	Risk Tables Description	Baseline Risk	Residual Risk
2,1	Radiological – Onsite-1 Facility Worker	R: III	R: IV
2.2	Radiological – Onsite-2 Co-located Worker	R: III	R: IV
2.3	Radiological – MOI Offsite	R: III	R: IV
2.4	Toxic Materials – Onsite 1 Facility Worker	R: N/A	R: N/A
2.5	Toxic Materials – Onsite 2 Co-located Worker	R: N/A	R: N/A
2.6	Toxic Materials – MOI Offsite	R: N/A	R: N/A
2.7	Flammable & Combustible Materials – Onsite-1 Facility Worker	R: *	R: *
2.8	Flammable & Combustible Materials – Onsite-2 Co-located worker	R: *	R: *
2.9	Flammable & Combustible Materials – MOI Offsite	R: *	R: *
2.10	Electrical Energy – Onsite-1 Facility Worker	R: *	R: *
2.11	Electrical Energy – Onsite-2 Co-located Worker	R: *	R: *
2.12	Electrical Energy – MOI Offsite	R: *	R: *
2.13	Thermal Energy – Onsite-1 Facility Worker	R: N/A	R: N/A
2.14	Thermal Energy – Onsite-2 Co-located Worker	R: N/A	R: N/A
2.15	Thermal Energy – MOI Offsite	R: N/A	R: N/A
2.16	Kinetic Energy – Onsite-1 Facility Worker	R: *	R: *
2.17	Kinetic Energy – Onsite-2 Co-located Worker	R: *	R: *
2.18	Kinetic Energy – MOI Offsite	R: *	R: *
2.19	Potential Energy- Onsite-1 Facility Worker	R: *	R: *
2.20	Potential Energy – Onsite-2 Co-located Worker	R: *	R: *
2.21	Potential Energy – MOI Offsite	R: *	R: *
2.22	Magnetic Fields – Onsite-1 Facility Worker	R: N/A	R: N/A
2.23	Magnetic Fields – Onsite-2 Co-located Worker	R: N/A	R: N/A
2.24	Magnetic Fields – MOI Offsite	R: N/A	R: N/A
2.25	Other Hazards – Onsite-1 Facility Worker	R: *	R: *
2.26	Other Hazards – Onsite-2 Co-located Worker	R: *	R: *
2.27	Other Hazards – MOI Offsite	R: *	R: *
2.28	Access & Egress – Onsite-1 Facility Worker	R: N/A	R: N/A
2.29	Access & Egress – Onsite-2 Co-located Worker	R: N/A	R: N/A
2.30	Access & Egress – MOI Offsite	R: N/A	R: N/A
2.31	Environmental Hazards	R: N/A	R: N/A

Table 2. Summary of Baseline and Residual Risks (Shipping and Receiving)

* 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)
Radioactive Sources	Hazard: Personnel exposure due to various low activity sealed sources which arrive in receiving	L: U C: L R: III	P: Containers in which sealed sources arrive in are to remain closed/sealed at all times and are put in designated secure area immediately upon arrival to minimize handling and potential exposure.P: All low activity sealed sources are kept in a properly labeled designated, secure area until retrieved by ES&H Hazard Control.M: GERT provides recognition that source training is required	L: EU C: N R: IV

Likelihood (L, of event)/year	Co	nsequence (C, of event)/y	year	Risk (R, Qualitative R	lanking)	Risk	Matri	x			
A = Anticipated (L > 1.0E-02)	$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation (event) of major concern}$					Like	lihood		
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		II = situation (even	nt) of concern			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 (event) of minimal concern		enc	М	II	П	III	IV
Control(s) Type	С	Offsite (MOI)	Onsit	te-2 (co-located worker)	Onsite-1 (facility worker)	edu	т	Ш	III	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	111	III	IV	1V
$\mathbf{M} = $ Mitigative (reduces event consequences)	Μ	$25.0 \text{ rem} > C \ge 5 \text{ rem}$	10	$00 \text{ rem} > C \ge 25 \text{ rem}$	$100 \text{ rem} > \mathbf{C} \ge 25 \text{ rem}$	C	Ν	IV	IV	IV	IV
Acronyms	L	5 rem $>$ C		25 rem > C	25 rem > C	1					
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	N	$0.5 \text{ rem} > \mathbf{C}$		5 rem > C	$5 \text{ rem} > \mathbf{C}$						

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)
Radioactive Sources	Hazard: Personnel exposure due to various low activity sealed sources which	L: U C: L R: III	P: Containers in which sealed sources arrive in are to remain closed/sealed at all times and are put in designated secure area immediately upon arrival to minimize handling and potential exposure.P: All low activity sealed sources are kept in a properly labeled designated,	L: EU C: N R: IV
	arrive in receiving		secure area until retrieved by ES&H Hazard Control. M: GERT provides recognition that source training is required	

Likelihood (L, of event)/year	Co	nsequence (C, of event)/y	year R	Risk (R, Qualitative R	anking)	Risk	Risk Matrix				
A = Anticipated (L > 1.0E-02)	$\mathbf{H} = \mathrm{High}$		I = situation (even	I = situation (event) of major concern				Like	lihood		
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		$\mathbf{II} = \text{situation (event) of concern}$				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	Π	II	III	IV
Control(s) Type	С	Offsite (MOI)	Onsite-2	2 (co-located worker)	Onsite-1 (facility worker)	nbə	T	ш	ш	TV.	T.
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	ш	IV	IV
$\mathbf{M} = $ Mitigative (reduces event consequences)	Μ	$25.0 \text{ rem} > C \ge 5 \text{ rem}$		$rem > C \ge 25 rem$	$100 \text{ rem} > \mathbf{C} \ge 25 \text{ rem}$	Ŭ	Ν	IV	IV	IV	IV
Acronyms	L	5 rem $>$ C		25 rem > C	25 rem > C	1					
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	Ν	$0.5 \text{ rem} > \mathbf{C}$		5 rem > C	5 rem > C	1					

Table 2.3 Radiological – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Radioactive	Hazard: N/A	L:		L:
Sources		C:		C:
		R:		R:

Likelihood (L, of event)/year	Co	nsequence (C, of event)/y	year	Risk (R, Qualitative F	(R, Qualitative Ranking)			Risk Matrix					
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		I = situation (even	t) of major concern				Like	lihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		II = situation (event) 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	Η	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)	Onsit	te-2 (co-located worker)	Onsite-1 (facility worker)	edu	T	ш	Ш	IV	IV		
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge 25.0$ rem		$C \ge 100 \text{ rem}$	$C \ge 100 \text{ rem}$	ons	L	ш	III	IV	IV		
$\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 > C ≥ 25 rem		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	Ν	$0.5 \text{ rem} > \mathbf{C}$		5 rem > C	5 rem > C								

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: This hazard is a potential facility fire. The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential facility fire. Poor housekeeping can also lead to life safety concerns, such as egress obstruction and tripping hazards. The exposure of the hazard to the facility worker is of major concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the facility worker is of major concern. 	5	See Section 1 Chapter 04	L: C: R:

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)
Flammable Materials (Flammable gas, cleaning materials, etc.)	 Hazard: This hazard is a potential facility fire. The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential facility fire. Poor housekeeping can also lead to life safety concerns, such as egress obstruction and tripping hazards. The exposure of the hazard to the facility worker is of major concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the facility worker is of major concern. 	5	See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-1	l , "E	xample Qualitative Conse	equence Matrix", DOE-Hl	DBK-1163-2020.						
Likelihood (L, of event)/year	C	onsequence (C, of event)/y	year Risk (R, Qualitative	e Ranking)	Risk	Matr	ix			
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (ev	ent) of major concern				Like	elihood	
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 (e	vent) of concern			Α	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$	III = situation (event) of minor concern	ses	Н	Ι	I	II	III
BEU = Beyond Extremely Unlikely $(1.0E-06 > L)$		N = Negligible	IV = situation (e)	event) of minimal concern	ienc	М	П	Π	III	IV
Control(s) Type	С	Offsite (MOI)	Onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	ш	IV	IV
P = Preventive (reduce event occurrence likelihood)	Н	$\mathbf{C} \geq$ Irreversible,	$C \ge$ Prompt worker fatality	$\mathbf{C} \ge \operatorname{Prompt}$ worker	ons	L	III	- 111	11	1 V
$\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		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.								
	Μ	$C \ge Mild$, transient	$C \ge$ Serious injury, no	$\mathbf{C} \ge$ 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						
		than those for Low 1	those for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

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: The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential fire. Poor housekeeping can also lead to life safety concerns, such as egress obstructions and tripping hazards. The exposure of the hazard to the co-locate worker is of concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the co-locate worker is of concern. 	<i>d</i>	See Section 1 Chapter 04	L: C: R:

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)
Flammable Materials (Flammable gas, cleaning materials, etc.)	Hazard: The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential fire. Poor housekeeping can also lead to life safety concerns, such as egress obstruction and tripping hazards. The exposure of the hazard to the co-locate worker is of concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the co-locate worker is of concern.		See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Consec	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			
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood	
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	Ш	IV
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	ш	IV	IV
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	IV	1V
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual			hreatening 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						
		than those for Low the	nose 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: The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential fire. Poor housekeeping can also lead to life safety concerns, such as egress obstruction and tripping hazards. The exposure of the hazard to the public is of minimal concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the public is of minor concern. 	5	See Section 1 Chapter 04	L: C: R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Flammable Materials (Flammable gas, cleaning materials, etc.)	 Hazard: The presence of excessive combustible materials can pose a hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential fire. Poor housekeeping can also lead to life safety concerns, such as egress obstruction and tripping hazards. The exposure of the hazard to the public is of minimal concern. Hazard: The presence of flammable gases in cylinders or storage containers pose an inherent hazard due to their flammability/combustibility properties. Exposure to hot work provides a dangerous situation where flammable liquids will ignite. Unmitigated this could lead to an explosion and subsequent fire. The exposure of the hazard to the public is of minor concern. 	5	See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Consec	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			
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood	
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	Ш	IV
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	ш	IV	IV
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	ons	L	III	ш	IV	1V
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	С	Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual			hreatening 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						
		than those for Low the	nose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

Table 2.10 Electrical Energy – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
High Voltage	Hazard:	L:	See Section 1 Chapter 04	L:
Exposure		C:		C:
	Shock hazard, voltage > 50 V, <u>Non-interlocked enclosures</u> Flash,	R:		R:
	<u>Non-interlocked enclosures</u>			

Other Hazard Consequences, derived from Figure C-	l, "E	Example Qualitative Consec	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			
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-02})$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (even	nt) of major concern					lihood	
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	$\mathbf{II} = \text{situation} (\text{ev})$	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	ses	Η	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	III	IV
Control(s) Type	С	Offsite (MOI) 0	nsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	TTT	ш	πı	IV
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, C	$C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	III	IV	IV
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual			hreatening or permanently	threatening or						
		individual's ability to	disabling.	permanently disabling.						
		take protective								
		action.								
	М	$C \ge Mild$, 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						
		than those for Low th	ose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

Table 2.11 Electrical Energy 1 Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
High Voltage	Hazard:	L:	See Section 1 Chapter 04	L:
Exposure	Shock hazard, voltage $> 50 V$,	C:		C:
	<u>Non-interlocked enclosures</u>	R:		R:
	Flash,			
	Non-interlocked enclosures			

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	ear Risk (R, Qualitative	Ranking)	Risk	Matri	x			
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood	
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	III	IV
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	1V	IV
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual			hreatening 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						
		than those for Low the	nose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

Table 2.12 Electrical Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
High Voltage Exposure	Hazard: Shock hazard, >50 V, Arc flash <u>outside</u>	L: C: R:	See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Consec	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			
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood	
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	Ш	IV
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	ш	IV	IV
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	ons	L	III	ш	IV	1V
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	С	Ν	IV	IV	IV	IV
Acronyms		or symptoms which	immediately life-	is immediately life-						
MOI = Maximally-exposed Offsite Individual			hreatening or permanently	threatening or						
		individual's ability to	disabling.	permanently disabling.						
		take protective								
		action.								
	М	$C \ge Mild$, 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						
		than those for Low the	nose for Low Consequence	those for Low						
		Consequence Level	Level	Consequence Level						

Table 2.16 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: Personnel injury due to improper use of tools	L: C: R:	See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-	Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	С	onsequence (C, of event)/y	ear Risk (R, Qualitative	Ranking)	Risk	Matri	ix						
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)		$\mathbf{M} = \mathbf{Moderate}$	$\mathbf{II} = \text{situation}$ (ev	ent) of concern	r		Α	U	EU	BEU			
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$	III = situation (e	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-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV			
P = Preventive (reduce event occurrence likelihood)	Н	$\mathbf{C} \ge $ Irreversible, ($C \ge Prompt$ worker fatality	$C \ge Prompt worker$	ons	L	m	- 111	1 V	IV			
\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 t individual's ability to take protective action.	immediately life- threatening or permanently disabling.	is immediately life- threatening or permanently disabling.									
	Μ	$C \ge Mild$, transient	$C \ge$ Serious injury, no	$\mathbf{C} \geq$ Serious injury, no									
		adverse effects.	immediate loss of life no permanent disabilities; hospitalization required.	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									
	1	than those for Low th	hose for Low Consequence	those for Low									
		Consequence Level	Level	Consequence Level									

Table 2.17 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: Personnel injury due to improper use of tools	L: C: R:	See Section 1 Chapter 04	L: C: R:

Likelihood (L, of event)/year	C	onsequence (C, of event)/y	year F	Risk (R, Qualitative	Ranking)	Risk	Matr	ix	x						
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$		$\mathbf{I} = \text{situation}$ (even	nt) of major concern										
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate		II = situation (even	ent) of concern		1	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	II	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-2	co-located worker)	Onsite-1 (facility worker)	Consequences	L	ш	Ш	IV	IV				
P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences)	Н			ompt worker fatality	$C \ge Prompt worker$	Con	N	IV	IV	IV	IV				
Acronyms MOI = Maximally-exposed Offsite Individual		other serious effects, or symptoms which could impair an individual's ability to take protective action.	im	cute injury that is mediately life- ning or permanently disabling.	fatality or acute injury that is immediately life- threatening or permanently disabling.		14	1 V	1	1 V	1 V				
	Μ	C ≥ Mild, transient adverse effects.	immed perma	Serious injury, no diate loss of life no anent disabilities; talization required.	C ≥ Serious injury, no immediate loss of life no permanent disabilities; hospitalization required.										
	L	Mild, transient adverse effects > C		nor injuries; no pitalization > C	Minor injuries; no hospitalization > C										

Table 2.18 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:	The public does not have access to areas where power tools are used	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "F	Example Qualitative Cons	sequen	nce Matrix", DOE-HD	BK-1163-2020.						
Likelihood (L, of event)/year	С	onsequence (C, of event)/	year	Risk (R, Qualitative	Ranking)	Ris	k Matı	ix			
A = Anticipated (L > 1.0E-02)		$\mathbf{H} = \mathrm{High}$	-	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				Like	elihood	
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		-	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	ces	Η	Ι	Ι	Π	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	vent) of minimal concern	en	М	Π	II	III	IV
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	nbəsi	L	ш	ш	IV	IV
P = Preventive (reduce event occurrence likelihood)M = Mitigative (reduces event consequences)	Н	$C \ge$ Irreversible, other serious effects,		Prompt worker fatality acute injury that is	$C \ge$ Prompt worker fatality or acute injury that	Con	N	IV	IV	IV	IV
Acronyms MOI = Maximally-exposed Offsite Individual		or symptoms which could impair an individual's ability to take protective action.	i threat	mmediately life- tening or permanently disabling.	is immediately life- threatening or permanently disabling.						
	М	C ≥ Mild, transient adverse effects.	imm per	≥ Serious injury, no rediate 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		/linor injuries; no ospitalization > C	Minor injuries; no hospitalization > C						

Table 2.19 Potential Energy – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Compressed Gasses	Hazard: Personnel injury due to unexpected release or unsecure tanks	L: C: R:	See Section 1 Chapter 04	L: C: R:
Material Handling	Hazard: Personnel injury due to moving/handling material (rollovers, crush, etc.)	L: C: R:	See Section 1 Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-	1, "E	Example Qualitative Consec	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	X						
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (even	nt) of major concern				-	lihood					
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	$\mathbf{II} = \text{situation} (\text{ev})$	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	ses	Η	Ι	Ι	II	III				
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	Ш	IV				
Control(s) Type	С	Offsite (MOI) 0	nsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	ш	IV	IV				
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, C	$C \ge$ Prompt worker fatality	$C \ge Prompt worker$	ons	L	III	ш	IV	1V				
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	С	Ν	IV	IV	IV	IV				
Acronyms		or symptoms which	immediately life-	is immediately life-										
MOI = Maximally-exposed Offsite Individual			hreatening 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										
		than those for Low th	ose for Low Consequence	those for Low										
		Consequence Level	Level	Consequence Level										

Table 2.20 Potential Energy – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Compressed Gasses	Hazard: Personnel injury due to unexpected release or unsecure tanks	L: C: R:	See Section 1 Chapter 04	L: C: R:
Material Handling	Hazard: Personnel injury due to moving/handling material (rollovers, crush, etc.)	L: C: R:	See Section 1 Chapter 04	L: C: R:

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	ear Risk (R, Qualitative	Ranking)	Risk	Matri	x	X						
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood					
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III				
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	III	IV				
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV				
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	1V	IV				
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV				
Acronyms		or symptoms which	immediately life-	is immediately life-										
MOI = Maximally-exposed Offsite Individual			hreatening 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										
		than those for Low the	nose for Low Consequence	those for Low										
		Consequence Level	Level	Consequence Level										

Table 2.21 Potential Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Compressed Gasses	Hazard: Personnel injury due to unexpected release or unsecure tanks	L: C: R:	See Section 1 Chapter 04	L: C: R:
Material Handling	Hazard: Personnel injury due to moving/handling material (rollovers, crush, etc.)	L: C: R:	See Section 1 Chapter 04	L: C: R:

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	ear Risk (R, Qualitative	Ranking)	Risk	Matri	x	X						
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood					
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III				
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	III	IV				
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV				
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	1V	IV				
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV				
Acronyms		or symptoms which	immediately life-	is immediately life-										
MOI = Maximally-exposed Offsite Individual			hreatening 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										
		than those for Low the	nose for Low Consequence	those for Low										
		Consequence Level	Level	Consequence Level										

Table 2.25 Other hazards – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Ergonomics	Hazard: Office Space Industrial space (over lifting, repetitive motion, static posture)	L: C: R:	See Section 1 Chapter 04	L: C: R:

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	ear Risk (R, Qualitative	Ranking)	Risk	Matri	x	X						
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E-}02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	nt) of major concern				-	lihood					
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	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	ses	Η	Ι	Ι	II	III				
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	vent) of minimal concern	enc	М	II	Π	III	IV				
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV				
P = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	1V	IV				
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV				
Acronyms		or symptoms which	immediately life-	is immediately life-										
MOI = Maximally-exposed Offsite Individual			hreatening 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										
		than those for Low the	nose for Low Consequence	those for Low										
		Consequence Level	Level	Consequence Level										

Table 2.26 Other hazards – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Ergonomics	Hazard: Office Space Industrial space (over lifting, repetitive motion, static posture)	L: C: R:	See Section 1 Chapter 04	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	Risk (R, Qualitative Ranking)		Risk Matrix					
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (eve	\mathbf{I} = situation (event) of major concern				Likelihood			
U = Unlikely (1.0E-02> L >1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	II = situation (evolution)	$\mathbf{II} = \text{situation (event) of concern}$			Α	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L > 1.0E-06)		$\mathbf{L} = \mathbf{Low}$	III = situation (ev	III = situation (event) of minor concern		Η	Ι	Ι	II	III	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	IV = situation (event) of minimal concern		М	II	Π	III	IV	
Control(s) Type	С	Offsite (MOI) 0	onsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV	
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, ($C \ge$ Prompt worker fatality	$C \ge$ Prompt worker fatality or acute injury that	ons	L	III	ш	1V	IV	
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is		C	Ν	IV	IV	IV	IV	
Acronyms		or symptoms which	immediately life-	is immediately life-							
MOI = Maximally-exposed Offsite Individual			hreatening 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							
		than those for Low the	nose for Low Consequence	those for Low							
		Consequence Level	Level	Consequence Level							

Table 2.27 Other hazards – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Ergonomics	Hazard: Office Space Industrial space (over lifting, repetitive motion, static posture)	L: C: R:	See Section 1 Chapter 04	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	Risk (R, Qualitative Ranking)		Risk Matrix					
$\mathbf{A} = \text{Anticipated} (\text{L} > 1.0\text{E}-02)$		$\mathbf{H} = \mathrm{High}$	$\mathbf{I} = \text{situation}$ (even	\mathbf{I} = situation (event) of major concern		[Likelihood			
U = Unlikely (1.0E-02 > L > 1.0E-04)		$\mathbf{M} = \mathbf{M}$ oderate	$\mathbf{II} = \text{situation} (\text{ev})$	$\mathbf{H} = \text{situation (event) of concern}$			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	ses	Η	Ι	Ι	II	III	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	IV = situation (event) of minimal concern		М	II	Π	III	IV	
Control(s) Type	С	Offsite (MOI) 0	nsite-2 (co-located worker)	Onsite-1 (facility worker)	Consequences	т	ш	Ш	IV	IV	
\mathbf{P} = Preventive (reduce event occurrence likelihood)	Н	$C \ge Irreversible$, C	$C \ge$ Prompt worker fatality	$C \ge Prompt worker$	suo	L	III	ш	1V	IV	
$\mathbf{M} = $ Mitigative (reduces event consequences)		other serious effects,	or acute injury that is	fatality or acute injury that	C	Ν	IV	IV	IV	IV	
Acronyms MOI = Maximally-exposed Offsite Individual		or symptoms which	immediately life-	is immediately life-							
			hreatening or permanently	threatening or							
		individual's ability to	disabling.	permanently disabling.							
		take protective									
		action.									
	М	$C \ge Mild$, 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							
		than those for Low th	ose for Low Consequence	those for Low							
		Consequence Level	Level	Consequence Level							

Table 2.31 Environmental

Hazard	Hazard Description Hazard:	Baseline Qualitative Risk (without controls) L:	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls) L:
Alloonie	 Airborne release of radionuclides beyond permitted limits. Discharge of chemicals into onsite surface waters beyond permitted limits. 	C: R:		C: R:
Water	 <i>Hazard:</i> Discharge of radionuclides into onsite surface waters beyond permitted limits. Discharge of chemicals into onsite surface waters beyond permitted limits. 	L: C: R:		L: C: R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Soil	 Hazard: Radioactive soil in beam loss areas beyond allowable concentrations of radionuclides beyond calculated Fermilab limits. Discharge of chemicals into onsite soils beyond permitted limits. 	L: C: R:		L: C: R: