Edison Electric
INSTITUTE

Serious Injury and Fatality (SIF) Precursor Customization Project

Implementation Guide

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INTRODUCTION

The purpose of this document is to provide EEI members with some answers to frequently asked questions about serious injury and fatality (SIF) precursor analysis. This guide was produced using the experience and ideas of the EEI SIF team that customized methodology for application in the electric power generation and delivery sectors. The guidance is a set of ideas that readers may find helpful as they consider implementation strategies; however, use of this approach to precursor analysis is not a guarantee that no SIF event will occur. There is no "one-size-fits-all" approach, and personnel should continue to rely on their experience and judgment when deciding whether any particular job should proceed. This document is purposefully concise and is organized into four main sections: understanding precursor analysis, performing quality engagements, making assessments and analyzing results, and avoiding pitfalls.

Understanding Precursor Analysis

1. **What is precursor analysis?** Precursor analysis is the process of observing an environment and engaging with field personnel prior to beginning work to determine if warning signs of SIF events may be present. Through a brief discussion with workers and targeted observations of the work environment, an observer can assess the worker's readiness to begin work. In simple terms, precursor analysis helps an observer to determine whether identified ingredients of a potential SIF event may be present before work starts.

2. **What is a precursor?** Precursors are reasonably detectable events, conditions, or actions that can serve as warning signs of a SIF event. Typically, they are unusual circumstances (i.e., anomalies). They are not the same as root causes. Although root causes are important to manage, they are not considered precursors unless they can be assessed through a brief field engagement and are proven differentiators between SIF events and non-occurrences.

3. **What are the research-validated precursors?** The research process revealed that the 13 precursors in Table 1 below are the strongest predictors for electric power generation and delivery. For a description of how the team arrived at this list and for a description of all 59 potential precursors studied, see the detailed project report.

Precursor	Description
Safe Work Procedure	Workers cannot express the core elements of the safe/standard workplan for their task.
Hazard Recognition	Workers do not recognize hazards or properly evaluate the severity of risks.
Departure from Routine	Unfamiliar or unforeseen task or job site conditions that depart from a well-established routine.
Plan to Address Work Change	Workers do not stop and reassess conditions when work changes from what is planned (i.e., switch to plan B).
Safety Attitudes	Workers demonstrate priority of productivity, heroic tendencies, invulnerability, fatalism, or summit fever.
Rules and Procedures	Adequate rules and procedures are documented and communicated but not followed by workers. The correct procedure is documented and communicated to workers, but they are not followed.

Familiarity with Task	Workers are not familiar with task expectations or performance standards because of a lack of experience or significant procedural change.
Risk Normalization	Lower perception of risk or higher risk tolerance resulting from repeated exposures. Tied to procedural drift.
Productivity Pressure	Workers feel an unusual amount of pressure to work quickly and complete their task.
Perceived Safety Culture	Lessons learned from previous projects and events are not incorporated into planning and execution.
Stop-Work Execution	Workers do not have the ability, or management does not encourage, stopping work to address hazards.
Workers Inactive in Safety	Workers are not engaged with or diligently participating in safety activities.
Pre-Task Plan	Workers have not completed an adequate pre-task safety plan.

4. **What is a SIF event?** A SIF event is one that resulted in or had the potential to result in a life-changing injury. A key element of this definition is the inclusion of near miss events because research has shown that the causes of high-potential near misses are the same as actual events. Notably, an organization's total recordable injury rate (TRIR) is driven by low- and medium-severity injuries and does not directly indicate SIF experience or potential.

5. **What is a field safety engagement?** A field safety engagement is the process of engaging with field personnel prior to beginning work to collect information needed for the precursor assessment. These engagements typically are conducted via comfortable conversations among an observer and worker(s). Field safety engagements end after the observer has listened to ideas, processed feedback, and provided coaching and support as appropriate.

6. **What is the most important aspect of this method?** Although the analytical methods provide intelligence and prediction, the most important aspect is a high-quality and open conversation with workers. When an observer connects well with workers and candid information is shared, the potential to improve conditions increases. Quantitative analysis of the information collected is a collateral benefit of strong worker engagements and support.

7. **How does this method fit within the overall safety program?** Most field safety practices focus on identifying and planning for the hazards of the work. For example, tailboard meetings, audits, and safety plans typically focus on the potential dangers at hand. Precursor analysis, however, focuses on the capacity of the workers to engage the potential hazards and work safely. The presence of precursors like schedule pressure, risk normalization, and poor attitudes compromise readiness and may increase the potential for events. When strong pre-task planning is performed to manage hazards and precursor analysis is used to check worker readiness, both the demands of the work and readiness of the worker are considered.

Performing Quality Engagements

8. **What questions should I ask?** The suggested questions that were validated by the research team are provided in Appendix A. These questions were validated through the research and customization process to provide observers with the information needed to perform a precursor assessment. However, users should consider these to be the *questions that the observer must be able to answer after the engagement is complete*, not necessarily the exact questions that need to be asked. Observers should strive to make conversations feel natural rather than scripted. A strength of this method is that field safety engagements can be part of typical safety conversations that occur during normal safety activities.

9. **What if my company already asks these questions?** Most trained observers already should ask some of the questions in Appendix A when they speak with field personnel about safety. However, it is unlikely that all these questions are asked, and formal assessments are made. Thus, this method can be used by all safety professionals to add additional strategy for, and intentional focus on, preventing SIF events. For less experienced professionals, this method can serve as a guide. Further, for upper-level management who are less connected to the field, this method provides a framework to engage with a field personnel about safety in an exercise that is not compliance enforcement-driven.

10. **At what stage of the work should we perform these engagements?** Ideally, perform these engagements before the work begins. A goal when using this method is to minimize the disruption of the work. To this end, observers first should observe and participate in the pre-job safety meeting, which provides answers to several questions from Appendix A without disrupting normal daily planning. Then, the observer can engage to fill in the gaps by asking the remaining unanswered questions. This approach reduces the time required to perform the engagement and avoids redundancy from the worker's perspective. If this approach cannot be used for practical reasons, the field safety engagements can be performed anytime early in the work period. Performing the engagement later in the work period diminishes the opportunity to intervene and provide support.

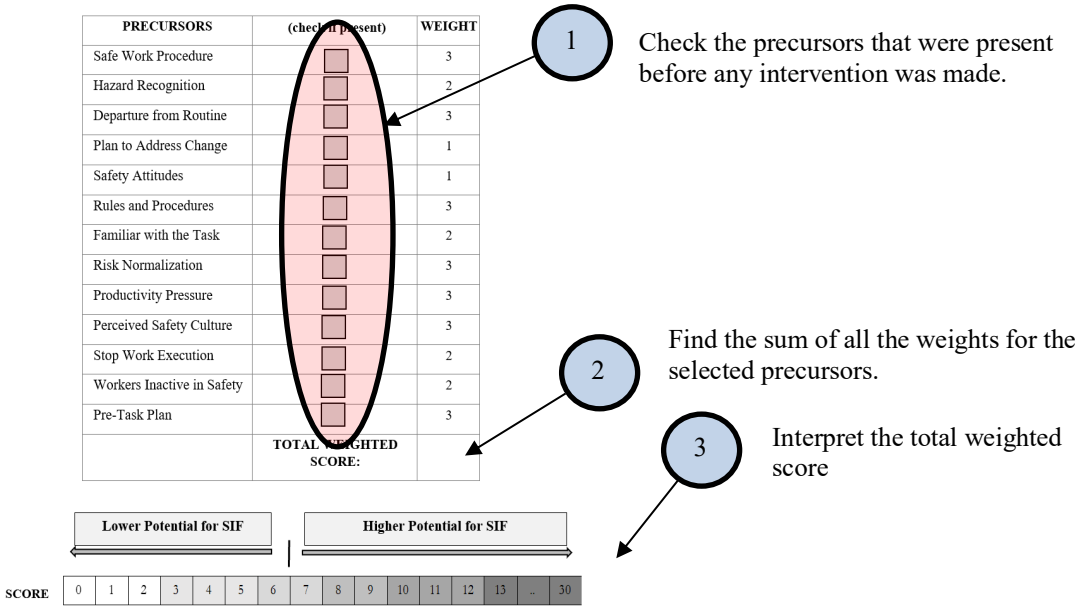
11. **Who should conduct the field safety engagements?** There are a variety of approaches to assigning individuals to the field safety engagement role. Some organizations experienced with this type of precursor analysis approach have selected specific positions (i.e., field safety managers, project managers, or safety coordinators) to perform field safety engagements, while others have selected individuals who have the personality, temperament, and emotional intelligence to engage effectively. Regardless, safety leadership training should be provided to all who assume this role to ensure that effective messaging and body language are used. Training in the use of the precursor protocol and performing precursor analysis also should be provided.

Making Assessments and Analyzing Results

12. **How do I know when a precursor is present?** Identifying whether a precursor is present or absent requires knowledge of the work type, the context in which the work is to occur, and the workers themselves. A key attribute of precursors is that they are rare occurrences (i.e., anomalies). the individual performing the engagement must compare identified current conditions against normal conditions. For example, by knowing the work and the typical context, an observer likely can judge whether a level of work pressure is actually unusual.

13. **How do I use the scorecard?** The information from the predictive analytics was converted into the scorecard shown in Figure 1 to make assessments simple and easy. Figure 1 illustrates the 3-step scoring process. Once a field safety engagement is performed, the user begins by deciding whether each precursor is present or absent by checking the appropriate boxes (step 1). A check in the box represents that the precursor (deficiency) is perceived to be present. Then, weights are tallied for all selected precursors (step 2). The provided scale is used to interpret the total weighted score, which indicates the extent to which elevated SIF potential is predicted (step 3). This scale is based upon the numerical simulation conducted during the research process. The full scorecard is provided as Appendix B. After completion, copies of completed scorecards should be submitted to safety professionals, legal/compliance contacts, and other relevant departments within the company to allow for data collection and analysis.

Figure 1 – EEI SIF Precursor Scorecard



14. **When should I make corrections?** The scale in the scorecard provides some indication of the extent to which SIF potential is elevated, but does not guarantee the absence of SIF potential. Thus, it is recommended that observers provide coaching and support if any precursors are identified. For example, a manager may help the team to plan for *change even if a low total score is obtained*. If a high precursor score results, the team should consider stopping work because a high number of unusual circumstances known to precede SIF events have been observed. For example, the observer should refer to internal work stoppage policies and should consider initiating the decision process to stop work and trigger any internal notification requirements.

15. **How can I analyze the results of precursor analysis?** If precursor assessments are collected for numerous engagements, trends in the presence of precursors can be analyzed internally. For example, the frequency with which specific precursors are encountered in the field *before intervention* provides valuable insights. This information could be shared internally and used to direct resources for the prevention of future precursor manifestations and support a proactive approach to SIF frequency reduction. For this reason, completed

precursor assessments should be shared among safety professionals or other relevant departments within the company to promote discussion and deeper analysis.

16. **What is the benefit of sharing the data with other organizations?** Traditionally, organizations share injury records to benchmark performance and explain industry trends. However, the usefulness of this information in severe injury prevention is questionable. In contrast, by reporting and pooling precursor data, industry trends may emerge and may serve as areas where organizations can collaborate to catalyze improvement. Data should be shared in accordance with relevant company policies, including information-sharing and privacy policies.

Avoiding Potential Pitfalls

17. **What are some potential problems that we could encounter?** Precursor analysis can be a fragile process, one that depends upon constructive relationships among observers and workers. The quality of field engagements is derived from a positive work safety culture that fosters the openness and honesty at all levels. Given that the manifestation of most precursors more often is linked to a cultural or managerial deficiency rather than an individual worker's error, organizations should use this method to actively encourage a culture of safety rather than as a fault-finding exercise. If organizations react negatively to field safety engagement information or retaliate against involved personnel, it is unlikely that workers will be open in the future.

18. **What if some precursors are always present?** Precursors should be relatively rare observations (i.e., anomalies). Therefore, if organizations believe that one or more precursors are present in most work, the organization's perspective of what constitutes an anomaly may need calibration. For example, if schedule pressure constantly is identified, it is possible that routine schedule pressure is being exaggerated. Additionally, if departure from routine constantly is identified for a task like troubleshooting, this precursor may not be applicable for that type of work. Regardless of the cause, no precursor should be a standard attribute of routine work.

19. **What if I think a precursor is missing from the list?** It is tempting to add precursors to the list, especially given the wealth of experience among professionals. However, it is important to recognize that a rigorous statistical approach was used to reduce the original set of more than 50 precursors to the final 13 with the greatest predictive capacity. This reduction process was critical for creating a field engagement process that could be conducted in a reasonable amount of time. If an organization wishes to add a precursor, it should recognize that the method's efficiency and validity may be compromised.

APPENDIX A - EEI SIF PRECURSOR QUESTIONS AND OBSERVATIONS

Questions

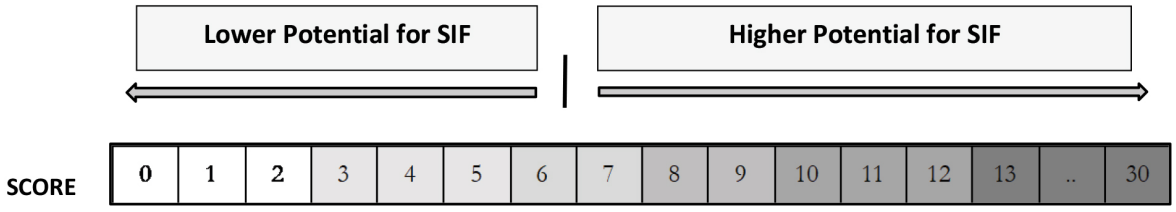
1. What are you working on today?
2. Who is doing each task?
3. What is the safe work procedure for the task today?
4. What hazards might you face?
5. What hazards might you face from your surroundings?
6. What about the work might not be completed as planned?
7. What is different about the work today?
8. How might the work or work environment change?
9. How will you manage changes in the work?
10. If the worst was to happen, what is in place to keep everyone safe?
11. What gives you confidence that no one will get hurt today?
12. What could be changed to improve the rules, procedures, or work plan?
13. When was the last time you performed this task with this configuration?
14. How long have you been doing this task?
15. Since the first time, how has the task been changed?
16. What part of this job do you expect to have to troubleshoot?
17. From whom would you seek information if you don't know how to do the work?
18. What makes you nervous about your work?
19. What would be a critical step in the work procedure where someone could make a mistake?
20. Have there been any work disruptions recently?
21. What happens when someone reports safety concerns, stop work, or a good catch?
22. What lessons learned have been shared recently?
23. How does your team communicate about the job?
24. How often is work stopped because of a safety concern?
25. What triggered the stop work?
26. What would cause this work to be stopped today?
27. Once the job is complete, what's next?

Observations

1. There is little questioning or planning that occurs prior to work.
2. Work has changed without re-planning.
3. Housekeeping is unusually poor.
4. Workers are not following the correct rules or work procedures.
5. Workers use wordings that suggest a lack of clarity about their work (e.g., "I think" "I'm guessing").
6. Experienced workers are comfortable being close to dangers or are resistive to change.
7. Good catches and near misses are not reported.
8. Workers belittling or talking over one another.
9. Work reassignment being used to manage discomfort with the work.
10. Workers are not engaged in the safety planning process or seem disinterested.
11. JSA meeting and/or paperwork suggests that the day's work was not well planned.

APPENDIX B - EEI SIF PRECURSOR SCORECARD

PRECURSORS	(check if deficiency is present)	WEIGHT
Safe Work Procedure	☐	3
Hazard Recognition	☐	2
Departure from Routine	☐	3
Plan to Address Change	☐	1
Safety Attitudes	☐	1
Rules and Procedures	☐	3
Familiar with the Task	☐	2
Risk Normalization	☐	3
Productivity Pressure	☐	3
Perceived Safety Culture	☐	3
Stop Work Execution	☐	2
Workers Inactive in Safety	☐	2
Pre-Task Plan	☐	3
	TOTAL WEIGHTED SCORE:	



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