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Slot: Tuesday 9-11

Risk Management assignment 1

1. Severity of consequence(s)

- 1 = Insignificant
- 2 = Minor
- 3 = Moderate
- 4 = Major
- 5 = Catastrophic

2. Likelihood of occurrence

- A = Almost certain
- B = Likely
- C = Moderate
- D = Unlikely
- E = Rare

Hazard	Description	Likelihood	Consequence	Risk Level	Current Control Measure	Further Risk Mitigation Measure	Likelihood	Consequence	Residual risk Level
Fire and electrical shock	During the welding process, there is some flammable substance (paper, thinner) or welding on a wet floor.	B	4	High	No flammable substance, no paper near welding area and equipped with fire extinguisher. Welding warning sign, PPE and clean welding environment is a must. All welders have been attended the welder training from approved agent.	Provide in-house fire safety, welding safety and general safety training for all welders.	D	2	L
Skin burn injury	Welder or worker is affected.	C	3	Moderate	Welder must be equipped with PPE. All welders have attended the welder training from approved agent.	Provide in-house fire safety, welding safety and general safety training for all welders.	D	3	M
Inhalation	During the welding process, worker inhales the welding fume.	D	2	Low	Open area or with electric fan. All welders have attended the welding training from approved agent.	Provide in-house fire safety, welding safety and general safety training for all welders.	E	2	L
Radiation	During the welding process, the worker's skin may be expose partially to the extremely bright flash.	D	2	Low	All welders must wear long sleeves or arm cover or coverall clothing to prevent skin from directly being exposed to the bright flash.	Provide in-house fire safety, welding safety and general safety training for all welders.	E	2	L
Arc-eye or eye hurt by slat	During welding process, bright flash light will appear. And after each welding, the welder needs to remove the slag. If the welder does not have PPE, then the eye will be damaged by the bright flash or slag.	E	1	Low	Welder has been equipped with PPE. All welders have attended the welder training from approved agent.	Provide in-house fire safety, welding safety and general safety training for all welders.	E	1	L

Place: Chinese manufacturer

Hazards Description	Severity	Probability	HRI	P_H	EF	N_p	N_s	E_p	R_i
Spalling of rocks from tunnel crown due to poor rock condition in chambers and stress relief from the excavation	I	E	12	2.00E-08	1	2	1	0.24	9.6E-06
Rockfall from quarry wall landing on traffic at region A	I	E	12	1.00E-04	1	1	1	0.0005	5.00E-08
Exposure to subsurface Radon (Rn) radiation	IV	C	18	5.00E-03	0.001	20	4	0.24	9.6E-05
Discharge of CO2 when service personnel is inside the electrical substation *1	I	E	12	2.24E-12	1	2	1	1*2	4.48E-12
H2 gas present in common exhaust duct system & lead to fire hazard due to MHE Battery charging process. The nominal concentration is about 0.2% in the main duct. H2 gas could be accumulated in the duct in the event of inadequate extraction due to equipment malfunction.	III	D	14	5.00E-05	0.01	2	1	0.24	2.40E-07
Hypoxia – 14.4% to 19.5% oxygen level For passive fire protection system, storage chamber is kept at 15.3% + 0.5% oxygen concentration	IV	A	13	1	0.001	4	1	0.24	9.6E-04
Lighting strikes on ammunition & personnel in area due to potential build-up in storm clouds *1	I	E	12	7.65E-09	1	10	1	1*2	7.65E-08
								Total Risk	1.06E-03

*1 Hazards probabilities are defined by an independent QRA study
*2 Ep is defined as 1 due to fact that the exposure is considered in the Fault Tree Analysis

#	Risk Categories	Occurrence / Likelihood	Correlated to Litigation	Financial Impact	Responsible Parties
1	Higher than anticipated operating expenses - excessive energy use, water use, and maintenance	high	high	high	owner / designer / contractor
2	Establishing conflicting standards and potentially unachievable project requirements	high	mid	mid	owner
3	Construction cost and schedule impacts associated with delivering a sustainable building	mid	high	high	owner / contractor
4	Failure to meet Green code or Green Certification requirements - during the original design phase, due to end user design changes, or during construction	mid	mid	mid	owner / designer
5	Employing materials and equipment with reduced lifecycles or immediate failure (aesthetic or performance)	mid	high	mid / high	owner / designer
6	Damage to environmental and professional reputation	low	low	mid	owner

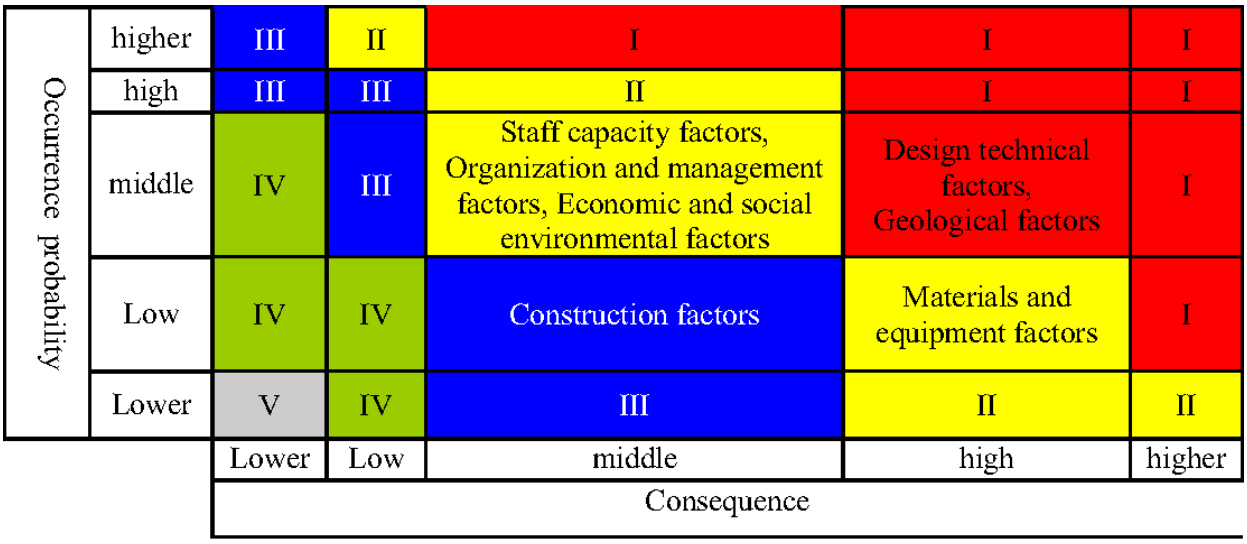

Fig 1 Grades of mine construction project risk evaluation

Risk Matrix for construction project

Links

1. https://qualityinspection.org/risk-assessment/
2. https://www.researchgate.net/figure/Examples-of-Quantitative-Risk-Calculations-for-Hazard-Analysis_tbl5_283297294
3. https://minewiki.engineering.queensu.ca/mediawiki/index.php/Risk_assessment_matrix
4. https://www.semanticscholar.org/paper/Risk-Assessment-of-Mine-Shaft-Construction-Projects- Zhao-Xin/55c6c4e85f9883f5ae3bbf1dba3fdf63bdb890be