	Risk Tables Description	Baseline	Residual
		Risk	Risk
13.1	Radiological – Onsite-1 Facility Worker	R: I	R: IV
13.2	Radiological – Onsite-2 Co-located Worker	R: I	R: IV
13.3	Radiological – MOI Offsite	R: I	R: III
13.4*	Toxic Materials – Onsite 1 Facility Worker	R: *	R: *
13.5*	Toxic Materials – Onsite 2 Co-located Worker	R: *	R: *
13.6*	Toxic Materials – MOI Offsite	R: *	R: *
13.7*	Flammable & Combustible Materials – Onsite-1 Facility Worker	R: *	R: *
13.8*	Flammable & Combustible Materials – Onsite-2 Co-located	R: *	R: *
	worker		
13.9*	Flammable & Combustible Materials – MOI Offsite	R: *	R: *
13.10*	Electrical Energy – Onsite-1 Facility Worker	R: *	R: *
13.11*	Electrical Energy – Onsite-2 Co-located Worker	R: *	R: *
13.12*	Electrical Energy – MOI Offsite	R: *	R: *
13.13*	Thermal Energy – Onsite-1 Facility Worker	R: *	R: *
13.14*	Thermal Energy – Onsite-2 Co-located Worker	R: *	R: *
13.15*	Thermal Energy – MOI Offsite	R: *	R: *
13.16*	Kinetic Energy – Onsite-1 Facility Worker	R: *	R: *
13.17*	Kinetic Energy – Onsite-2 Co-located Worker	R: *	R: *
13.18*	Kinetic Energy – MOI Offsite	R: *	R: *
13.19*	Potential Energy- Onsite-1 Facility Worker	R: *	R: *
13.20*	Potential Energy – Onsite-2 Co-located Worker	R: *	R: *
13.21*	Potential Energy – MOI Offsite	R: *	R: *
13.22*	Magnetic Fields – Onsite-1 Facility Worker	R: *	R: *
13.23*	Magnetic Fields – Onsite-2 Co-located Worker	R: *	R: *
13.24*	Magnetic Fields – MOI Offsite	R: *	R: *
13.25	Other Hazards – Onsite-1 Facility Worker	R: *	R: *
13.26	Other Hazards – Onsite-2 Co-located Worker	R: *	R: *
13.27	Other Hazards – MOI Offsite	R: *	R: *
13.28*	Access & Egress – Onsite-1 Facility Worker	R: *	R: *
13.29*	Access & Egress – Onsite-2 Co-located Worker	R: *	R: *
13.30*	Access & Egress – MOI Offsite	R: *	R: *
13.31*	Environmental Hazards	R: *	R: *

#### Table 13. Summary of Baseline and Residual Risks – P1 and P2 Beamlines

\* 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).

### Table 13.1 Radiological – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual	Hazard: Exposure to residual	L: A	P – Radiological Work Permit prevents unauthorized personnel form	L: BEU
Activation	activation.	С: Н	areas where excessive residual radiation exists.	C: L
		R: I	P – Postings intended to caution workers of area hazard.	R: IV
			P – Training for workers to identify and respond to the hazard.	
			M – Run Conditions to ensure total radiation levels are within expected parameters.	
			<ul> <li>M – Shielding increases distance from the source of residual activation, minimizing exposure.</li> </ul>	
Groundwater	Hazard: Potential exposure due to	L: A	P – Sump water is evaluated to determine the presence of tritium or	L: EU
Activation	construction activities, (e.g.,	C: N	other activation products to prevent personnel exposure.	C: N
	earthmoving).	R: IV	<ul> <li>P – Sump pits/enclosures capture activated water to prevent releases exceeding allowed discharge limits.</li> <li>M – Facility designs employ shielding to mitigate the production of activation products in groundwater.</li> </ul>	R: IV
Surface Water	Hazard: Radionuclides in surface	L: A	P – Sump Pumps ensure water does not remain in the enclosure for	L: EU
Activation	water exceeding regulatory levels.	C: N	extended periods of time.	C: N
		R: IV	P – Sump Monitoring Program samples the water discharged by the sump pumps.	R: IV
			M – Run Conditions to ensure total radiation levels are within expected parameters.	
			M – Shielding ensures the distance from source to surface is maximized to	
			reduce total dose.	
Radioactive	Hazard: N/A	L:		L:
Water (RAW)		C:		C:
Systems		R:		R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Air Activation	Hazard: Radionuclides in air exceeding	L: A	M – Engineered Air Flow ensures the air activation remains within the	L: A
	regulatory levels.	С: Н	enclosure for more than the half-life of radionuclides before exiting.	C: L
		R: I	<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	R: III
Soil Interactions	Hazard: Scattered beam has potential	L: A	P – No excavation work allowed without an RWP.	L: A
	to activate soil at low levels calculated	C: N		C: N
	in the shielding assessment.	R: IV	M – Beamline Design ensures beam is transported through areas without interacting with soil.	R: IV
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
Radioactive	Hazard: Personnel are exposed to	L: A	P – Locked Gates prevent access to areas where radiation waste is stored.	L: BEU
Waste	ionizing radiation beyond regulatory	С: Н	P – Key Control Program ensures access to these areas is managed.	C: N
	levels.	R: I	P – Postings intended to caution workers of area hazard.	R: IV
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
			M – Distance to Stored Materials reduces total exposure risk to personnel.	
			M – Material survey and release program ensures radioactive waste is not stored in unauthorized areas.	
Contamination	Hazard: Personnel are exposed to	L: A	P – Radiation Survey of areas to measure and detect contamination	L: EU
	ionizing radiation beyond regulatory	С: Н	hazards.	C: L
	levels.	R: I	P – Postings intended to caution workers of area hazard.	R: IV
			M – PPE Specified by the RWP to protect workers in a contamination area.	
			M – Training to ensure workers understand the risks and can prepare for	
			the job accordingly.	

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
<sup>7</sup> Be	<i>Hazard:</i> Potential radiation exposure to <sup>7</sup> Be (uptake/committed dose).	L: A C: N R: IV	<sup>7</sup> Be isn't hazardous in this pattern of use by facility.	L: A C: N R: IV
Radioactive Sources	Hazard: Personnel are exposed to ionizing radiation beyond regulatory levels.	L: A C: H R: I	<ul> <li>P – Training for workers to identify and respond to the hazard.</li> <li>P – Postings intended to caution workers of area hazard.</li> <li>M – Source Handling Storage Requirements ensure radioactive sources are secured when not in use.</li> <li>M – Source Handling "In-Use" Requirements ensure the area where the radioactive source is used is tightly controlled.</li> </ul>	L: EU C: L R: IV

Radiological Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	ikelihood (L, of event)/year Consequence (C, of event)/year		Risk (R, Qualitative Ranking)		Risk	Matrix						
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (event) of major concern					Like	ihood		
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (even	t) of concern		1	A	U	EU	BEU	
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (even	I = situation (event) of minor concern		Н	1	1	II	Ш	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	N = Negligible		IV = situation (event) of minimal concern		м	П	Ш	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsi	ite-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> 25.0 rem		<b>C</b> <sup>3</sup> 100 rem	<b>C</b> <sup>3</sup> 100 rem	Son 2						
M = Mitigative (reduces event consequences)	м	25.0 rem > <b>C</b> <sup>3</sup> 5 rem	1	100 rem <b>&gt; C</b> <sup>3</sup> 25 rem	100 rem <b>&gt; C</b> <sup>3</sup> 25 rem		N	IV	IV	IV	IV	
Acronyms	L	5 rem > <b>C</b>		25 rem <b>&gt; C</b>	25 rem <b>&gt; C</b>							
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	N	0.5 rem > <b>C</b>		5 rem <b>&gt; C</b>	5 rem <b>&gt; C</b>							

### Table 13.2 Radiological – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual	Hazard: Exposure to residual	L: A	P – Radiological Work Permit prevents unauthorized personnel form	L: BEU
Activation	activation.	С: Н	areas where excessive residual radiation exists.	C: M
		R: I	P – Postings intended to caution workers of areas of residual activation.	R: IV
			P – Training for workers to identify and respond to the hazard.	
			M – Run Conditions to ensure total radiation levels are within expected parameters.	
			<ul> <li>M – Shielding increases distance from the source of residual activation, minimizing exposure.</li> </ul>	
Groundwater	Hazard: Radionuclides in groundwater	L: A	P – Sump Pumps ensure water does not remain in the enclosure for	L: EU
Activation	exceeding regulatory levels.	С: Н	extended periods of time.	C: M
		R: I	P – Sump Monitoring Program samples the water discharged by the sump pumps.	R: III
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
Surface Water	Hazard: Radionuclides in surface	L: A	P – Sump Pumps ensure water does not remain in the enclosure for	L: EU
Activation	water exceeding regulatory levels.	С: Н	extended periods of time.	C: L
		R: I	P – Sump Monitoring Program samples the water discharged by the sump pumps.	R: IV
			M – Run Conditions to ensure total radiation levels are within expected	
			parameters.	
			reduce total dose.	
Radioactive	Hazard: N/A	L:		L:
Water (RAW)		C:		C:
Systems		R:		R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Air Activation	Hazard: Radionuclides in air exceeding	L: A	M – Engineered Air Flow ensures the air activation remains within the	L: A
	regulatory levels.	С: Н	enclosure for more than the half-life of radionuclides before exiting.	C: L
		R: I	<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	R: III
Soil Interactions	Hazard: Scattered beam has potential	L: A	P – No excavation work allowed without an RWP.	L: A
	to activate soil at low levels calculated	C: N		C: N
	in the shielding assessment.	R: IV	<ul> <li>M – Beamline Design ensures beam is transported through areas without interacting with soil.</li> </ul>	R: IV
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
Radioactive	Hazard: Personnel are exposed to	L: A	P – Locked Gates prevent access to areas where radiation waste is stored.	L: BEU
Waste	ionizing radiation beyond regulatory	С: Н	P – Key Control Program ensures access to these areas is managed.	C: N
	levels.	R: I	P – Postings intended to caution workers of area hazard.	R: IV
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
			M – Distance to Stored Materials reduces total exposure risk to personnel.	
			M – Material survey and release program ensures radioactive waste is not stored in unauthorized areas.	
Contamination	Hazard: Personnel are exposed to	L: A	P – Radiation Survey of areas to measure and detect contamination	L: EU
	ionizing radiation beyond regulatory	С: Н	hazards.	C: L
	levels.	R: I	P – Postings intended to caution workers of area hazard.	R: IV
			M – PPE Specified by the RWP to protect workers in a contamination area.	
			M – Training to ensure workers understand the risks and can prepare for	
			the job accordingly.	

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
<sup>7</sup> Be	Hazard: Potential radiation exposure to <sup>7</sup> Be (uptake/committed dose).	L: A C: N R: IV	<sup>7</sup> Be isn't hazardous in this pattern of use by facility.	L: A C: N R: IV
Radioactive Sources	Hazard: Personnel are exposed to ionizing radiation beyond regulatory levels.	L: A C: H R: I	<ul> <li>P – Training for workers to identify and respond to the hazard.</li> <li>P – Postings intended to caution workers of area hazard.</li> <li>M – Source Handling Storage Requirements ensure radioactive sources are secured when not in use.</li> <li>M – Source Handling "In-Use" Requirements ensure the area where the radioactive source is used is tightly controlled.</li> </ul>	L: EU C: L R: IV

Radiological Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	Likelihood (L, of event)/year Consequence (C, of event)/year		ear Risk (R, C	Risk (R, Qualitative Ranking)		Risk Matrix						
A = Anticipated (L > 1.0E-02)	H = High		<b>I</b> = s	I = situation (event) of major concern					Like	ihood		
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (event) of concern				Α	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (event) of minor concern		se	Н	1	1	Ш	Ш	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV =	IV = situation (event) of minimal concern		lenc	М	П	П	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsite-2 (co-loca	ated worker)	Onsite-1 (facility worker)	sedu	1	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> 25.0 rem	<b>C</b> <sup>3</sup> 100	) rem	<b>C</b> <sup>3</sup> 100 rem	Con	-					
M = Mitigative (reduces event consequences)	м	25.0 rem > <b>C</b> <sup>3</sup> 5 rem	100 rem <b>&gt; (</b>	2 <sup>3</sup> 25 rem	100 rem <b>&gt; C</b> <sup>3</sup> 25 rem		N	IV	IV	IV	IV	
Acronyms	L	5 rem > <b>C</b>	25 ren	n > C	25 rem <b>&gt; C</b>							
MOI = Maximally-exposed Offsite Individual rem = Roentgen equivalent man	Ν	0.5 rem > <b>C</b>	5 rem	> C	5 rem <b>&gt; C</b>							

## Table 13.3 Radiological – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Residual	Hazard: Exposure to residual	L: A	P – Locked building prevents unauthorized access by public.	L: EU
Activation	activation.	С: Н	P – Locked enclosure prevents unauthorized access by public.	C: M
		R: I	<ul> <li>M – Run Conditions limit total beam through the area to limit the creation of activation.</li> </ul>	R: III
Groundwater	Hazard: Radionuclides in groundwater	L: A	P – Sump Pumps ensure water does not remain in the enclosure for	L: EU
Activation	exceeding regulatory levels.	С: Н	extended periods of time.	C: M
		R: I	<ul> <li>P – Sump Monitoring Program samples the water discharged by the sump pumps.</li> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	R: III
Surface Water	Hazard: Radionuclides in surface	L: A	P – Sump Pumps ensure water does not remain in the enclosure for	L: EU
Activation	water exceeding regulatory levels.	С: Н	extended periods of time.	C: L
		R: I	<ul> <li>P – Sump Monitoring Program samples the water discharged by the sump pumps.</li> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> <li>M – Shielding ensures the distance from source to surface is maximized to reduce total dose.</li> </ul>	R: IV
Radioactive	Hazard: N/A	L:		L:
Water (RAW)		C:		C:
Systems		R:		R:
Air Activation	Hazard: Radionuclides in air exceeding	L: A	M – Engineered Air Flow ensures the air activation remains within the	L: A
	regulatory levels.	С: Н	enclosure for more than the half-life of radionuclides before exiting.	C: L
		R: I	<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	R: III

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Soil Interactions	Hazard: Scattered beam has potential	L: A		L: A
	to activate soil at low levels calculated	C: N	M – Beamline Design ensures beam is transported through areas without	C: N
	in the shielding assessment.	R: IV	interacting with soil.	R: IV
			<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	
Radioactive	Hazard: Personnel are exposed to	L: A	P – Locked Gates prevent access to areas where radiation waste is stored.	L: EU
Waste	ionizing radiation beyond regulatory	С: Н	P – Key Control Program ensures access to these areas is managed.	C: N
	levels.	R: I	<ul> <li>M – Run Conditions to ensure total radiation levels are within expected parameters.</li> </ul>	R: IV
			M – Distance to Stored Materials reduces total exposure.	
			<ul> <li>M – Material survey and release program ensures radioactive waste is not stored in unauthorized areas.</li> </ul>	
Contamination	Hazard: Personnel are exposed to	L: A	P – Locked building prevents unauthorized access by public.	L: EU
	ionizing radiation beyond regulatory	С: Н	P – Locked enclosure prevents unauthorized access by public.	C: L
	levels.	R: I	<ul> <li>M – Shielding increases distance to stored materials reduces total exposure.</li> </ul>	R: IV
			M – Material survey and release program ensures radioactive waste is not stored in unauthorized areas.	
<sup>7</sup> Be	Hazard: Potential radiation exposure	L: A	<sup>7</sup> Be isn't hazardous in this pattern of use by facility.	L: A
	to 7Be (uptake/committed dose).	C: N		C: N
		R: IV		R: IV

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Radioactive	Hazard: Personnel are exposed to	L: A	P – Locked building prevents unauthorized access by public.	L: EU
Sources	ionizing radiation beyond regulatory	С: Н	P – Sources locked and inventoried by ES&H always ensuring positive	C: L
	levels.	R: I	control of radioactive source.	R: IV
			M – Source Handling Storage Requirements ensure radioactive sources	
			are secured when not in use.	
			M – Source Handling "In-Use" Requirements ensure the area where the	
			radioactive source is used is tightly controlled.	

Radiological Hazard Consequences, derived from Figure	C-1, '	Example Qualitative Con	sequ	ence Matrix", DOE-HDBI	K-1163-2020.							
Likelihood (L, of event)/year	Cor	sequence (C, of event)/y	ear	Risk (R, Qualitative Ranking)			Risk Matrix					
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (event) of major concern				Likelihood		ihood		
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (even	it) of concern			A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (even	nt) of minor concern	es	Н	1	I	Ш	III	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	nt) of minimal concern	ienc	М	П	Ш	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsit	te-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> 25.0 rem		<b>C</b> <sup>3</sup> 100 rem	<b>C</b> <sup>3</sup> 100 rem	Cons	-					
M = Mitigative (reduces event consequences)	м	25.0 rem > <b>C</b> <sup>3</sup> 5 rem	1	.00 rem <b>&gt; C</b> <sup>3</sup> 25 rem	100 rem <b>&gt; C</b> <sup>3</sup> 25 rem		N	IV	IV	IV	IV	
Acronyms	L	5 rem > <b>C</b>		25 rem <b>&gt; C</b>	25 rem <b>&gt; C</b>							
<ul> <li>MOI = Maximally-exposed Offsite Individual</li> <li>rem = Roentgen equivalent man</li> </ul>	Ν	0.5 rem > <b>C</b>		5 rem <b>&gt; C</b>	5 rem <b>&gt; C</b>							

### Table 13.4 Toxic Materials – Onsite 1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	Hazard: Potential exposure to lead	L:	See Section I Chapter 04	L:
	during manual handling of un-	C:		C:
	encased lead bricks, lead shot, lead	R:		R:
	sheets, lead paint, and soldering operations.			

Chemical Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.												
Likelihood (L, of event)/year	Со	nsequence (C, of event)	/year	Risk (R, Qualitative R	Risk (R, Qualitative Ranking)			Risk Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern		<u>1</u>	A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (ev	ent) of minor concern	s	Н	1	I.	Ш	III	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sequ	L	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> PAC-2		<b>C</b> <sup>3</sup> PAC-3	C <sup>3</sup> IDLH	Ö						
M = Mitigative (reduces event consequences)	м	PAC-2 > <b>C</b> <sup>3</sup> PAC-1	F	PAC-3 <b>&gt; C</b> <sup>3</sup> PAC-2	IDLH > C <sup>3</sup> PEL or TLV <sub>c</sub>		N	IV	IV	IV	IV	
Acronyms	L	PAC-1 > <b>C</b>		PAC-2 > <b>C</b>	PEL or $TLV_c > C$							
<b>IDLH</b> = Immediately Dangerous to Life and Health	Ν	Consequences less	Con	sequences less than	Consequences less than							
MOI = Maximally-exposed Offsite Individual		than those for Low	those	for Low Consequence	those for Low							
PAC = Protective Action Criteria		Consequence Level		Level	Consequence Level							
PEL = Permissible Exposure Limit												
TLV <sub>c</sub> = Threshold Limit Value (ceiling)												

#### Table 13.5 Toxic Materials – Onsite 2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	Hazard: Potential exposure to lead	L:	See Section I Chapter 04	L:
	during manual handling of un-	C:		C:
	encased lead bricks, lead shot, lead	R:		R:
	sheets, lead paint, and soldering			
	operations.			

Chemical Hazard Consequences, derived from Figure C-2	Chemical Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.											
Likelihood (L, of event)/year	Со	nsequence (C, of event),	/year	Risk (R, Qualitative R	Risk (R, Qualitative Ranking)			Risk Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	I = situation (event) of major concern				Likelihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern		<del></del>	A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (ev	ent) of minor concern	s	Н	1	I.	П	III	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sequ	L	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> PAC-2		<b>C</b> <sup>3</sup> PAC-3	C <sup>3</sup> IDLH	Ö						
M = Mitigative (reduces event consequences)	м	PAC-2 > <b>C</b> <sup>3</sup> PAC-1	F	PAC-3 <b>&gt; C</b> <sup>3</sup> PAC-2	IDLH > C <sup>3</sup> PEL or TLV <sub>c</sub>		N	IV	IV	IV	IV	
Acronyms	L	PAC-1 > <b>C</b>		PAC-2 <b>&gt; C</b>	PEL or $TLV_c > C$							
<b>IDLH</b> = Immediately Dangerous to Life and Health	Ν	Consequences less	Con	sequences less than	Consequences less than							
MOI = Maximally-exposed Offsite Individual		than those for Low	those	for Low Consequence	those for Low							
PAC = Protective Action Criteria		Consequence Level		Level	Consequence Level							
PEL = Permissible Exposure Limit												
TLV <sub>c</sub> = Threshold Limit Value (ceiling)												

#### Table 13.6 Toxic Materials – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Lead	Hazard: Potential exposure to lead.	L:	See Section I Chapter 04	L:
		C:		C:
		R:		R:

Chemical Hazard Consequences, derived from Figure C-2	1, "E>	cample Qualitative Cons	equend	ce Matrix", DOE-HDBK-	1163-2020.						
Likelihood (L, of event)/year	Со	nsequence (C, of event)	/year	Risk (R, Qualitative R	anking)	Risk	Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (eve	I = situation (event) of major concern			Likelihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (ev	ent) of minor concern	ses	Н	1	I.	П	Ш
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> PAC-2		<b>C</b> <sup>3</sup> PAC-3	C <sup>3</sup> IDLH	Con					
M = Mitigative (reduces event consequences)	М	PAC-2 > <b>C</b> <sup>3</sup> PAC-1	ŀ	PAC-3 <b>&gt; C</b> <sup>3</sup> PAC-2	IDLH > C <sup>3</sup> PEL or TLV <sub>c</sub>	-	N	IV	IV	IV	IV
Acronyms	L	PAC-1 > <b>C</b>		PAC-2 <b>&gt; C</b>	PEL or TLV <sub>c</sub> > C						
IDLH = Immediately Dangerous to Life and Health MOI = Maximally-exposed Offsite Individual PAC = Protective Action Criteria PEL = Permissible Exposure Limit TLV <sub>c</sub> = Threshold Limit Value (ceiling)	N	Consequences less than those for Low Consequence Level	Con those	nsequences less than e for Low Consequence Level	Consequences less than those for Low Consequence Level						

# Table 13.7 Flammable and Combustible Materials – Onsite -1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Combustible	Hazard: This hazard is a potential	L:	See Section I Chapter 04	L:
materials (cables,	facility fire. The presence of excessive	C:		C:
Boxes, Paper,	combustible materials can pose a	R:		R:
wood cribbing,	hazard stemming from inadequate			
etc.)	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			
	obstructions and tripping hazards.			
	The exposure of the hazard to the			
	facility worker is of major concern.			
Flammable	Hazard: The presence of flammable	L:	See Section I Chapter 04	L:
Materials	gases in cylinders or storage	C:		C:
(Flammable gas,	containers pose an innerent hazard	к:		R:
cleaning	due to their			
materials, etc.)	properties Exposure to bot 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.			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.									
Likelihood (L, of event)/year	Co	nsequence (C, of event),	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix								
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood					
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU			
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I.	П	III			
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	П	П	Ш	IV			
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV			
P = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suo	_							
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV			
Acronyms		symptoms which	i	immediately life-	immediately life-									
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or									
		individual's ability to	per	manently disabling.	permanently disabling.									
		take protective												
		action.												
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no									
		adverse effects.	imm	nediate loss of life no	immediate loss of life no									
			per	manent disabilities;	permanent disabilities;									
			hosp	pitalization required.	hospitalization required.									
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no									
		adverse effects > C ho		nospitalization > C	hospitalization > C									
	Ν	Consequences less	Con	sequences less than	Consequences less than									
		than those for Low	those	for Low Consequence	those for Low									
		Consequence Level		Level	Consequence Level									

### Table 13.8 Flammable and Combustible Materials – Onsite -2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
		controls)		
Combustible	Hazard: The presence of excessive	L:	See Section I Chapter 04	L:
materials (cables,	combustible materials can pose a	C:		C:
Boxes, Paper,	hazara stemming from indaequate	к:		к:
wood cribbing,	nousekeeping practices. This hazara			
elc.)	notential fire Poor housekeeping can			
	also lead to life safety concerns such			
	as earess obstructions and tripping			
	hazards. The exposure of the hazard			
	to the co-located worker is of			
	concern.			
Flammable	Hazard: The presence of flammable	L:	See Section I Chapter 04	L:
Materials	gases in cylinders or storage	C:		C:
(Flammable gas,	containers pose an inherent hazard	R:		R:
cleaning	due to their			
materials, etc.)	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-			
	located worker is of concern.			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	uence N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	onsequence (C, of event),	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern		1	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	lences	Н	I.	I.	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (even	ent) of minimal concern		М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	i iii							
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	١	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.9 Flammable and Combustible Materials – MOI Offsite

		Baseline		Residual
		Qualitative	Preventative (P)/	Qualitative
Hazard	Hazard Description	Risk	Mitigativo (M)	Rick (with
		(without		RISK (WILLI
		controls)		controisj
Combustible	Hazard: The presence of excessive	L:	See Section I Chapter 04	L:
materials (cables,	combustible materials can pose a	C:		C:
Boxes, Paper,	hazard stemming from inadequate	R:		R:
wood cribbing,	housekeeping practices. This hazard			
etc.)	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 public is of minimal concern.			
Flammable	Hazard: The presence of flammable	L:	See Section I Chapter 04	L:
Materials	gases in cylinders or storage	C:		C:
(Flammable gas,	containers pose an inherent hazard	R:		R:
cleaning	due to their			
materials, etc.)	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.			

Other Hazard Consequences, derived from Figure C-1, "Example Qualitative Consequence Matrix", DOE-HDBK-1163-2020.											
Likelihood (L, of event)/year	Co	nsequence (C, of event)/	/year	Risk (R, Qualitative Ra	anking)	Risk	Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Like	lihood	
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			Α	U	EU	BEU
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	Ш	Ш	Ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	1	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Ö	_				
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV
Acronyms		symptoms which	i	immediately life-	immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or						
		individual's ability to	per	manently disabling.	permanently disabling.						
		take protective									
		action.									
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	<b>C</b> <sup>3</sup> Serious injury, no						
		adverse effects.	imm	nediate loss of life no	immediate loss of life no						
			per	manent disabilities;	permanent disabilities;						
			hos	pitalization required.	hospitalization required.						
	L	Mild, transient	Ν	Vinor injuries; no	Minor injuries; no						
		adverse effects > C	adverse effects > C hospit		hospitalization > C						
	Ν	Consequences less	Con	sequences less than	Consequences less than						
		than those for Low	those	for Low Consequence	those for Low						
		Consequence Level		Level	Consequence Level						

 Table 13.10
 Electrical Energy – Onsite-1
 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Stored Energy	Hazards: Shock Hazard, >50V, Interlocked enclosure area	L: C: R:	See Section I Chapter 04	L: C: R:
	Arc Flash, Interlocked enclosure area	L: C: R:		L: C: R:
High Voltage Exposure	Hazards: Shock hazard voltage > 50V, Interlocked enclosures	L: C: R:	See Section I Chapter 04	L: C: R:
	Arc Flash, Interlocked enclosures	L: C: R:		L: C: R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Stored Energy	Hazards: Shock Hazard, >50V, Interlocked enclosure area	L: C: R:	See Section I Chapter 04	L: C: R:
	Arc Flash, Interlocked enclosure area	L: C: R:		L: C: R:
Low Voltage, High	Hazards:			
Current Exposure	Arc Flash, Non-interlocked enclosures	L: C: R:	See Section I Chapter 04	L: C: R:
	Fire hazard from high current	1.		1.
	causing smoke initiation and barns.	C: R:		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	ar Risk (R, Qualitative R	anking)		Dick	Motrix					
A = Anticipated (L > 1.0E-02)		H = High I = situation (event) of major concern							Likelihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate II = situation (event) of concern							U	FU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low	III = situation (ev	ent) of minor concern		s	н	1	-			
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation (ev	ent) of minimal concern		Con						
Control(s) Type	С	Offsite (MOI) 0	nsite-2 (co-located worker)	Onsite-1 (facility worker)		0,0	M	II.	II	ш	IV	

<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	C <sup>3</sup> Prompt worker fatality	C <sup>3</sup> Prompt worker fatality	1	ш	ш	IV	IV
M = Mitigative (reduces event consequences)		serious effects, or	or acute injury that is	or acute injury that is					
Acronyms		symptoms which	immediately life-	immediately life-	 N	IV	IV	IV	IV
MOI = Maximally-exposed Offsite Individual		could impair an	threatening or	threatening or					
		individual's ability to	permanently disabling.	permanently disabling.					
		take protective							
		action.							
	М	C <sup>3</sup> Mild, transient	C <sup>3</sup> Serious injury, no	C <sup>3</sup> 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	those for Low Consequence	those for Low					
		Consequence Level	Level	Consequence Level					

# Table 13.11 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)
Stored Energy	Hazards:			
	Shock Hazard, >50V, Non-interlocked	L:	See Section I Chapter 04	L:
	enclosures	C:		C:
		R:		R:
	Arc Flash, Non-interlocked enclosures			
		L:		L:
		C:		C:
		R:		R:
High Voltage	Hazards:		See Section I Chapter 04	
Exposure	Shock hazard, voltage > 50V,	L:		L:
	Interlocked enclosures	C:		C:
		R:		R:
	Arc Flash, Interlocked enclosures			
		L:		L:
		C:		C:
		R:		R:

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Low Voltage, High	Hazards:		See Section 1, Chapter 04	
Current Exposure	Arc Flash, Non-interlocked enclosures	L:		L:
		C:		C:
	Fire hazard from high current	R:		R:
	causing smoke inhalation and burns.			
		L:		L:
		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	Со	onsequence (C, of event)/	year Risk (R, Qualitativ	e Ra	anking)	Risk Matrix					
A = Anticipated (L > 1.0E-02)		<b>H</b> = High	I = situation (	even	nt) of major concern				Lik	elihood	
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate	II = situation (	eve	nt) of concern		-	A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low	III = situation	(eve	ent) of minor concern	es	Н	1	1	ll II	Ш
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible	IV = situation	(eve	ent) of minimal concern	enc	М	П	П	ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite-2 (co-located worker	)	Onsite-1 (facility worker)	sedu	L	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	C <sup>3</sup> Prompt worker fatalit	y	C <sup>3</sup> Prompt worker fatality	Con					
M = Mitigative (reduces event consequences)		serious effects, or	or acute injury that is		or acute injury that is		N	IV	IV	IV	IV
Acronyms		symptoms which	immediately life-		immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an	threatening or		threatening or						
		individual's ability to	permanently disabling.		permanently disabling.						
		take protective									
		action.									
	М	C <sup>3</sup> Mild, transient	C <sup>3</sup> Serious injury, no		C <sup>3</sup> 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	those for Low Consequence	those for Low
	Consequence Level	Level	Consequence Level

## Table 13.12 Electrical Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Stored Energy	Hazard: Shock hazard, >50V, Arc	L:	See Section I Chapter 04	L:
	Flash	C:		C:
		R:		R:
High Voltage	Hazard: Shock Hazard, >50V, Arc	L:	See Section I Chapter 04	L:
Exposure	Flash outside	C:		C:
		R:		R:
Low Voltage, High	Hazard: N/A	L:		L:
Current Exposure		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	Co	onsequence (C, of event)/	/year	Risk (R, Qualitative Ra	anking)	Risk	Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Like	lihood	
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern	-		A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedu	1	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	i iii	_				
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV
Acronyms		symptoms which	i	immediately life-	immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or						
		individual's ability to	per	manently disabling.	permanently disabling.						
		take protective									
		action.									
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	<b>C</b> <sup>3</sup> Serious injury, no						
		adverse effects.	imm	nediate loss of life no	immediate loss of life no						
			per	manent disabilities;	permanent disabilities;						
			hosp	pitalization required.	hospitalization required.						
	L	Mild, transient	N	Vinor injuries; no	Minor injuries; no						
		adverse effects > C	adverse effects > C hosp		hospitalization > C						
	Ν	Consequences less	Con	sequences less than	Consequences less than						
		than those for Low	those	for Low Consequence	those for Low						
		Consequence Level		Level	Consequence Level						

# Table 13.13 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: Hot work will cause elevated temperatures. If hot work is not supervised, there is a potential for combustibles in the surrounding area to be ignited due to exposure to slag or elevated temperatures. This could lead to excessive heat and burning, which could potentially lead to a 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 fire. The exposure of the hazard to the facility worker is of	L: C: R:	See Section I Chapter 04	L: C: R:
	potential fire. The exposure of the hazard to the facility worker is of major concern.			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	uence N	/latrix", DOE-HDBK-116	3-2020.						
Likelihood (L, of event)/year	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix					
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				lihood		
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	vent) of minor concern		Н	1	1	П	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (even	ent) of minimal concern	ienc	М	П	Ш	Ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sequ	1	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Cons	_				
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	•	N	IV	IV	IV	IV
Acronyms		symptoms which	i	immediately life-	immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or						
		individual's ability to	per	manently disabling.	permanently disabling.						
		take protective									
		action.									
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no						
		adverse effects.	imm	nediate loss of life no	immediate loss of life no						
			per	manent disabilities;	permanent disabilities;						
			hos	pitalization required.	hospitalization required.						
	L	Mild, transient M		Vinor injuries; no	Minor injuries; no						
		adverse effects > C ho		ospitalization > C	hospitalization > C						
	Ν	Consequences less	Consequences less Cons		Consequences less than						
	than those for Low	those	for Low Consequence	those for Low							
		Consequence Level		Level	Consequence Level						

## Table 13.14 Thermal Energy – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
	temperatures. If hot work is not supervised, there is a potential for combustibles in the surrounding area to be ignited due to exposure to slag or elevated temperatures. This could lead to excessive heat and burning, which could potentially lead to a fire. The presence of excessive combustible materials can pose a	C: R:		C: R:
	hazard stemming from inadequate housekeeping practices. This hazard can add to the fuel load of a potential fire. The exposure of the hazard to the co-located worker is of minor concern.			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	uence N	/latrix", DOE-HDBK-116	3-2020.							
Likelihood (L, of event)/year	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix						
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				lihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	ses	Н	1	1	Ш	Ш	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		<b>N</b> = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	П	П	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	equ	1	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suc	-					
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV	
Acronyms		symptoms which		immediately life-	immediately life-							
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or							
		individual's ability to	per	manently disabling.	permanently disabling.							
		take protective										
		action.										
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no							
		adverse effects.	imm	nediate loss of life no	immediate loss of life no							
			per	manent disabilities;	permanent disabilities;							
			hos	pitalization required.	hospitalization required.							
	L	Mild, transient M		Vinor injuries; no	Minor injuries; no							
		adverse effects > C ho		ospitalization > C	hospitalization > C							
	Ν	Consequences less Cons		sequences less than	Consequences less than							
than those for Low those				for Low Consequence	those for Low							
		Consequence Level		Level	Consequence Level							

## Table 13.15 Thermal Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Hot Work		L:	See Section I Chapter 04	L:
		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	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk	Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Like	lihood	
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	ses	Н	I	I	11	III
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	ent) of minimal concern	ienc	М	Ш	П	Ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedı	L	ш	ш	IV	IV
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> Pi	rompt worker fatality	C <sup>3</sup> Prompt worker fatality	Con	-				
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV
Acronyms		symptoms which	i	immediately life-	immediately life-						
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or						
		individual's ability to	per	manently disabling.	permanently disabling.						
		take protective									
		action.									
	Μ	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no						
		adverse effects.	imm	nediate loss of life no	immediate loss of life no						
			per	manent disabilities;	permanent disabilities;						
			hosp	pitalization required.	hospitalization required.						
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no						
		adverse effects > C	h	nospitalization > C	hospitalization > C						
	Ν	Consequences less	Con	sequences less than	Consequences less than						
		than those for Low	those	for Low Consequence	those for Low						
		Consequence Level		Level	Consequence Level						

# Table 13.16 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	L:	See Section I Chapter 04	L:
Tower Tools	improper use of power tools.	C:		C:
		R:		R:
Pumps and	Hazard: Personal injury due to	L:	See Section I Chapter 04	L:
Motors	entrapment/entanglement.	C:		C:
		R:		R:
Motion Tables	Hazard: Personnel injury due to pinch	L:	See Section I Chapter 04	L:
	points, tip-overs, caught in between.	C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	onsequence (C, of event),	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	enc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suo	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	N	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	adverse effects > C ho		hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.17 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	L:	See Section I Chapter 04	L:
Tower Tools	power tool use (flying debris, struck	C:		C:
	by object).	R:		R:
Pumps and	Hazard: Personal injury due to	L:	See Section I Chapter 04	L:
Motors	entrapment/entanglement.	C:		C:
		R:		R:
Motion Tables	Hazard: Personnel injury due to tip-	L:	See Section I Chapter 04	L:
	overs, caught in between, crushing.	C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "	Exan	nple Qualitative Conseque	ence N	latrix", DOE-HDBK-116	<b>i</b> 3-2020.								
Likelihood (L, of event)/year	Co	nsequence (C, of event)/	year	Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern								
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern		1	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (ev	ent) of minor concern	es	Н	- I	I	Ш	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	enc	М	П	П	ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	sequ	L	Ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> Pr	rompt worker fatality	C <sup>3</sup> Prompt worker fatality	Con	N	11/	1)/	11/	11/		
<b>M</b> = Mitigative (reduces event consequences)		serious effects, or or acute ir		acute injury that is	or acute injury that is		IN	IV	IV	IV	IV		
Acronyms		symptoms which	i	mmediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	<b>C</b> <sup>3</sup>	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	ediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	bitalization required.	hospitalization required.								
	L	Mild, transient	Ν	/linor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								

### Table 13.18 Kinetic Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Power Tools	N/A	L:	Public is prevented from having access to work areas.	L:
		C:		C:
		R:		R:
Pumps and	N/A	L:	Public is prevented from having access to work areas.	L:
Motors		C:		C:
		R:		R:
Motion Tables	N/A	L:	Public is prevented from having access to work areas.	L:
		C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "	Exan	nple Qualitative Conseque	ence M	atrix", DOE-HDBK-116	3-2020.						
Likelihood (L, of event)/year	Co	onsequence (C, of event)/	year	Risk (R, Qualitative R	anking)	Risk	Matrix				
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Like	ihood	
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (ev	ent) of minor concern	es	Н	I.	I.	Ш	Ш
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	enc	М	П	П	ш	IV
Control(s) Type	С	Offsite (MOI)	Onsite-2	2 (co-located worker)	Onsite-1 (facility worker)	nbəs	L	ш	ш	IV	IV
P = Preventive (reduce event occurrence likelihood) M = Mitigative (reduces event consequences)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> Pro	ompt worker fatality	C <sup>3</sup> Prompt worker fatality	Con	N	IV	IV	IV	IV
Acronyms		serious effects, or symptoms which	or a in	nmediately life-	immediately life-		1				
<b>MOI =</b> Maximally-exposed Offsite Individual		could impair an	1	threatening or	threatening or						
		individual's ability to	pern	nanently disabling.	permanently disabling.						
		take protective									
		action.									
	м	C <sup>3</sup> Mild, transient	<b>C</b> <sup>3</sup>	Serious injury, no	C <sup>3</sup> Serious injury, no						
		adverse effects.	imme	ediate loss of life no	immediate loss of life no						
			pern	manent disabilities;	permanent disabilities;						
			hospi	italization required.	hospitalization required.						
	L	Mild, transient	Μ	1inor injuries; no	Minor injuries; no						
		adverse effects > C	hc	ospitalization > C	hospitalization > C						

# Table 13.19 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: personnel injury due to	L:	See Section I Chapter 04	L:
	improper crane operations.	C:		C:
		R:		R:
Compressed	Hazard: Personnel injury due to	L:	See Section I Chapter 04	L:
Gasses	unexpected release, or unsecure	C:		C:
	tanks.	R:		R:
Vacuum Pumps	Hazard: Personnel injury due to	L:	See Section I Chapter 04	L:
	entrapment/entanglement.	C:		C:
		R:		R:
Material	Hazard: Personnel injury due to	L:	See Section I Chapter 04	L:
Handling	improper operation of Powered	C:		C:
	Industrial Trucks and their	R:		R:
	attachments (rollovers, crush, etc.).			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern								
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedu	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Ö	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	<b>C</b> <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hos	pitalization required.	hospitalization required.								
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

# Table 13.20 Potential Energy – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Crane Operations	Hazard: Struck by falling, swinging	L:	See Section I Chapter 04	L:
	loads.	C:		C:
		R:		R:
Compressed	Hazard: Collocated personnel injury	L:	See Section I Chapter 04	L:
Gasses	due to unexpected release, or	C:		C:
	unsecure tanks.	R:		R:
Vacuum Pumps	Hazard: Personnel injury due to	L:	See Section I Chapter 04	L:
	interaction with existing vacuum.	C:		C:
		R:		R:
Material Handling	Hazard: Collocated personnel injury	L:	See Section I Chapter 04	L:
	due to moving/handing material	C:		C:
	(rollovers, crush, etc.)	R:		R:

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	nsequence (C, of event)/	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suo	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	•	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hos	pitalization required.	hospitalization required.								
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

# Table 13.21 Potential Energy – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Crane Operations	Hazard: N/A	L:		L:
		C:		C:
		R:		R:
Compressed	Hazard: Injury due to unexpected	L:	See Section I Chapter 04	L:
Gasses	release, or unsecure tanks outside of	C:		C:
	buildings.	R:		R:
Vacuum Pumps	Hazard: N/A	L:		L:
		C:		C:
		R:		R:
Material Handling	Hazard: N/A	L:		L:
		C:		C:
		R:		R:

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	onsequence (C, of event),	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			Α	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	1	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suo	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	0	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	N	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.22 Magnetic Fields – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	Hazards:			
	Exposure to fringe fields beyond	L:	See Section I Chapter 04	L:
	allowable limits (worker <b>with</b>	C:		C:
	ferromagnetic or electronic medical	R:		R:
	device(s))			
	Exposure to fringe fields beyond	L:		L:
	allowable limits (worker without	C:		C:
	ferromagnetic or electronic medical device(s))	R:		R:
	Exposure to flying metallic objects	L:		L:
	causing potential injury.	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	Co	nsequence (C, of event)	/year	Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (even	ent) of minor concern	ses	Н	1	1	Ш	Ш		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	ienc	М	П	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	nbəs	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Suo	-						
M = Mitigative (reduces event consequences)		serious effects, or	serious effects. or or ac		or acute injury that is	0	N	IV	IV	IV	IV		
Acronyms		symptoms which	symptoms which im		immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hos	pitalization required.	hospitalization required.								
	L	Mild, transient	1	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	adverse effects > <b>C</b> hos		hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.23 Magnetic Fields – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	Hazards: Exposure to fringe fields beyond allowable limits (worker <b>with</b> ferromagnetic or electronic medical device(s)) Exposure to fringe fields beyond allowable limits (worker <b>without</b> ferromagnetic or electronic medical	L: C: R:	See Section I Chapter 04	L: C: R:
	Exposure to flying metallic objects causing potential injury.			

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern	-		A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	- I	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedu	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	i iii	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hos	pitalization required.	hospitalization required.								
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.24 Magnetic Fields – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Fringe Fields	Hazards: Exposure to fringe fields beyond allowable limits (worker <b>with</b> ferromagnetic or electronic medical device(s)) Exposure to fringe fields beyond allowable limits (worker <b>without</b> ferromagnetic or electronic medical device(s)) Exposure to flying metallic objects causing potential injury.	L: C: R:	See Section I Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "I	Exan	nple Qualitative Consequ	ience N	/latrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	nsequence (C, of event)/	/year	Risk (R, Qualitative Ra	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern	-		A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	es	Н	- I	I	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedu	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	i iii	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	<b>C</b> <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hos	pitalization required.	hospitalization required.								
	L	Mild, transient	ľ	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

# Table 13.25 Other hazards – Onsite-1 Facility Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined Spaces	Hazard: Limited egress	L: C:	See Section I Chapter 04	L: C:
Noise	Hazard:	L: C: R:	See Section I Chapter 04	L: C: R:
Silica	Hazard:	L: C: R:	See Section I Chapter 04	L: C: R:
Ergonomics	Hazard:	L: C: R:	See Section I Chapter 04	L: C: R:
Working at Heights	Hazard: Falls, dropped items.	L: C: R:	See Section I Chapter 04	L: C: R:

Other Hazard Consequences, derived from Figure C-1, "	Exan	nple Qualitative Consequ	ience N	Matrix", DOE-HDBK-116	3-2020.								
Likelihood (L, of event)/year	Co	onsequence (C, of event),	/year	Risk (R, Qualitative R	anking)	Risk	Matrix						
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		<b>M</b> = Moderate		II = situation (eve	ent) of concern		r —	A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low	L = Low		ent) of minor concern	se	Н	1	1	П	Ш		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	П	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sequ	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> P	rompt worker fatality	C <sup>3</sup> Prompt worker fatality	Cons							
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	ľ	Minor injuries; no	Minor injuries; no								
		adverse effects > C	h	nospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.26 Other hazards – Onsite-2 Co-located Worker

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined Spaces	Hazard: Accidental entry	L: C: R:	See Section I Chapter 04	L: C: R:
Noise		L: C: R:	See Section I Chapter 04	L: C: R:
Silica	Hazard:	L: C: R:	See Section I Chapter 04	L: C: R:
Ergonomics		L: C: R:	See Section I Chapter 04	L: C: R:
Work from Heights	Hazard: Struck by dropped tool/material.	L: C: R:	See Section I 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	Co	onsequence (C, of event),	/year	Risk (R, Qualitative R	anking)	Risk Matrix						
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood			
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern		1	A	U	EU	BEU	
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low	L = Low		ent) of minor concern	es	Н	1	I.	П	Ш	
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	П	П	Ш	IV	
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	sedr	L	ш	ш	IV	IV	
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	<b>C</b> <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> Pi	rompt worker fatality	C <sup>3</sup> Prompt worker fatality	Ö	-					
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	•	N	IV	IV	IV	IV	
Acronyms		symptoms which	i	immediately life-	immediately life-							
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or							
		individual's ability to	per	manently disabling.	permanently disabling.							
		take protective										
		action.										
	М	C <sup>3</sup> Mild, transient	C <sup>3</sup>	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no							
		adverse effects.	imm	nediate loss of life no	immediate loss of life no							
			per	manent disabilities;	permanent disabilities;							
			hosp	pitalization required.	hospitalization required.							
	L	Mild, transient	Ν	Vinor injuries; no	Minor injuries; no							
		adverse effects > C	h	ospitalization > C	hospitalization > C							
	Ν	Consequences less	Con	sequences less than	Consequences less than							
		than those for Low	those	for Low Consequence	those for Low							
		Consequence Level		Level	Consequence Level							

#### Table 13.27 Other hazards – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Confined Spaces	Hazard: Accidental entry	L: C:	See Section I Chapter 04	L: C:
Noise		R: L: C: R·	See Section I Chapter 04	R: L: C:
Silica	Hazard:	L: C: R:	See Section I Chapter 04	L: C: R:
Ergonomics		L: C: R:	See Section I Chapter 04	L: C: R:
Work from Heights	N/A	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	Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low	L = Low		ent) of minor concern	es	Н	1	1	П	Ш		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	П	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	sequ	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	C <sup>3</sup> Pr	ompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	i i i i i i i i i i i i i i i i i i i							
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is		Ν	IV	IV	IV	IV		
Acronyms		symptoms which	i	mmediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	<b>C</b> <sup>3</sup>	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	ediate loss of life no	immediate loss of life no								
			peri	manent disabilities;	permanent disabilities;								
			hosp	italization required.	hospitalization required.								
	L	Mild, transient	Ν	/linor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

# Table 13.28 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		L:	See Section I Chapter 04	L:
		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	Co	nsequence (C, of event)	/year	Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU		
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (even	ent) of minor concern	es	Н	1	1	Ш	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	C <sup>3</sup> Pr	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Ö	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	Ŭ	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	<b>C</b> <sup>3</sup>	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	ediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	Ν	vlinor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

### Table 13.29 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		L:	See Section I Chapter 04	L:
		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	Co	nsequence (C, of event)	/year	Risk (R, Qualitative R	anking)	Risk Matrix							
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (even	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU		
<b>EU</b> = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (even	ent) of minor concern	ses	Н	I.	1	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (ev	ent) of minimal concern	lenc	М	Ш	Ш	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	-2 (co-located worker)	Onsite-1 (facility worker)	sedr	1	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	н	C <sup>3</sup> Irreversible, other	C <sup>3</sup> Pr	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Ö	_						
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	Ŭ	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	<b>C</b> <sup>3</sup>	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	ediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	pitalization required.	hospitalization required.								
	L	Mild, transient	Ν	vlinor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

### Table 13.30 Access & Egress – MOI Offsite

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Life Safety Egress	N/A	L:	See Section I Chapter 04	L:
		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	Co	nsequence (C, of event)	/year	Risk (R, Qualitative Ra	anking)	Risk	Matrix						
A = Anticipated (L > 1.0E-02)		<b>H</b> = High		I = situation (ever	nt) of major concern				Likelihood				
<b>U</b> = Unlikely (1.0E-02> L >1.0E-04)		M = Moderate		II = situation (eve	ent) of concern			A	U	EU	BEU		
EU = Extremely Unlikely (1.0E-04 > L >1.0E-06)		L = Low		III = situation (eve	ent) of minor concern	ses	Н	1	I.	П	III		
BEU = Beyond Extremely Unlikely (1.0E-06> L)		N = Negligible		IV = situation (eve	ent) of minimal concern	ienc	М	П	П	Ш	IV		
Control(s) Type	С	Offsite (MOI)	Onsite	e-2 (co-located worker)	Onsite-1 (facility worker)	sedr	L	ш	ш	IV	IV		
<b>P</b> = Preventive (reduce event occurrence likelihood)	Н	C <sup>3</sup> Irreversible, other	<b>C</b> <sup>3</sup> Pi	rompt worker fatality	<b>C</b> <sup>3</sup> Prompt worker fatality	Con							
M = Mitigative (reduces event consequences)		serious effects, or	or	acute injury that is	or acute injury that is	•	N	IV	IV	IV	IV		
Acronyms		symptoms which	i	immediately life-	immediately life-								
MOI = Maximally-exposed Offsite Individual		could impair an		threatening or	threatening or								
		individual's ability to	per	manently disabling.	permanently disabling.								
		take protective											
		action.											
	М	C <sup>3</sup> Mild, transient	C	<sup>3</sup> Serious injury, no	C <sup>3</sup> Serious injury, no								
		adverse effects.	imm	nediate loss of life no	immediate loss of life no								
			per	manent disabilities;	permanent disabilities;								
			hosp	oitalization required.	hospitalization required.								
	L	Mild, transient	Ν	Vinor injuries; no	Minor injuries; no								
		adverse effects > C	h	ospitalization > C	hospitalization > C								
	Ν	Consequences less	Con	sequences less than	Consequences less than								
		than those for Low	those	for Low Consequence	those for Low								
		Consequence Level		Level	Consequence Level								

#### Table 13.31 Environmental

Hazard	Hazard Description	Baseline Qualitative Risk (without controls)	Preventative (P)/ Mitigative (M)	Residual Qualitative Risk (with controls)
Airborne	Hazards: Airborne release of radionuclides beyond permitted limits. Discharge of chemicals into onsite surface waters beyond permitted limits.	L: C: R:	See Section I Chapter 04	L: C: R:
Water	Hazards: Discharge of radionuclides into onsite surface waters beyond permitted limits. Discharge of chemicals into onsite surface waters beyond permitted limits.	L: A C: N R: IV	See Section I Chapter 04	L: C: R:
Soil	Hazards: 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:	See Section I Chapter 04	L: C: R: