NAVIGATING SIFS

Brief on Safety Metrics With ANSI/ASSP Z16 Chair & Vice-Chair, Alexi Carli & Lisa Foster-Morrow

Identifying potential serious injuries and fatalities (SIFs) in the workplace is a necessary way to protect workers and enhance safety culture. To focus on how safety professionals can prevent SIFs in the workplace, members of the ANSI/ASSP Z16 Committee for Safety and Health Metrics and Performance Measures discuss SIFs and what ASSP is doing to address them.

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What are some ways ASSP is addressing SIFs in the workplace?

From our perspective, ASSP has been more than active on the issue of leading and lagging metrics and the impact on EHS professionals. We cannot speak for ASSP overall, but from our perspective, the Society has focused much of its effort on the ANSI/ASSP Z16 committee and its standards on safety and health metrics and performance measures.

To improve safety and health performance, organizations must transition beyond traditional incident rates or other failure metrics to a more holistic view. The Z16 standard promotes the use of a balanced set of metrics to gain a better understanding of what is actually happening in an organization. The key to controlling SIFs is a greater understanding of all factors leading to them. The intelligent use of metrics gives safety professionals great insight into an incredibly complex issue.

The Z16.1 standard defines requirements and expectations for organizations to establish effective measurement systems that assess safety and health performance, reduce risks, identify gaps in safety and health management systems, and drive needed improvements. It applies to all organizations and provides flexibility based on their size, type of management system and level of organizational risk. The standard provides the means to track and demonstrate the impact that safety and health efforts have on the organization's business. It utilizes a balanced approach to understand and assess safety and health efforts using leading, lagging and impact metrics.

Does the Z16 standard cover SIFs?

Yes, ANSI/ASSP Z16.1-2022, Safety and Health Metrics and Performance Measures, covers and includes SIFs by shifting the focus from traditional incident rates to a balanced set of multiple metrics. In some ways, this includes semantics. It is important to consider how the Z16 standard addresses risk overall, including SIFs, by requiring:

- **Balanced approach.** The standard uses a balanced approach by evaluating risk management factors as well as safety management systems to establish a more comprehensive and effective approach to safety and health performance (ASSP, n.d.).
- **Risk-based metrics.** The standard moves beyond total recordable incident rate (TRIR), which fails to predict SIFs or identify the potential causes behind them. It emphasizes evaluating and tracking risk precursors, including high-risk situations where a serious injury or fatality could have occurred even if no injury took place.
- **Interrelated metric categories.** The standard requires a set of metrics to help identify high-risk areas before an event occurs. These include leading metrics (which measure proactive activities as well as their inputs and outputs aimed at controlling risks and preventing SIFs; e.g., hazard identification and higher levels of controls), lagging metrics (which track actual outcomes, including SIF occurrences, to understand trends) and impact metrics (which measure the business and operational effects of safety performance, and can include the catastrophic costs associated with SIFs).

By incorporating metrics that look at actual and potential exposure, the standard encourages organizations to manage the risks that lead to life-altering events rather than just minor injuries.

You mentioned that SIFs are covered under the standard, but why is "SIF" not defined in the ANSI/ASSP Z16 standard?

Based on the provided search results, the ANSI/ASSP Z16.1-2022 standard does not specifically define "serious injuries and fatalities" because its primary purpose is to provide a comprehensive, balanced framework for all safety metrics—including leading, lagging and impact metrics—rather than focusing on a single category of incidents. Here is why the Z16 standard does not specifically define SIFs:

- **Focus on a balanced approach with a set of metrics.** The ANSI/ASSP Z16.1-2022 standard focuses on moving away from relying solely on lagging metrics (e.g., OSHA rates) toward a balanced set of metrics addressing risk and safety management system elements that include leading, lagging and impact metrics to improve overall safety performance.
- **Definition of "metrics" versus "indicators."** Z16 uses the term "metric" rather than "indicator" because it is more multidimensional. It aims to track the overall safety process, whereas SIF prevention requires a different, more specific focus on high-energy hazards, which may not be fully captured by a general metrics standard.
- **Separation of standards.** The definition of SIFs and potential SIFs is being addressed elsewhere, specifically through the revision of the ASTM E2920 standard.
- **Purpose of Z16.** The Z16 standard is designed to help organizations create relevant, persuasive and actionable safety reports that reflect a holistic approach to safety. It aims to move beyond just

tracking incident rates to understanding the "why" and "how" behind safety performance.

In summary, Z16.1 provides the framework for how to measure safety while other standards (e.g., ASTM E2920) and research are focused on defining the specific, high-hazard events known as SIFs. Further, the Z16 committee will consider adding a SIF definition in a future revision of a standard.

How does the Z16 standard help safety professionals move beyond traditional incident rates when addressing SIFs?

This is an important question since the whole point of the standard is to provide guidance and a tool to help safety professionals identify and remediate hazards and exposures. It is particularly effective for complex issues such as SIF risks because it is process-driven rather than prescriptive. Everything we currently know about SIFs suggests that there is no single perfect measurement to indicate what has contributed or will contribute to them. The ANSI/ASSP Z16.1-2022 standard helps safety professionals move beyond traditional incident rates by providing a process to use multiple metrics in a balanced approach. This combination of leading, lagging and impact metrics measures safety performance, identifies risk, improves management systems and drives improvement. It enables organizations to focus on potential SIFs by tracking proactive safety measures to address high-risk precursors before a life-altering event occurs, rather than just reacting to injuries that have already occurred.

Safety professionals must consider the strategic ways Z16 helps address SIFs:

- **Shift focus to risk management.** The standard encourages identifying and controlling high-energy hazards before they result in serious incidents.
- **Utilize a balanced metric approach.** The standard moves away from relying solely on lagging metrics (e.g., OSHA recordables) by incorporating leading metrics—the activities and their inputs and outputs that promote safety and prevent incidents.
- **Identify precursors.** The standard helps professionals identify the specific, high-risk activities and potential, serious injuries that could lead to fatalities.
- **Drive continuous improvement.** By integrating with organizational management systems, the standard provides a structured feedback loop for evaluating the effectiveness of safety initiatives and ensures resources are allocated to the areas of highest risk and greatest need.
- **Focus on "powered action."** The approach targets the neutralization of high-risk hazards at the point of work.

It is important to make the point that by implementing the ANSI/ASSP Z16 standard, safety professionals can gain a clearer understanding of their safety program's effectiveness and better protect employees from serious harm.

What role do leading metrics play in preventing SIFs, and why are they especially critical compared to lagging metrics?

Leading metrics prevent SIF events by proactively controlling risk and measuring the effectiveness of safety systems, enabling and encouraging corrective actions before incidents occur. They are critical because they focus on reducing risks, such as monitoring critical hazards and controls, whereas lagging metrics only measure past failures.

It is important to remember that unless safety professionals develop leading metrics properly, they are no better than any other metric. We have learned over time that many leading metrics can lead to wasted effort because they are not targeted to the right issue or may create incentives that could lead to unintentional consequences or create a false sense of security. Creating a balanced set of metrics that support each other is a much more effective practice, particularly when it comes to something as complicated as SIFs. The role of leading metrics in SIF prevention includes:

- **Proactive hazard identification and risk treatment.** Leading metrics serve as an early warning system, identifying weaknesses in safety processes (e.g., equipment inspections, effectiveness of current or new controls, conformance rates) before they result in harm.
- **Targeting high-hazard activities.** These metrics focus on verifying that critical, high-risk controls are in place and functioning properly.
- **Driving safety culture.** Leading metrics measure elements of the management system such as leadership, employee engagement, quality of participation, and training completion and competency to foster a proactive safety culture.
- **Continuous improvement.** These metrics provide frequent, actionable feedback, allowing for immediate course correction in a way that lagging metrics cannot.

It is critical that safety professionals incorporate leading metrics into their measurement systems rather than rely only on lagging metrics for various reasons, including:

- **Prevention versus reaction.** Leading metrics are forward-looking (predictive), allowing for prevention, while lagging metrics (e.g., injury rates) are backward-looking (historical), detailing what has already happened. Lagging metrics do not enable learning about how and why incidents have occurred.
- **Actionable intelligence.** Leading metrics highlight what needs to be done to improve, whereas lagging metrics only confirm that a failure occurred.
- **Real-time assessment.** Leading metrics allow for daily, weekly or monthly monitoring of safety performance, rather than waiting for annual or quarterly incident reports. This allows organizations to make agile, data-driven decisions in real time.
- **Risk reduction.** Leading metrics focus on mitigating risk factors before they evolve into actual incidents, improving overall organizational safety and reducing associated costs.

Leading metrics for SIFs include measures such as the percentage of critical safety checks completed, worker involvement to identify high-risk hazards,

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exposure rates, effectiveness of controls and conformance rates to specified controls.

How can organizations practically identify and track SIF precursors using the ANSI/ASSP Z16 framework?

The Z16 standard is designed for scalability to all organizations, regardless of size or program maturity. Organizations can practically identify and track SIF precursors by utilizing the ANSI/ASSP Z16.1-2022 standard, which provides a structured, balanced framework of leading and lagging metrics to move beyond traditional injury and incident reporting. SIF precursors are high-risk situations where controls are broken, absent or not followed and, if allowed to continue, may result in a fatality or serious injury. Here is a practical approach to implementing this framework:

Step 1: Identify SIF Precursors (Planning & Identification)

- **Define high-risk activities.** Identify tasks that have the potential to lead to a SIF, such as confined space entry, working at heights or electrical work.
- **Analyze past data (look-back).** Review prior hazard and risk assessments, past incidents, near misses and workers' compensation data to identify if they had SIF potential.
- **Conduct field observations (precursor analysis).** Train personnel to recognize precursors in the field—unusual conditions, high-risk behaviors or failing safeguards—before work begins.
- **Use the three-question test.** Evaluate whether an event is a precursor by asking: 1) Was there a high-risk exposure? 2) Were critical safeguards absent, bypassed or ineffective? Was there a failure to follow controls or procedures? 3) Was the activity allowed to continue despite the presence of the hazard and lack of control?

Step 2: Track SIF Precursors (Measurement & Monitoring)

- **Implement a balanced set of metrics.** Use the ANSI/ASSP Z16 framework to move away from solely relying on lagging metrics (e.g., TRIR) and adopt leading metrics that track precursors.
- **Track SIF potential in near misses.** Categorize near-miss reports in the incident management system to highlight those that had SIF potential. By analyzing events where the outcome was minor but the potential was catastrophic, the organization can identify high-risk trends before they manifest as significant incidents or fatalities
- **Utilize dashboards for visibility.** Develop safety dashboards that monitor the frequency of SIF exposures and the effectiveness of controls, verifying that risk mitigations perform as intended.
- **Monitor safety management systems.** Track metrics related to organizational infrastructure, such as preventive maintenance completion, training effectiveness and competency, and management leadership and support.

Step 3: Action & Continuous Improvement (Plan-Do-Check-Act)

- **Strengthen controls (hierarchy of risk treatment).** When a precursor is identified, move beyond retraining and use the hierarchy of risk treatment to implement higher levels of control to eliminate or reduce the risk.
- **Incorporate visual literacy.** Train employees to move beyond seeing to interpreting to spot specific visual cues in the workplace that indicate a SIF precursor scenario.
- **Evaluate control effectiveness.** Regularly observe and audit the system to verify that the implemented defenses are working properly under actual field conditions.
- **Drive accountability.** Use Z16 metrics to align safety performance with business impact and ensure leadership accountability for reducing high-risk situations.

By focusing on these precursors, organizations can proactively manage risks and prevent serious, often fatal incidents before they occur. Members of the Z16 committee are pleased to work with stakeholders and implementers of the standard on how we move future versions of the standard forward with an eye on improvement and practical implementation.

How does Z16 balance proactive measures with real-world results such as SIF reduction?

It is important to note the ANSI/ASSP Z16.1-2022 standard addresses the concern that focusing solely on leading metrics can dilute accountability for safety outcomes by requiring a balanced, interconnected framework that tracks interrelated leading, lagging and impact metrics. Leading metrics alone do not indicate whether the desired outcome is being achieved. Instead of replacing lagging metrics (e.g., SIF rates) with proactive ones, Z16.1 embeds them into a continuous improvement cycle (plan-do-check-act) to ensure that proactive efforts directly reduce real-world incidents.

Using only one type of metric or a set where metrics are not related to each other is like running a boat without a rudder. To effectively steer an organization, safety professionals must be able to see how leading activities strengthen controls that impact the desired outcome. If the relationship is not evident, then no meaningful means exist to guide the organization. The balanced approach is the rudder. Here is how the standard balances these elements:

The "Balanced Set" Approach

The Z16 standard notes that relying on a single metric is ineffective. It uses a balanced approach that evaluates key risks and safety management system elements and uses the interrelationships between the three types of metrics below to provide a multidimensional view of EHS performance:

- **Leading metrics (proactive).** Measures that predict and prevent incidents (e.g., inspections, hazard reporting, effectiveness of controls, conformance rates).

•**Lagging metrics (reactive).** Measures of past performance, including SIFs, to assess where the system has failed.

•**Impact metrics (organizational value).** Measures that link safety performance to organizational outcomes such as operational efficiency, worker well-being and cost reduction.

Tying Leading Metrics to Outcomes (SIF Reduction)

To prevent the dilution of accountability, the standard emphasizes that leading metrics must be meaningful and, when used in isolation, have limited value. Z16.1 requires:

•**Interrelationship mapping.** Proactive measures must be connected to specific outcomes. For example, leading metrics (e.g., hazard identification, daily site cleanup) must be tracked alongside lagging metrics (e.g., trip-and-fall incidents) to ensure that the actions are producing the desired result.

•**Focus on high-risk (SIF) reduction.** The standard guides organizations to use data to identify risks that lead to fatalities and serious injuries, focusing on the prevention of those high-severity events rather than just lowering overall incident counts.

Maintaining Accountability Through Impact Metrics

The addition of impact metrics is key to accountability. It moves beyond checking boxes on activities (leading metrics) to demonstrating the result and value of those activities on the business. This ensures that if leading metrics (e.g., implementation of new controls, conformance rates) are not resulting in incident reductions such as SIFs, the metric system helps identify this trend, maintaining focus on real-time results.

Continuous Improvement Loop (Plan-Do-Check-Act)

The standard utilizes a plan-do-check-act model, in which plan and do entail implementing proactive, leading metrics, and check and act include using lagging metrics to verify if the proactive steps actually improved safety.

In essence, Z16.1 does not allow for a proactive-only approach; it forces the validation of proactive efforts against reactive, real-world results, ensuring that both safety professionals and leadership remain accountable for preventing serious harm.

What guidance does the Z16 standard provide for aligning SIF-related metrics with overall business performance and operational risk?

We interpret this question to be asking how Z16 coordinates with the new revision of the ASTM E2920 standard and pending standards coming out of ASTM addressing SIFs. The key consideration to note here is that the ANSI/ASSP Z16.1-2022 standard provides guidance on aligning SIF-related metrics with business performance by requiring a balanced set of metrics (leading, lagging and impact metrics)

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to measure risk, safety management systems and organizational impact. It focuses on integrating safety metrics into overall business management and the decision-making process rather than having them isolated outside the core business activities. Key guidance from the Z16 standard includes:

•Z16.1 defines a "balanced set" of metrics of risk management and safety management system improvements, combining leading (proactive), lagging (reactive), and impact (business-focused) measures to predict, influence and track SIF outcomes.

•Unlike traditional standards, Z16 highlights the use of impact metrics to measure the effect of safety initiatives on organizational goals and financial outcomes, linking SIF prevention directly to business performance.

•The standard encourages identifying, analyzing and mitigating operational risks that could lead to SIFs by examining the interrelationships between safety management systems and operational outcomes.

•Z16 provides a structured approach for monitoring and evaluating metrics to identify gaps, driving accountability, and facilitating continuous improvement in safety and health systems.

•The standard allows flexibility in applying these metrics based on an organization's specific size, type of management system and risk level.

By utilizing this framework, organizations can connect their SIF reduction efforts (e.g., reducing high-risk tasks) to broader business objectives (e.g., reducing operational downtime, enhancing reputation, improving employee morale).

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How does the Z16 standard support organizations with very different risk profiles (e.g., construction, manufacturing, healthcare) when it comes to managing SIF risk?

This is also an important consideration for safety professionals using the standard to address different businesses and industries. The ANSI/ASSP Z16.1-2022 standard supports diverse industries in managing SIF risk by moving beyond TRIR to a flexible, balanced framework of risk and management system improvements using leading, lagging and impact metrics. The standard is process-driven rather than prescriptive. It does not tell organizations what they need to measure; rather, it tells them how to create measurements that are effective for their organization. It enables customized, risk-focused and

proactive safety management suitable for construction, manufacturing and healthcare alike. The standard supports diverse risk profiles in some key ways:

•**Flexible metrics framework.** Z16.1 encourages selecting metrics relevant to specific hazards, allowing high-risk construction projects to focus on fall protection while healthcare focuses on patient handling or hazardous exposures.

•**Focus on precursors (leading metrics).** Organizations can track leading metrics tailored to their operational realities, such as control effectiveness reporting for manufacturing machinery or conformance rates in field work, to identify and mitigate SIF precursors.

•**Set of metrics (lagging, leading, impact).** By combining lagging metrics (what happened) with leading metrics (predictive measures) and impact metrics (effect on business), organizations can better understand their risk profile and the effectiveness of their controls.

•**Integration with management systems.** The standard is designed to be embedded into existing safety management systems, allowing companies of any size or industry to align safety with their specific operational goals.

•**Focus on high-risk activities.** Instead of relying on low-frequency, high-severity lagging data, Z16.1 guides firms to identify "what could happen" by analyzing high-risk tasks and potential SIF precursors.

This approach transforms safety from a compliance-driven, reactive effort into a proactive, data-driven strategy that fits the unique risks of any organization.

What is ASSP doing to help EHS professionals address SIFs in their own workplaces?

We cannot speak for the Society, but we see ASSP helping EHS professionals address SIFs by focusing on "powered action" to neutralize top hazards such as falls and lockout/tagout, utilizing ANSI standards (e.g., Z359, Z244) to drive proactive risk management. ASSP staff did offer some feedback on this issue. They identified some key ways ASSP is addressing SIFs, including:

•**Targeting "lethal leaders."** ASSP focuses on the top drivers of SIFs—specifically, falls from heights and lockout/tagout—by deploying, updating and promoting the adoption of ANSI/ASSP Z359 (fall protection) and ANSI/ASSP Z244 (control of hazardous energy) standards.

•**Shifting to risk-based approaches.** Through their Corporate Listening Tour and collaboration with the Workplace EHS Coalition, ASSP is promoting a shift away from focusing only on injury frequency toward managing high-risk activities that have the potential for fatalities.

•**Educational resources and training.** ASSP offers targeted webinars and training on SIF prevention, including topics such as identifying, analyzing and controlling serious injury precursors.

•**Advancing safety culture.** ASSP provides tools to eliminate blame in organizational culture, fostering positive accountability that helps prevent future SIFs.

•**Collaborative partnerships.** As part of the Workplace EHS Coalition, ASSP works with other organizations to promote evidence-based practices and influence public policy to improve safety.

ASSP emphasizes that addressing SIFs requires moving beyond mere compliance to implementing proactive, risk-based safety management systems, as outlined in the Society's 2025 strategic guidance.

Conclusion

The ANSI/ASSP Z16.1-2022 standard covers and includes SIFs through the use of a balanced approach that identifies risk and safety management system improvements using a set of interrelated leading, lagging and impact metrics to provide a more comprehensive view of EHS performance to predict or influence outcomes.

The standard uses this approach as it views safety as the end-state, the result of controlling hazards or conditions that can lead to harm. It considers safety as the by-product of the interaction between all parts of an organization's system and includes elements such as hazards and controls, worker competency, and how work is performed. To actively monitor and improve EHS performance, the effectiveness of preventive actions and controls as well as the conditions in the safety management system are key. In this view, safety is not the absence of incidents, but rather the presence of effective controls and organizational capacity. **PSJ**

References

ASSP. (n.d.). Risk assessment and management for safety professionals. https://assp.us/2Tlu2ni

ASSP RESOURCES FOR SIF PREVENTION

ASSP provides many resources for SIF prevention and implementing Z16 into a workplace.

•ASSP held a webinar addressing Z16 on Jan. 29, 2026, titled "Stand-Up for Standards: Ask the Chairs—Z16.1 Key Metrics That Drive Impact": **https://assp.us/3Pxs4xy**

•*Professional Safety*, Sept. 2023, "A Model for Defining Serious Injuries and Fatalities": **https://assp.us/3Ety9BU**

•Webinar, "Confronting Serious Injuries and Fatalities (SIFs): Lessons From Data and Experience": **https://assp.us/4d3aaKD**

•Blog post, "Three Keys to Preventing Serious Injuries and Fatalities": **https://assp.us/3vrKSii**

•*The Case for Safety* Podcast, Episode 76, "How the Z16 Standard Can Help You Improve Metrics and Performance Measures": **https://assp.us/3WYrHL6**

•Blog post, "Leading With Safety and Health Metrics": **https://assp.us/2H34ySv**

•Webinar, "Benchmarking Panel on Serious Injuries and Fatalities (SIFs)": **https://assp.us/4cQIQAI**

•Webinar, "Serious Injuries and Fatalities: What's the Problem and What Can You Do About It?": **https://assp.us/4tetKd6**

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