



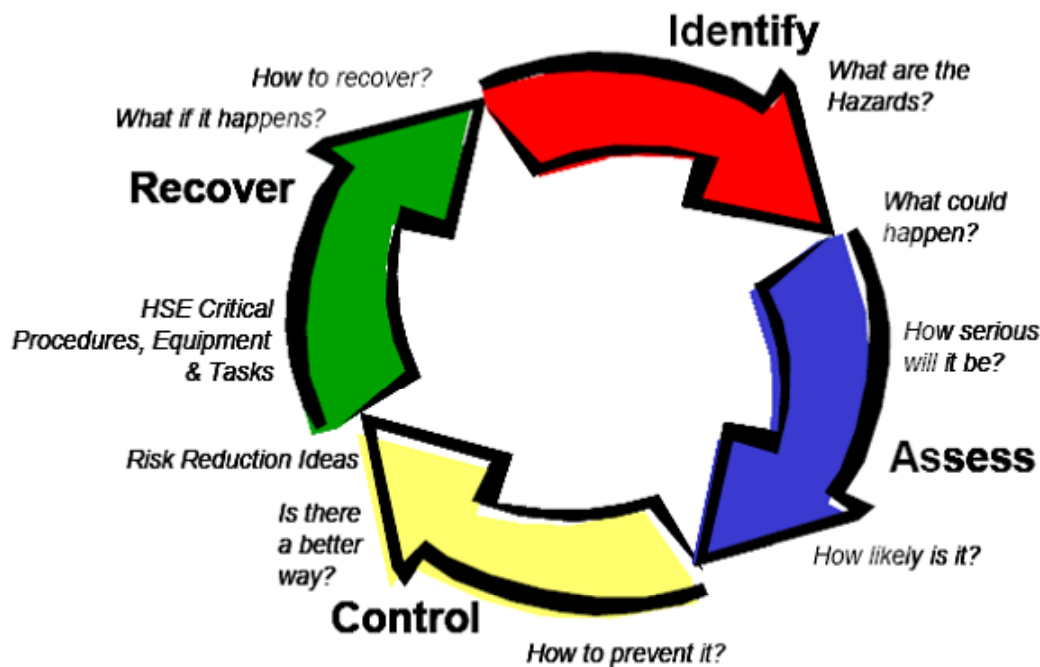
MANAGING THE BEAST WE CALL *RAM*

Risk Assessment Matrix

March 2014

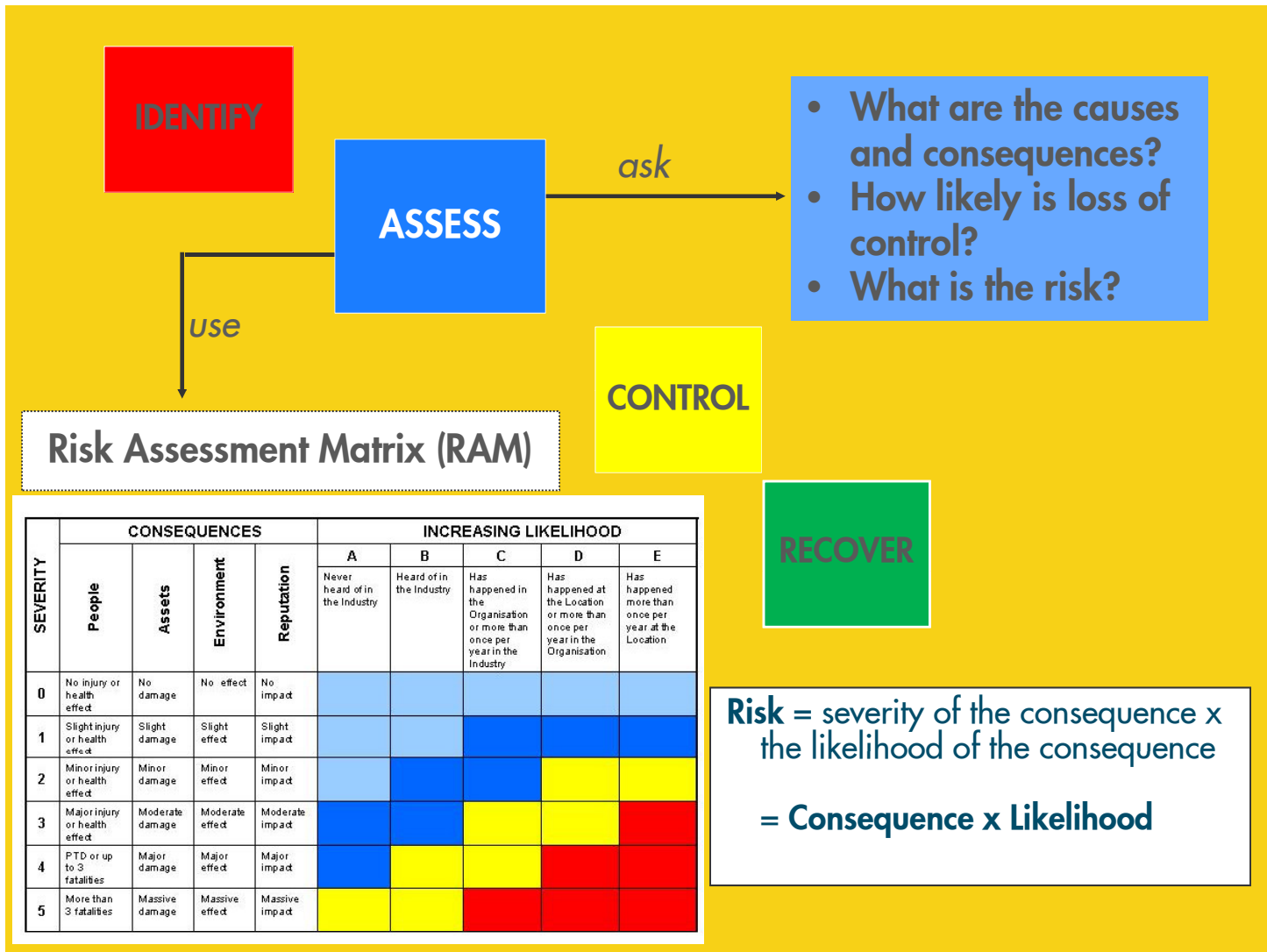


HAZARD AND RISK MANAGEMENT



Identify	What hazards are present? Are people, the environment, Shell 's reputation, or assets exposed to these hazards?
Assess	Can the hazard be eliminated or minimized? What are the threats that can release the hazard? What are the credible scenarios and how likely are they? What are the potential consequences? What is the potential likelihood of the hazardous event? What is the risk? Is the risk tolerable?
Control	How are the hazards and their risks managed? What are the controls and barriers? How effective are the barriers and controls?
Recover	When a hazard is released, what are the recovery measures in place? How can the consequences be mitigated or minimized?

HAZARD AND RISK MANAGEMENT - ASSESS



USING THE RAM

1. Identify potential consequences to P,A,E,R
2. Use left side to Assess the severity (0-5) of each potential consequence for P,A,E,R
3. Estimate likelihood (A to E) of each consequence

SEVERITY	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No impact					
1	Slight injury or health effect	Slight damage	Slight effect	Slight impact					
2	Minor injury or health effect	Minor damage	Minor effect	Minor impact					
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate impact					
4	PTD or up to 3 fatalities	Major damage	Major effect	Major impact					
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact					

4. Plot positions in the coloured area of the matrix to determine the level of risk

HOW 'NOT' TO USE THE RAM



SEVERITY	CONSEQUENCES		RATING LIKELIHOOD			
	A	B	C	D	E	F
5	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death
4	FTI or up to 1000 fatalities	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death
3	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death	Major loss of health or death
2	Minor loss of health or death	Minor loss of health or death	Minor loss of health or death	Minor loss of health or death	Minor loss of health or death	Minor loss of health or death
1	Slight loss of health or death	Slight loss of health or death	Slight loss of health or death	Slight loss of health or death	Slight loss of health or death	Slight loss of health or death
0	No loss of health or death	No loss of health or death	No loss of health or death	No loss of health or death	No loss of health or death	No loss of health or death



	Misuse	Impact
Likelihood scale	One of the biggest misuses of the RAM is using the likelihood scale to assess the <i>frequency of an incident</i> rather than the <i>frequency of the consequences</i> . A RAM rating should be a combination of the consequences of an incident and the likelihood of these consequences happening.	This usually means risks are rated too highly and results in an incorrect risk ranking and prioritisation.
It's not happened to us	When assessing the likelihood of an incident, a lower ranking is allocated on the basis that 'it's not happened to us'. The fact that it has not happened to us could be pure chance. The alternative description for columns C and D should help to prevent this practice.	The risk rating is underestimated.
Salami Slicing	Chopping up activities and resultant risks is a technique widely used to lower risk ranking. For example, the risk of a leak from a suction valve of a pump is assessed rather than the risk of a total pump failure.	The risk rating is underestimated.
Use of numerical scales	Using the tool as an exact science and applying quantitative measures to what is essentially a qualitative tool.	Distinctions may be made between RAM ratings that are not justified by the quality of the input data
RAM yourself out of action	Applying the RAM in ways that produce low risk rating and thereby justify not taking action, for example 'salami slicing' or, underestimating the risks of incidents by basing them on actual outcome rather than potential outcome (which is general higher).	Risks do not receive the detailed follow-up or adequate investigation so potential for learning is lost.
Surfing the Red/Black	Using the boundary between red and yellow as a hard decision criterion of tolerability eg. red = take action, yellow = no action. The RAM tool helps rank risk and prioritise further assessment - it should not be used as a criterion to judge tolerability of the risk.	By not addressing risks in the Yellow area, we are not fulfilling our HSE policy and commitment to manage risks to ALARP.

EXAMPLE 1

Example 1 – Risk Assessment: Hazard and Effect Management existing facility

A hazard identification exercise on a gas stabilisation unit establishes that one of the hazard release scenarios (top events) is a seal blow out on a gasoline pump with two subsequent threat lines:

1. A gasoline leak could ignite and escalate if the resulting fire is not controlled, or a significant leak and resulting vapour cloud could result in an explosion in a confined plant area.
2. A further possibility is that the gasoline could run off via the drain system into the plant interceptor. If the gasoline is not contained in the interceptor it could lead to pollution of the estuary.

Assess the Risk of these hazardous release scenarios. Make use of the following information about earlier incidents.

There were spill incidents 2 months ago and another 11 months ago. In both these incidents oil passed through the interceptor and polluted the estuary. Both incidents were reported to the Environmental Agency as a breach of consent. The estuary is an environmentally sensitive area and the incident 2 months ago was reported in the national media.

The Organisation suffered an incident at another site 2 years ago in which a spill of gasoil in the tank area ignited. The fire was restricted to the one tank bund, but it resulted in US \$3.5 million of equipment damage. No one was injured.

There was an incident 7 years ago at another of the Organisation's sites in which a spill of gasoline resulting from a pump failure in the stabilisation unit was allowed to get out of control. In this case fire damaged the stabiliser column, which eventually ruptured. The resulting explosion led to 2 operators being seriously injured (internal injuries and broken bones; off work for several months), US \$50 million of equipment damage and the plant shutdown for 3 months.

EXAMPLE 1 – EXISTING FACILITY

Applying the knowledge of previous similar incidents at this Location and elsewhere in the Organisation we come to the following RAM ratings:

Potential Consequence	People	Assets	Environment	Reputation
Fire damage		3C		
Major explosion	3C	5C		
Oil in the estuary			3E	4D

Severity	Consequences				Increasing likelihood				
	People	Assets	Environment	Reputation	A	B	C	D	E
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Serious injury Fire damage Major explosion damage National media attention Pollution of estuary

EXAMPLE 2

Example 2 – Risk Assessment: Hazard and Effect Management project

A project needs to transport 3,300 pipe joints from the port of entry to the construction contractor's coating facility. The distance is about 200 km and the options are:

- Transport by road on public highways – 5 joints per load
- Transport by barge through inland waterways

The region has significant security concerns with theft, piracy, hijacking and hostage taking commonplace within the oil field operations. The roads are generally single carriageway, of poor quality and can become very overcrowded in the vicinity of built up areas.

Assess the Risk associated with the two transport options.

i. Road Transport

The most significant hazard release potential is a road traffic accident. The worst case credible potential Consequences for this scenario are:

- Injury to contractors and third parties, including fatalities.
- Community and environmental impact of substantial road transport operation.

The Risk associated with a road traffic accident is assessed as People 4D, because there have been several fatal road accidents per year in this Organisation, although none on this project.

ii. Marine Transport

The most significant hazard release potential is deemed to be the seizing of a barge by pirates and subsequent hostage taking, as opposed to the barge sinking during a routine operation. The worst case credible Consequences for this scenario are:

- Injury and possible fatalities to contractors
- Damage or loss of barge and pipe joints with impact on project schedule.

EXAMPLE 2 - PROJECT

Overall assessment

The road transport option Risk cannot be reduced to ALARP within the project timeframe, whereas the marine transport option can be. The marine transport option is thus selected.

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Marine Transport option

Road Transport option

EXAMPLE 3

Example 4 – Incident: Fall from access platform

A section of grating approximately 1 metre x 1 metre was removed from the top platform of a plant to allow maintenance work to be done. It was not replaced afterwards. An operator on his rounds on the night shift did not see the hole because the lighting was poor. He stepped into the hole but was able to hold onto the edge of the grating and stop himself from falling to the next platform four metres below. He climbed out and had only minor grazes and bruising.

Classify the actual Consequence and the Risk rating of this incident on the RAM.

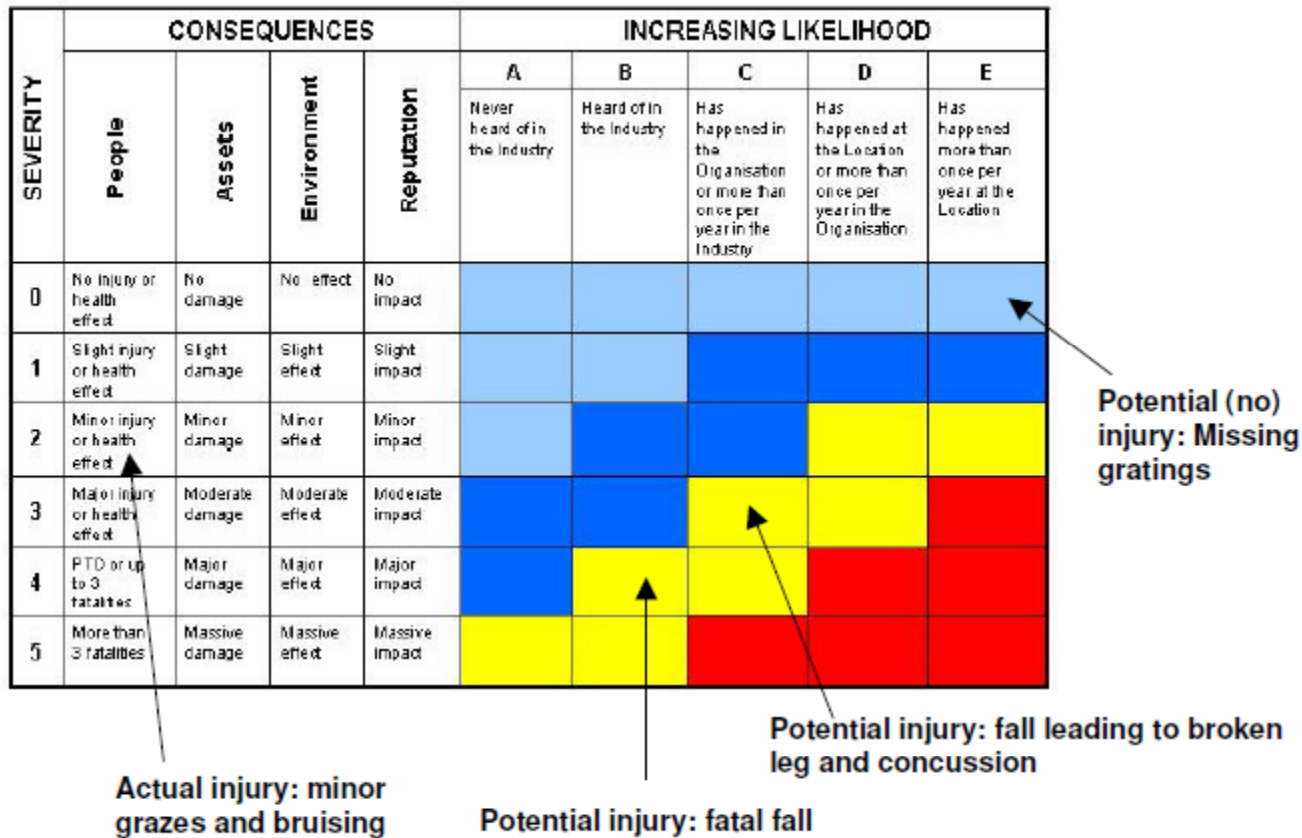
There have been several reports in the last year of grating not being replaced after maintenance work. There have been no cases in the Organisation of people falling from platforms at height, but there was a case last year in another plant in the Organisation where a technician fell one metre from a platform because a section of handrail was missing. This handrail had been removed to enable a heat exchange tube bundle to be removed and had not been replaced. The technician broke a leg and suffered concussion.

EXAMPLE 3 - INCIDENT

The actual injury is classified People 2 (Note that Likelihood is not used for actual Consequence)

There are two potential Consequences of which one rates in the yellow area of the RAM:

- Fatal fall People 4B
- Missing gratings People 0E



Q & A