individual's ability to			permanently disabling.							
		take protective										
		action.										
	M	$C \ge Mild$ , transient	$\mathbf{C} \geq \mathbf{S}$	Serious injury, no	$C \ge$ Serious injury, no							
		adverse effects.	immed	diate loss of life no	immediate loss of life no							
			perma	anent disabilities;	permanent disabilities;							
			hospit	talization required.	hospitalization required.							

L	,	Mild, transient	Minor injuries; no	Minor injuries; no	
		$adverse\ effects > C$	hospitalization $> C$	hospitalization $> \mathbf{C}$	
N		Consequences less	Consequences less than	Consequences less than	
		than those for Low	those for Low Consequence	those for Low	
		Consequence Level	Level	Consequence Level	