



Causal Factors in Safety Investigations (Part 2): Causal Analysis Activities

[Part 1](#) of this series on safety investigations discussed causal and contributing factors and how their identification supports a Safety Management System (SMS). Causal and contributing factors include key actions, situations, or conditions that led to an event's occurrence or that increased an event's effects. Part 2 examines investigation activities and the "Five Whys" analysis method.¹

Investigation Activities

Typically, the first step of an investigation is preserving and securing the scene and gathering information. An investigation will often start with reporting to the event scene to conduct in-person interviews with all involved parties and to gather information and evidence that may be lost or modified once the scene is clear. The investigation team will then review information such as:

- Field observation notes (e.g., weather conditions, lighting, injuries)
- Scene photographs, sketches, measurements, and CCTV video footage
- Radio communication and recordings
- Damaged equipment, infrastructure, vehicles, public and private property, and any other evidence that is part of the event scene (e.g., broken rail, debris)

Resources

- [Identifying Causal Factors in Safety Event Investigations webinar](#)
- [Safety Event Investigation in SMS webinar](#)
- [Sample Hazard Classification System](#)

An investigation should include subject matter experts (SMEs) in the investigation process. SMEs are helpful in all phases of accident investigations, from information and evidence gathering to performing causal analysis to developing recommendations or corrective action plans to address investigation findings.

¹ The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. This document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies. Grantees and subgrantees should refer to FTA's statutes and regulations for applicable requirements.

Note that State Safety Oversight Agencies may have specific event investigation requirements for the rail transit agencies in their jurisdiction, which this article does not discuss. This article only provides suggestions related to implementing the Safety Assurance component of SMS.

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- Operating rules, bulletins, special orders, speed limits, restrictions, or other operating conditions in effect at the event location
- Maintenance records of the vehicles, equipment, and infrastructure involved in the event and vehicle event log data
- Supervisory control and data acquisition information
- Post-accident tests and inspections of the vehicles, equipment, and infrastructure involved in the event
- Internal transit agency reports (e.g., supervisor reports) and external reports (e.g., police reports)
- Past event data and trends
- Drug and alcohol test results
- Employee records and work history prior to the event, considering years of service, discipline, compliance with rules, accident history, training, qualifications, and certifications.

The investigation team will analyze all facts gathered at and away from the event scene. This analysis should include ongoing attention to the quality and credibility of the information. For example, consider whether the maintenance reports reviewed during an investigation are comprehensive, clear, signed, and dated.

The Five Whys Methods

Through analysis, the investigation team will draw conclusions to determine the most probable causal and contributing factor(s) of the event. A powerful analysis tool for event investigations is “The Five Whys Method,” a root-cause analysis technique that examines an event by asking “why?” more than once. The answer to the first “why” prompts another “why,” and the responses to each subsequent “why” prompts another, until the investigation team identifies the root cause that set in motion the sequence of steps that led to the event. Based on the root cause, the investigation team can recommend corrective actions to help avoid the reoccurrence of the event.

Situation: A train derailed.

Why? The track was out of gauge.



Why? Track inspector did not properly measure track gauge.



Why? Track inspector did not adhere to the procedure and inspection requirements.



Why? Track inspector was not properly trained.



Why? Track inspection training was never completed.



For more information on investigations, see the PTASP Technical Assistance Center (TAC) [Identifying Causal Factors in Safety Event Investigations](#) webinar.

Visit the [PTASP TAC Resource Library](#) for guides, fact sheets, and webinars on the PTASP regulation and SMS. Email the PTASP TAC at PTASP-TAC@dot.gov for technical assistance with any PTASP-related topic.



PTASP Technical Assistance Available Now

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