

Critical Control Risk Registers - Anglo Coal Australia

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Abstract

Risk Registers are arguably the most important document that should control a safety, health and environmental management system and be the driving force for prioritising management's focus on where targeted action is required. It should also be the document that the operator at the coal face can refer to, to check what the most critical controls and their associated critical activities (not always high risk tasks in themselves) are, for particular hazards. How does one achieve this? We historically have risk registers that are activity based, have endless (sometimes in the 1000s) unread entries and are reviewed annually at best and usually for system certification purposes only. We offer a system that is hazard based and has the potential to be a live document for converting field information into intelligence for management to use, presented in a dashboard format, and for operators to refer to for the most critical controls for controlling particular hazards. The word potential is used as it will also depend where you are on a safety culture journey as to how you view and use a critical control risk register. There currently appears to be no world's best practice in the field of Risk Registers but here is solution that could end up as just that.

What are Risk Registers & What they do?

Risk Registers are a list or database of hazards identified for a site or project that includes:

- Identified Risks (Hazards) sorted in a priority order.
- Reference to legislation / requirements applicable to the hazard.
- A summary of the existing and/or proposed controls.

They are a tool widely used within Risk Management for identifying, analysing and managing risks. Within our industry these are commonly a type of Workplace Risk

Assessment and Control (WRAC). They should direct the effort of the management system based on risk. They should

- Allow risks to be prioritised (those hazards with the potential to cause multiple and single fatalities at the top).
- Allow management of the organisation's risk profile (this profile should evolve overtime so as the highest risk are effectively controlled the next highest ones are tackled and controlled effectively and so on).
- Be used as a management tool to review and update identified risks to ensure they remain As Low As Reasonably Achievable (ALARA).

Activity based Risk Registers

Usually a WRAC

Process/ Area	Sub Process	Position Resp	No	Critical Hazards	Additional Hazard Explanation	No	Potential Consequences/ Outcomes	Additional Consequence/ Outcome Explanation	No	Legislation	Existing Critical Controls	Critical Control Effectiveness	Loss Type P/A/E/R	Norm/ Abnorm/ Em	Consequence	Likelihood	Risk Rank Number	Risk Rank Category	Risk ALARA? Y/N
General Production / Mining Department SHEC Risks	Vehicle movement	Production Department Manager	8	Mechanical (mobile)	Heavy vehicle/ heavy equipment interaction with mining activities by authorised personnel	30	Hit by moving objects -	0	p59	OMSH Reg 76 (1)	HMP0004 Vehicle Management Plan SOP 0021 Checking Mobile Plant SOP 0022 Using Mobile Plant	2	P	Abnormal	4	A	2	Ex	No
General Production / Mining Department SHEC Risks	Vehicle movement	Production Department Manager	8	Mechanical (mobile)	Light vehicle/ heavy equipment interaction with mining activities by authorised personnel	30	Hit by moving objects -	0	p59	OMSH Reg 76 (1)	HMP0004 Vehicle Management Plan SOP 0021 Checking Mobile Plant SOP 0022 Using Mobile Plant	2	P	Abnormal	5	B	3	Ex	No
General Production / Mining Department SHEC Risks	Vehicle movement	Production Department Manager	16	Community	Haul trucks crossing public roads -interaction with non-mine vehicles	30	Hit by moving objects -	0	p22	OMSH-Part 10-s76(1)	HMP0004 Vehicle Management Plan HMP0004 Public Access Management Plan SOP 0022 Using Mobile Plant	1	P, R	Abnormal	5	C	5	Ex	Yes
General Production / Mining Department SHEC Risks	Physical movement about the site, ie preparing for blast including dipping and dewatering holes, tying up with det wire	Orew Leaders	2	Biomechanical	Physical movement over rough / undeared terrain	27	Falls on the same level (inc- slips/trips) -	0	p70	OMSH Reg 94	SOP 0027 Check and Examine Work Areas	2	P	Normal	3	A	6	H	No
General Production / Mining Department SHEC Risks	Vehicle movement	Production Department Manager	8	Mechanical (mobile)	Vehicle/equipment interaction with mining activities by unauthorised personnel	30	Hit by moving objects -	Damage to reputation also possible	p22	OMSH-Part 10-s76(1)	HMP0004 Vehicle Management Plan HMP0004 Public Access Management Plan SOP 0022 Using Mobile Plant	2	PR	Abnormal	5	D	7	H	No
General Production / Mining Department SHEC Risks	Dragline and mobile equipment fires	Orew Leaders	8	Mechanical (mobile)	Equipment fires	7	Contact with heat -	0	p6	OMSH-Part 5-s37(3)	HMP0001 Emergency Response Management Plan SOP 0003 Action to be Taken in Case of Fire	2	P	Emerg	2	A	10	H	Yes

Activity based risk register can be used as a baseline for hazard based risk register. To do this one needs to convert the activity based risks firstly into a hazard matrix of activities and their associated hazards (energy types) and then this is converted into the hazard based risk register using the hazards critical controls and their associated critical activities.

Critical Control Concepts

Uncontrolled Risk or Raw Risk: Credible Worst Case Scenario - if no controls exist or if all controls fail. Determines 'which risks are significant' – Senior Management needs assurance that these are being controlled adequately. Without uncontrolled risk one can get false sense of security that residual risk is in play and forget what the raw risk was.

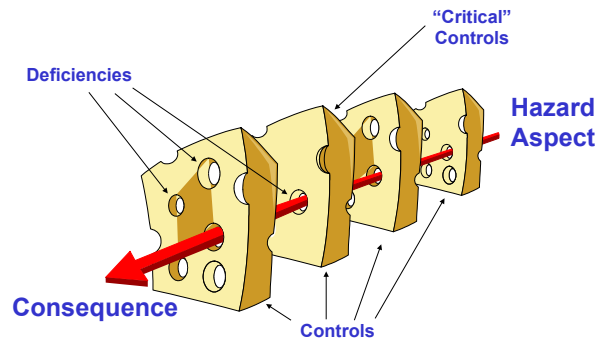
Controlled Risk or Residual Risk: This factors in the effectiveness of existing controls and determines what is required to be improved next.

Control: A barrier that prevents the hazard from causing harm. One of three types:-

- Physical (e.g., guarding for machines, separation distances for Dangerous Goods, etc)

- System (e.g., procedures, job rotation, job re-scheduling, etc)
- Behavioural (e.g., people's willingness and ability to engage in 'at-risk' behaviour)

'Critical' Control: A barrier, whose integrity is so important that if it is compromised, then there is a good chance that the hazard/aspect will cause harm. Example – no one under a load being lifted. Other controls like cranes checked, operators competent etc are still important but if person removed from the drop zone then can't get killed even if one of the other controls fail. Critical controls should be derived from SOPs / PHMPs etc.



(Ref: Reason, 2000)

'Critical' Activity: Activities that are not high risk in themselves, but would render a critical control ineffective if not performed competently. If a parachutist is jumping from an aircraft (critical Control for working at heights is the parachute) then the critical activity is the person who packed the parachute the day before – not a high risk task in its self but essential to the correct performance of the critical control. Other examples:-

- inspection of a lifting device (e.g., crane)
- daily checks of forklifts
- maintenance on guards, forklifts, etc
- completing a risk assessment prior to purchasing a new chemical

These activities usually are linked to competency.

Hazard based Risk Registers

Once the hazard matrix has been established and the critical controls for the hazards defined then the hazard based risk register is developed and would look like the example below in its simplest form

Hazard or Aspect	Raw Risk	Critical Controls	Critical Activities	Legal Requirements	ALARA? Yes/No
Mobile Plant (vehicle Interaction)	Extreme	Correct plant being operated safely	Site specific ticket/competency for operator	CMSH Regs 2001 secs 74-77	Yes
		Plant operating as designed	Inspection of plant by competent person	CMSH Regs 2001 secs 71 and 73	Yes
			Monitoring of tyre usage	None	Yes
			Maintenance and service of plant	CMSH Regs 2001 sec 66(2)	Yes
		Adhering to Mine Transport Rules (eg, approach distances for HVs, comms, etc)	Site induction and Area Induction	CMSH Regs 2001 sec 76(2)(a), 83 and 260	Yes

Note that Raw Risk is used and provides focus (prioritises) on most damaging energies. Critical Control Risk Registers are based on Raw Risk because one can quickly see what risk will be realised if the controls fail. No complex risk matrix is used, just a simple classification of four risks (Extreme, High, Medium and Low) of raw risk to indicate priority.

Monitoring for Effectiveness of Critical Controls

Commonly Misunderstood Fact: *Most incidents occur not because we do not understand the hazard (SH) or aspect (E) but because we thought we had effective processes and controls in place, when in fact, we didn't.*

Why does this happen? Because the majority of risk management systems do not:-

- rigorously implement effective controls for those hazards
- ensure systematically that the controls remain effective over time

We should be intent on monitoring what's important i.e. the critical controls and monitor these for effectiveness (by collecting data and reviewing periodically) and identify the critical activities (by ensuring the people carrying these out are competent).

Safety Interaction (or PTOs) for Monitoring Effectiveness

Each Extreme Uncontrolled Risk is where Safety Interactions can be focused. Safety Interactions can then count the correct and incorrect observations for each observable criterion and thereby generate the percentage effectiveness for the particular critical control or critical activity, with the added benefit that management information will be generated about the effectiveness of critical controls and activities. Critical controls and critical activities that aren't working can be included in Hazard and Housekeeping Inspections. Repetition in looking for critical controls and critical activities in the Safety Interaction process helps embed what's important to the people on the job therefore raises awareness levels. So the simplified Critical Control Risk Register would look like the one

below.

Hazard or Aspect	Raw Risk	Critical Controls	# ✓	Critical Activities	# ✓	Legal Requirements	ALARA ? Yes/No	# Tot	Effectiveness Score %
Mobile Plant (vehicle Interaction)	Extreme	Correct plant being operated safely	1	Site specific ticket/competency for operator	10	CMSH Regs 2001 secs 74-77	Yes	10	55
		Plant operating as designed	5	Inspection of plant by competent person	9	CMSH Regs 2001 secs 71 and 73		15	47
			5	Monitoring of tyre usage	1	None		5	60
			25	Maintenance and service of plant	20	CMSH Regs 2001 sec 66(2)		25	90
		Adhering to Mine Transport Rules (eg, approach distances for heavy vehicles, communications, etc)	9	Site induction and Area Induction	10	CMSH Regs 2001 sec 76(2)(a), 83 and 260		50	19

SHEC Risk Management Dashboard

An icon on management PCs that provides information about the percentage effectiveness of:-

- the site as a whole
- each Department
- each hazard/aspect

So that 'intelligence' about how well SHEC is being managed can be at their fingertips and how effective the critical controls and critical activities are being utilised. Low scores can be interrogated to explain the reasons for this and focused actions undertaken to rectify. A simple dashboard could look like this;

	Classification	Production	CHPP	Maintenance	Exploration	Other	Site Total
AFRS							
	Light Vehicles	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Surface Mobile Equipment	90	92	97	100	100	97
	Hazardous Substances	98	97	75	91	98	96
	Equipment Safeguarding	80	99	94	78	100	92
	Isolation	64	95	76	92	97	89
	Working at Heights	100	89	84	84	98	89
	Lifting Operations	91	90	87	90	89	89
GRs							
	Confined Space	80	81	71	100	98	91
	Explosives	80		92			91
	Water Bodies	50	97	94	100	98	97
Safety							
	Electricity	80	100	100	97	100	99
	Manual Handling	80	79	96	87	76	82
	Slips Trips Falls	85	64	91	75	91	79
	Caught between	90	74	89	76	91	83
	Heat	100	100	95	95	100	98
	Spon Com	80	95				94
Occ Health							
	Noise	20	35	59	25	69	42
	Dust	70	85	93	62	94	83
	Vibration	90		92			92
	Ergonomics	91	89	85	75	81	84
Enviro							
	Water	100	87	94	100	100	95
	Biodiversity	100	100	100	82	98	95
	Modified landscapes	100	100	100	100	100	100
	Spills	80	76	73	98	93	85
	Waste Disposal	89	95	91	89	98	93
	Cultural heritage	99	100	100	97	95	98
	Green House Gases			89			89
TOTAL		81	88	88	86	94	88

where;

- Production can be seen to have compliance issues that need attention.
- There are problems with noise across the whole site.
- There are problems with isolation in Production.
- There are problems with Working near Water bodies (after interrogation of the data this was found to be due to a low sample size and therefore the action would be to increase *n* (the sample size) to increase confidence limits.
- An error message (#DIV/0!) indicates there is no data available and therefore suggests the raw risk is potentially being realised

Critical Control Risk Register therefore check the effectiveness of the controls. It is important to know when the drift from “controlled status” starts and this again is achieved by monitoring and thus makes the data live and trends can be analysed over time. Critical Control Risk Registers;

- List Critical Controls (not all controls) and
- List Critical Activities (relating to critical controls)
- Allows mapping of activity to hazard whereas current RR map activity to controls
- Can have organisation wide Critical Controls developed and monitored at

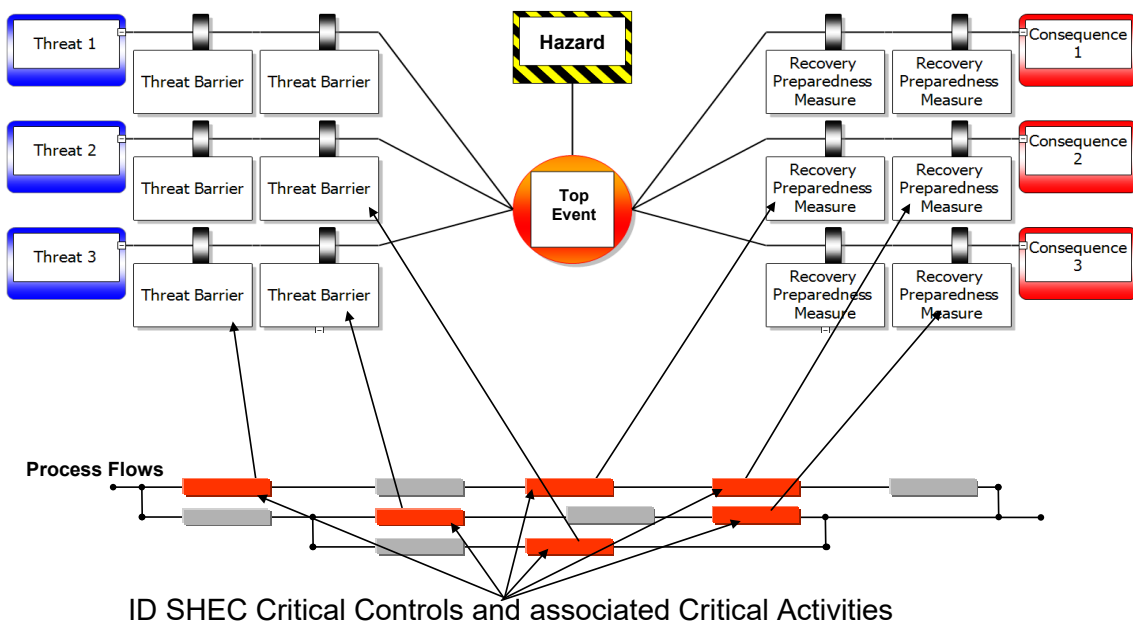
different levels within the organisation (i.e. whole organisation, site, department or section)

Activity based vs Hazard based

	Activity Based RRs	Hazard Based RRs
Pros	<ul style="list-style-type: none"> •Low maintenance 	<ul style="list-style-type: none"> •Manageable # of entries •Easy to refer to •Mgmt tools •More likely to be used as a live dynamic tool through monitoring •Potential to be updated in real time •Establish effectiveness through monitoring
Cons	<ul style="list-style-type: none"> •Repetition •1000s of entries •Not referred to •Mostly used for system certification •Too cumbersome to be used as a dynamic tool •Updated annually at best 	<ul style="list-style-type: none"> •Not a list of everything

What next?

BowTie Analysis (BTA) can be used to improve Critical Controls for high risks by using a more structure approach to obtaining the critical controls and their associated critical activities.



Increasing the Degree of Complexity

Currently the system is simple and based on observations improvements to increase robustness could be achieved through additional inputs into the system of the following;

- Hazard and Housekeeping Inspections
- Audit report results
- High Potential incident information
- Incidents information from LTIs, MTCs and even damage incidents or business loss incidents, this would enable verification that the correct critical controls and critical activities have been chosen and are being monitored.
- External inputs (safety alerts from Inspectorate, other State Government Inspectorates and other companies)

Assumptions

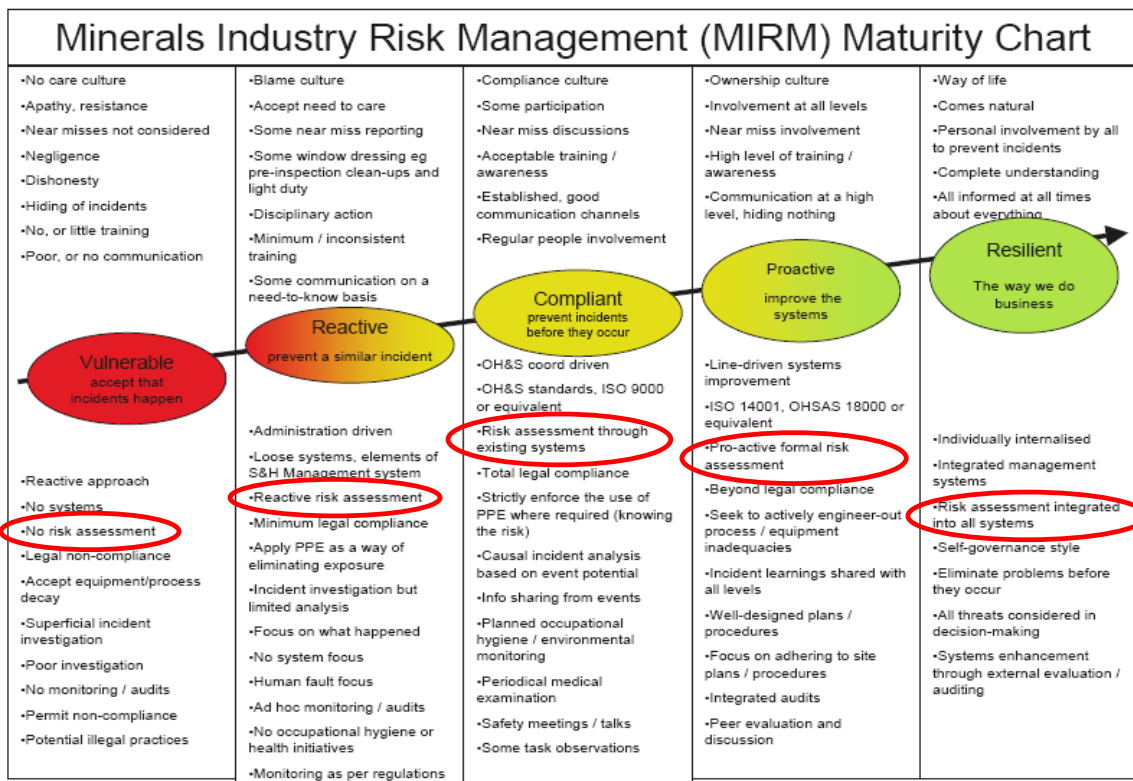
- Fit for Duty & contractor management can undermine the effectiveness of some controls
- Therefore assumed these are managed and controlled adequately
- People understand definition of a hazard

Issues to Consider in Establishing CRRs

- Only as good as it is used - needs management commitment to be used effectively
- Need clear guidelines for use
- Need to develop valid data set for each monitored control
- For effectiveness score what does n need to equal to be valid statistically – when is risk ALARA?
- What is a realistic review period – monthly?
- Need to included other triggers e.g. external alerts should trigger a check of the risk register and if three external alerts on the same issue are received in a defined time frame then the critical controls need to be checked on the c=ground to ensure effectiveness remains
- Need to have set of leading questions to test if something is a Critical Control
- Need to have Critical Controls and Risk Register process flow into objective & target setting for planning purposes.
- Spreadsheet vs software (reliability and robustability)

Risk Register use in relation to the Journey model

The type and usefulness of Risk Registers depends where you are on the Journey Model
 Below is the Minerals Industry Risk Management (MIRM) Maturity Chart indicating the differences in risk assessment at the various levels



Anglo American Safety Risk Management Process (SRMP) has a similar concept called the Journey Model which has 23 elements one of which is Risk Management Adoption (below) and highlights the fact that one needs to internalise safety and the values of having a live risk register that focuses on critical controls and critical activities before the full benefits of such a system can be realised.

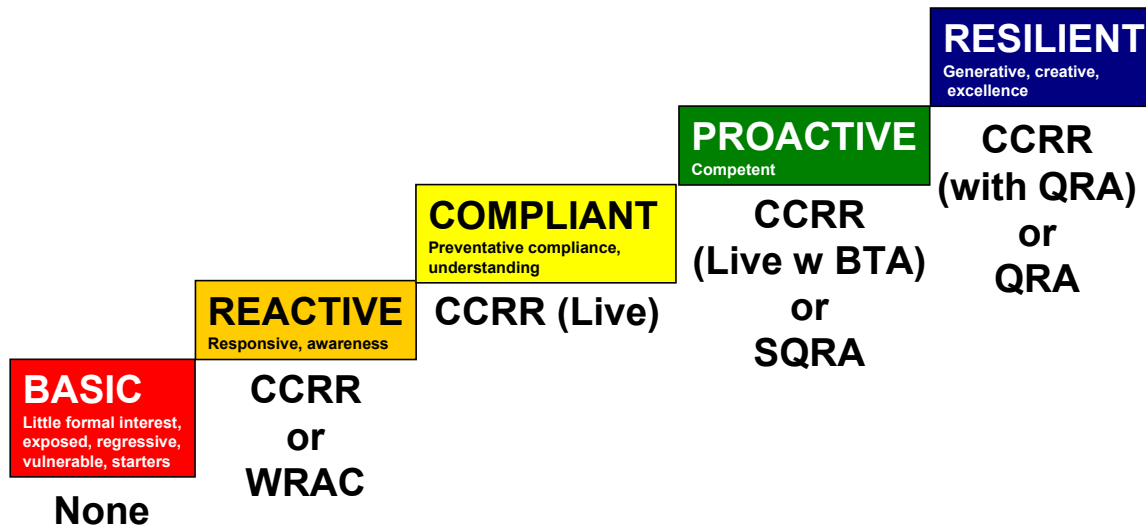
CATEGORIES	GUIDELINES	BASIC	REACTIVE	COMPLIANT	PROACTIVE	RESILIENT
DEFINITION		Little formal interest, exposed, regressive, vulnerable, starters	Responsive, awareness	Preventative, compliance, understanding	Competent	Generative, creative, excellence
Process followed by the organisation to organise risk management activities and extent to which risk management activities/ considerations are integrated among themselves and with all other aspects of the business.	Risk Management is really about tackling the source of problems rather than the consequences (injuries, illnesses, spills, waste, losses, etc.). To have a safe work place the organisation needs well designed equipment and facilities, competent and committed individuals and a systems platform that regulates the interfaces between these elements. Therefore, the attention must be focused on business processes/decisions that affect or have the potential to affect these elements and ensure they are designed to enhance workplace safety.	The organisation has limited, if any, safety risk management activities. The site has no formal safety systems.	The organisation has safety risk management activities (not systems) as suggested by externally sourced safety standards. The safety personnel incorporate the information into site documents.	The organisation has a well defined SHE risk management system, not just activities, as required by corporate expectations. The SHE personnel develop it for line management.	The organisation has a well defined SHE risk management system as well as some other management systems where safety risk management has been integrated. Examples are contractor management, project management, etc. This has happened because line management see the value.	The organisation has fully integrated SHE risk management into all site management systems where relevant risks need to be managed. The consideration of SHE risk has become part of the way the site does business. Very few exclusively SHE Management Systems remain. The focus is now on operational excellence in management systems.

Do it because I have to (even passionate lip service)

Do it because I want to (internalised and see value)



The suggested tools for use at the different levels of the journey model are suggested in the diagram below



(where CCRR = Critical Control Risk Register, SQRA = Semi Quantitative Risk Assessments, QRA = Quantitative Risk Assessments)

Conclusion

Creating, maintaining and utilizing a Critical Control Risk Register is a great tool for successful risk management and helps focus resources on high risks to work towards ensuring:-

- a hazard focus
- critical controls remain effective over time
- SHEC critical activities are carried out competently

Unless resources begin to focus harder at the critical controls and critical activities (instead of at the RAs), organisations will not be able to achieve the most risk reduction possible in a resource limited world, and thereby, injuries will continue