MINEPLEX

FOR QLD COAL MINES and METAL MINES & QUARRIES — 1 JUNE 2026

Hard truths your critical controls don't account for.

Four things human factors science has known for years, that most CCM frameworks still ignore.

Drawing on
- Ronald W. McLeod (2017), Human factors in barrier management: Hard truths and challenges, Process Safety and Environmental Protection, and
-CIEHF, 2016. Human Factors in Barrier Management. Chartered Institute of Ergonomics and Human Factors.

WHY THIS MATTERS NOW

Your critical controls are making An unrealistic assumption.

Every control that depends on a person to detect a problem, to make a decision, to take an action, assumes that the person will behave a certain way under real operating conditions.

Forty years of human factors science says they won't. Not consistently. Not reliably. Not in the way the procedure, the training matrix, or the bowtie diagram quietly assumes.

With **1 June 2026** approaching for Queensland coal mines, that gap is no longer academic. It's where officer due diligence under *s 47A CMSH Act or s 44A M&QSH Act* succeeds or fails.

Performance is situational.

The same competent operator behaves differently under fatigue, time pressure, leadership signals from the boss, or after a quiet change in the procedure that no one quite reviewed.

How a person thinks, decides, and acts is shaped by the situation as *they* experience it at the time, and not as the bowtie assessment team imagined it some time ago in a workshop.

"Trained and competent" isn't a performance specification. It's an assumption.

Design shapes behaviour.

Equipment layout. Interface design. Where the tool is positioned. What the gauge looks like. How far the operator has to walk. The labels. The lighting. The clutter.

These don't *influence* behaviour at the margins. They **steer** it.

A control that requires a worker to make extra effort to apply will, over time, generate a workaround. The workforce isn't being reckless. They're being human. The control didn't fail. **The design did.**

People will take the easier way.

Psychologists have a name for this. It's called *The Law of Least Effort.*

Daniel Kahneman put it fairly bluntly:

> *“Laziness is built deep into our nature.”*
>
> — Daniel Kahneman, 'Thinking, Fast and Slow'

Even motivated, competent people will gravitate to the least demanding path, **even when it carries more risk.** This is predictable. Plan for it.

You will think of any number of incidents at your mines where this hard truth has played out.

People can't be assumed rational.

Human beings have two systems of thinking.

System 2 is slow, careful, evidence-based, doubting, rational. It's the kind of thinking we like to imagine our operators are doing.

System 1 is fast, intuitive, automatic, and always on. It does most of the real-world work, and it has a quiet, dangerous feature.

System 1 doesn't experience doubt. It jumps to a conclusion and runs with it.

8 eight concerns with the way Human and Organisational Factors are addressed CCM

1. Top Events are frequently located too far to the right: that is, the events that critical controls seek to avoid are too close in time to the consequences (fatalities, losses, etc.) that those events can lead to.
2. Too many “critical controls” are identified, most of which are not able to meet the generally accepted criteria as critical controls.
3. CCM rarely take a systems view of the human and organisational factors associated with the threats they are trying to control.
4. There is a lack of understanding of the nature and complexity of the tasks, and especially the cognitive elements of those tasks, that need to be carried out for critical controls to function as intended.

8 eight concerns with the way Human and Organisational Factors are addressed CCM

5. There is a lack of awareness of the difference between "***work-as-imagined***" and "***work-as-done***" *(Hollnagel, 2014).*
6. Human "error" is commonly modelled as a threat, and proposed critical controls are put in place that try to block the error from leading to a top event.
7. Intentions and expectations of human performance that are implicit in the decision to rely on people as part of a critical controls system are rarely made explicit or communicated to those that need to implement, perform, support or maintain barriers.
8. ***CCM is often prepared, implemented and distributed to the workforce in a manner that does not properly support their operational use.***

THE 'SO WHAT' — FOR OFFICERS & SSEs

Most "human controls" in your bowtie aren’t critical controls.

McLeod's argument, backed by 40 years of human factors evidence, is that controls that rely on human performance can rarely meet the standards (specific, independent, effective, auditable) that a true critical control requires.

They are **safeguards**. Critical, valuable, worth investing in. But they are not critical controls. If your CCM lists "competent operator," "training," or "supervisor verification" as a critical control, then you have a ***VERY BIG*** problem.

For officers under *s47A CMSH Act and s44A M&QSH Act*, this lands squarely in due diligence territory. The duty isn't to know that critical controls *exist*. The duty is to understand what those controls actually do, under real conditions, against real human performance, and to verify it.

MINEPLEX

THE QUESTION WORTH ASKING

It isn't:

"Do we have critical controls?"

It's:

"Are we honest about how much of our control reliability rests on human performance assumptions the science says are unreliable?"

If this lands with you, then that's a conversation worth having.

Drop your thoughts below or get in touch.

Scott Graham

Founder & Managing Director, Mineplex

0400 820 250

www.mineplex.com.au