

Your Safety Metrics Look Strong. So Why Are Serious Events Still Happening?

New research shows why traditional safety approaches miss serious risk and what leading organizations are doing differently

Key Takeaways

- Low injury rates do not reliably predict Serious Injury and Fatality (SIF) risk.
- Traditional Behavior-Based Safety systems often miss the exposures linked to catastrophic events.
- Exposure-Based Safety (EBS) shifts the focus from injury outcomes to high-risk exposure conditions.
- Modern safety systems must address exposure pathways, system barriers, and human performance realities.

Research Highlight: Analysis of 1.3 million safety observations across 88 sites reveals which BBS design elements produce stronger results.

For decades, Behavior-Based Safety (BBS) served as one of the most widely used and empirically validated strategies for reducing workplace injuries. Early adopters found tremendous value in structured observations, two way feedback, and the deliberate reinforcement of safe behaviors.

These methods helped countless organizations drive down injury frequency and create a more consistent baseline of safe practices. Research repeatedly demonstrated that BBS, when properly designed and sustained, could reduce injuries significantly over multiple years.


Yet as organizations matured and incident rates declined, a persistent and deeply concerning pattern began to emerge. Companies with enviable total recordable injury rates were still experiencing Serious Injuries and Fatality (SIF) events that were life-altering or fatal, and not at all predicted by the decline in lower-severity injuries. Traditional BBS systems, despite their strengths, were never designed to detect or prevent higher consequence exposures.

This realization sparked a critical shift in the safety field. Leaders began to question whether traditional approaches, especially those focused heavily on observing individual worker behavior, were missing the underlying drivers of catastrophic events. As organizations examined their most serious incidents, they found these events were rarely caused by a single behavior. Instead, SIFs tended to emerge from a confluence of hazardous energy, system vulnerabilities, latent conditions, and momentary lapses that occurred in complex environments.

This is the world in which modern organizations now operate. Work systems are faster, more automated, and more interconnected than ever before. Cognitive demands on workers are high, organizational pressures are real, and exposure potential can shift rapidly throughout the day. In this reality, BBS needed to evolve.

And it has.

What has emerged over the past decade is a more sophisticated, exposure-centered version of BBS—branded as Exposure-Based Safety (EBS), that integrates behavioral science with human



performance principles and a clearer understanding of system reliability. This modernized form of BBS moves the focus away from compliance and toward a richer, more nuanced understanding of how exposures occur, how systems influence behavior, and how organizations can better eliminate or control the conditions that make SIF events possible.

From Injuries to Exposure: The Philosophical Shift

One of the most important evolutions in modern BBS thinking is the recognition that injuries alone are not a reliable measure of safety. The absence of injury does not mean that work is being performed safely; it simply indicates that harmful outcomes have not yet emerged. Workers may experience dozens of high consequence exposures without experiencing harm—until one day, the right conditions converge, and a severe event occurs.

This is why modern safety systems emphasize exposure, not injury. Exposure is the interaction between a person and a hazard, or the potential for that hazard to cause harm under certain conditions. In high-energy work environments, the nature and



severity of those exposures matter far more than the number of minor incidents the organization is or isn't reporting.

Traditional BBS processes did not always differentiate between exposure types. A near miss involving hazardous energy might be weighted similarly to a trip hazard, simply because both were categorized as "unsafe behaviors." But today, organizations understand that all exposure is not equal, and some exposures, especially those linked to SIF potential—require heightened attention and mitigation. Focusing on high frequency, low severity behaviors simply does not address the exposures that lead to catastrophic outcomes.

Why Traditional BBS Fell Short on SIFs

Behavior-Based Safety was never inherently flawed; it was incomplete. Its limitations, when viewed through a modern lens, are revealing:

1. SIF exposure was rarely distinguished from low-severity exposure

Many early BBS systems were excellent at increasing awareness and reducing common injuries. But they weren't built to identify or prioritize the specific

exposures associated with serious harm, such as stored energy, line-of-fire hazards, motorized equipment, or high-pressure systems.

2. System factors were often overlooked

Traditional BBS processes tended to focus heavily on worker behavior without adequately addressing the larger systems and conditions that influence exposure. Factors such as equipment reliability, engineered safeguards, workload, procedural clarity, and supervisor expectations all shape the exposure environment—but many early BBS implementations did not systematically capture or analyze these influences.

3. Human performance realities were not integrated

EBS materials explain that work performance is shaped by two interconnected modes of brain function:

- Fast Brain — automatic, habitual, and reactive
- Slow Brain — conscious, reflective, and analytical

These two modes act at different speeds. Fast-brain actions initiate within 0.4 seconds, long before slow-brain reasoning fully engages at around 0.5 seconds.

This means that much of what workers do, especially in repetitive tasks, is governed by fast, automatic processing. When safety systems depend on workers “paying attention” continuously, they conflict with the realities of human cognition. The implication is profound:

Because automatic actions occur before reflective reasoning fully activates, safety systems must be designed so that exposure-reducing behaviors are built into the normal, natural flow of work.

This understanding supports the shift toward engineered solutions, simplified processes, and system-level barrier removal—not reliance on human perfection.

The Rise of Exposure-Based Safety (EBS)

EBS builds on the strengths of traditional BBS but adds the missing elements required for SIF prevention. The EBS playbook identifies four essential components:

1. Identifying Critical Exposures
2. Gathering exposure data through structured sampling
3. Providing meaningful, two-way exposure-focused feedback
4. Using data to remove system barriers and improve controls

Rather than looking at “what workers did,” EBS examines why the exposure existed, what barriers were missing,

and how systems can be strengthened going forward.

The Cambridge Study: Evidence for What Works Now

Cambridge University researchers partnered with DEKRA to analyze one of the largest BBS datasets ever assembled. The study included:

- 88 international client sites
- More than 1.3 million observations
- 36 months of post implementation data

The findings were both validating and revealing. While the study reaffirmed BBS’s ability to reduce injuries, it also provided clear, data-backed insights into which design elements make modern BBS/EBS systems most effective.



Below is a narrative summary of the findings—and what they mean in practical terms.

Small, Skilled Observer Teams Outperform Broad Participation

Traditional BBS often encouraged high levels of employee participation. The belief was that the more observers involved, the stronger the culture would become. But the Cambridge research showed something different.

Organizations that used 10–20% of employees as observers—a small, focused group—saw the highest levels of injury reduction.

Why? Because observers in smaller groups:

- Perform higher-quality observations
- Have deeper conversations
- Become more proficient over time
- Understand the exposures of their area more intimately

In contrast, systems that attempted to involve 40–60% of the workforce often suffered from diluted training, superficial observations, and inconsistent feedback.

Moderate Observation Frequency Produces Better Outcomes

Another surprising finding was that more observations were not better. In fact, the most effective programs conducted 1–3 observations per month for every five employees.

Observer Mastery Matters: Seven or More Observations per Month

The research also found that individual observers who performed seven or more observations per month achieved significantly better outcomes than those who conducted fewer.

This demonstrates the importance of depth and practice. Observers become skilled through repetition, much like any technical or interpersonal skill.

Rotating Observers Boosts Long-Term Effectiveness

Over time, observers naturally become accustomed to patterns and may lose some of their awareness or energy. Cambridge’s data showed that rotating observers—typically every 3 to 12 months—resulted in improved outcomes.

Rotation prevents stagnation, broadens exposure awareness, and keeps fresh conversations circulating within teams.

Observer Specialization Produces Better Results Than “Fresh Eyes”

One of the most counterintuitive findings was that observers were more effective when they remained in their own work areas.

Traditional logic often suggested that observers from other areas could see hazards that local workers had normalized. But the study found the opposite.



Observers who specialize in their own area:

- Recognize nuanced exposure conditions
- Develop stronger relationships with coworkers
- Are more comfortable having honest conversations
- Provide more relevant feedback
- Notice system conditions that only a local expert would understand

The strength of this finding reinforces the importance of context-specific observation.

Contextual Comments Strengthen Data Quality and Action Planning

Finally, the study found that observers who used specific, contextual notes—rather than generic comments or no comments—achieved better results.

These “flags” help clarify:

- Why the exposure occurred
- What conditions influenced it
- Whether system barriers were missing
- What improvements might be needed

This aligns directly with the EBS principle of using exposure data to drive meaningful action planning.

Implications for SIF Prevention

When you combine the insights from the EBS process with the findings from Cambridge, a clear pattern emerges: Modern BBS/EBS is fundamentally

a system-improvement process aimed at reducing serious exposure potential—not simply a behavior observation program.

High-quality conversations and contextual insights help uncover:

- Missing engineering controls
- Conflicting priorities
- System barriers that make safe performance difficult
- Unaddressed maintenance or equipment issues
- Weaknesses in procedures or planning

This reinforces the idea that strong SIF prevention relies on:

- Asking better questions
- Understanding context
- Identifying exposure pathways
- Strengthening systems—not policing individuals

Organizations that embrace this mindset shift see not only reductions in injuries but also significant

CONCLUSION: The Future of BBS Is Exposure-Based, Data-Driven, and System-Focused BBS has not become obsolete—it has evolved.

improvements in safety culture, as the Cambridge study documented. Over six years, participating organizations showed a full standard deviation improvement in culture survey scores.

The most effective organizations no longer use BBS as a standalone behavior program but integrate it as a core element of a broader exposure based safety strategy.

Today's most successful approaches combine:

- Behavioral science
- Exposure prioritization
- Human performance principles
- System and barrier analysis
- High-quality observation and feedback
- Data-driven action planning

This integrated strategy helps organizations close the long standing gap between declining TRIRs and persistent SIF events.

THE EVIDENCE IS CLEAR: By shifting from a behavior-centric view to an exposure-centric model, organizations can finally make real, measurable progress in preventing the most serious events.

This is what works now.

Where Many Organizations Are Now

Many organizations recognize the gap between declining injury rates and persistent SIF exposure but struggle to translate that insight into practical system improvements.

DEKRA works with organizations to:

- Identify critical exposure pathways
- Evaluate behavioral safety systems
- Align safety observations with SIF risk
- Strengthen system barriers and controls

If your organization is evaluating how to evolve its safety strategy, DEKRA's EHS consulting team can help.

Schedule a Safety System Review

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