

THE ULTIMATE ACCIDENT INVESTIGATOR'S GUIDE

A comprehensive step-by-step guide to help you investigate and analyze accidents, uncover root causes, and make recommendations that improve your company's Occupational Health and Safety Management System (OHSMS)



Steven J. Geigle, MA, CSHM



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OSHAcademy Safety Training Network
A division of Geigle Communications, LCC
515 NW Saltzman Road #767
Portland, Oregon 97229-6098 USA
education@oshatrain.org
866.292.1430

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Introduction

Why do we conduct an accident investigation?

As an accident investigator, it is important know from the start that the purpose of the investigation is to prevent recurrence by:

1. finding out what happened
2. uncovering surface cause conditions and behaviors
3. uncovering the underlying root causes
4. implementing corrective actions
5. implementing safety program improvements

Fix the system, not the blame

As you can see above, the purpose of the investigation is to ultimately correct conditions and behaviors, and to improve safety program, policies, processes, plans, procedures, work instructions, rules, and guidelines.

The report should not state who is to blame

As the investigator, you should not do or say anything that implies you're trying to place blame on the injured employee or others. Why? If the purpose of the investigation is to establish fault, then when enough data is obtain to establish fault (usually that doesn't take long), the process stops and analysis of the safety management system (SMS) does not occur.

Placing blame and discipline are not appropriate unless the employee violated stated safety policies or rules and the safety management system did not contribute to that behavior. You will not have enough information to accurately determine fault until the accident investigation that includes SMS evaluation has been completed. If you discover root causes that contributed to the accident, forget about discipline: It won't be justified. If you and the Safety Department can't find root causes that contributed to the condition/behaviors that caused the accident, then their may be justification for discipline and that determination is made by conducting a personal performance appraisal of the specific behavior: A completely different process.

The error made by the employee may not be even the most important contributing cause. The employee who has not followed prescribed procedures may have been encouraged directly or indirectly by a supervisor or production quotas to "cut corners." The prescribed procedures may not be practical, or even safe, in the eyes of the employee(s). Sometimes where elaborate and difficult procedures are required, engineering redesign might be a better answer. In such cases, management errors -- not employee error -- may be the most important contributing causes. Even if injured workers openly blame themselves for making a mistake or not following prescribed procedures, you must not be satisfied that all contributing causes have been identified.

“Condemnation without investigation is the height of ignorance.” Albert Einstein

Accident investigators must describe causes carefully and clearly. When reviewing accident investigation reports, the Safety Department should be on the lookout for catch-phrases, for example, "Employee did not plan job properly." While such a statement may suggest an underlying problem with this worker, it is not conducive to identifying all possible causes, preventions, and controls. Certainly, it is too late to plan a job when the employee is about to do it. Further, it is unlikely that safe work will always result when each employee is expected to plan procedures alone.

When the purpose of the investigation is achieve, it stops

Accident investigations that primarily attempt to fix the blame stop once the investigator believes the fault has been established. Such investigations will make some kind of claim that the victim:

- was lazy
- lacked common sense
- was careless
- should have known better
- was dumb or stupid
- was inattentive
- was accident-prone
- had a poor attitude

The investigator who quickly arrives at these "causes" for an accident is committing attribution error. The investigator mistakenly attributes a performance failure to personal causes before considering external factors that may be contributing to the behavior.

Investigations that take this "band-aid" approach by merely fixing blame rarely analyze and evaluate safety programs. Consequently, similar accidents occur repeatedly.

When do you conduct an investigation?

All accidents, no matter how minor, should be investigated. Near-miss investigation allows you to identify and control hazards before they cause a more serious accident. The injury-accident investigation is a tool for uncovering hazards that either were missed earlier or have managed to slip out of the controls planned for them. It is useful only when done with the aim of discovering every contributing factor to the accident to "foolproof" the condition and/or activity and prevent future occurrences.

Who should investigate?

Usually, the accident investigator is the supervisor in charge of the involved area and/or activity. Investigations represent a good way to involve employees in safety and health. Employee involvement will not only give you additional expertise and insight, but in the eyes of the workers, will lend credibility to the results. Employee involvement also benefits the involved employees by educating them on potential hazards, and the experience usually makes them believers in the importance of safety, thus strengthening the safety culture of the organization. The Safety Committee may participate in the investigation or review the investigative findings and recommendations involving serious injury or extensive property damage.

Implications of accident investigations

Recommended preventive actions should make it very difficult, if not impossible, for the accident to recur. The investigative report should list all the ways to "foolproof" the condition or activity. Considerations of cost or engineering should not enter at this stage. The primary purpose of accident investigations is to prevent future occurrences. Beyond this immediate purpose, the information obtained through the investigation should be used to update and revise the inventory of hazards, and/or the program for hazard prevention and control. For example, the Job Safety Analysis should be revised and employees retrained to the extent that it fully reflects the recommendations made by an accident report. Implications from the root causes of the accident need to be analyzed for their impact on all other operations and procedures.

Benefits of the Investigation

Ted S. Ferry, a well-recognized expert in accident analysis and author of *Modern Accident Investigation and Analysis*, lists a number of objectives of accident investigation. We should also think of these objectives as benefits of effective accident investigation. The list could be greatly expanded. The rationale for each objective is usually self-evident.

- | | |
|---|--|
| 1 Reduce danger to employees and public | 14 Satisfy insurance requirements |
| 2 Prevent company resource losses | 15 Improve company products |
| 3 Prevent further mishaps | 16 Educate supervisors and managers |
| 4 Respond to management needs | 17 Develop cost information |
| 5 Prevent loss of trained personnel | 18 Anticipate government interest |
| 6 Develop costing information | 19 Identify errors in procedures |
| 7 Improve operating efficiency | 20 Comply with workers' compensation |
| 8 Provide answers to address public concern | 21 Protect against litigation |
| 9 Define operating errors | 22 Satisfy regulatory requirements |
| 10 Define management errors | 23 Research purposes |
| 11 Satisfy company rules | 24 Improve quality control and reliability |
| 12 Reduce work process disruption | 25 Isolate design deficiencies |
| 13 Provide protection against litigation | 26 Satisfy news media |

The order of listing is not important. Commonly voiced objectives that lack sound reasoning are not included. Samples of those are (1) do it for the sake of appearances, (2) justify safety manager's job, and (3) "hang someone to set an example."

Investigating to determine liability is quite different from the objective of defining management errors. While it may seem that one good investigation would serve all purposes, for legal reasons and practical expenditure of resources this is not feasible. It is true that the more complete and in-depth an investigation is, the more likely it is to serve more objectives. However, it is not practical to investigate each minor injury or mishap as if the survival of the organization depended on it. (Source: *Modern Accident Investigation and Analysis*, Ted S. Ferry, p.4)

PHASE ONE: GATHER THE FACTS

Step 1. Secure the Accident Scene (if required)

The first step in a serious injury accident investigation is to secure the accident scene. This is very important if OSHA also investigates the accident. Secure the scene so you can have time to make sketches, take photos, take measurements and obtain other necessary information. To secure the accident scene, use yellow caution tape or warning cones. If the accident occurs in the tower, nacelle, or hub, it may not be safe or feasible to secure the scene.

Step 2. Collect Pertinent Information

In this step, you will use various tools and techniques to collect pertinent facts about the accident. The information you gather in this step will be used to determine the:

- **Cause of injury.** You will want to know what caused the injury or illness. An injury occurs immediately while an illness occurs over time. Both injury and illness are caused by the harmful transfer of energy. Harmful forms of energy transfer can include chemical, thermal, mechanical. (See Appendix 2)
- **Surface Causes.** Hazardous conditions and behaviors that produced or contributed to the accident. (See Appendix 7)
- **Root Causes.** Underlying safety program weaknesses that contributed to the surface causes for the accident. (See Appendix 7)

Categories of Information

There are four categories of information that will provide facts about the accident:

- **Physical evidence.** Collect facts about the tools, equipment, machinery, facilities, environment that caused or somehow contributed to the accident. Note the position and condition of physical evidence. What is present or absent? What are the environmental conditions at the scene? Record what you see and don't see.
- **Paper evidence.** Examine written documentation, such as policies, procedures, work instructions, training records, maintenance records, previous accident records, HSE alerts and Bulletins, risk assessments, job hazard analyses and tailgate/safety meetings records.
- **People evidence.** To gather people evidence, make sure you get written eye/ear witnesses. Conduct interviews with all parties, such as the victim(s), co-workers, supervisors, maintenance workers, trainers.
- **Picture evidence.** Take photos of material evidence where it is. Also take photos of the accident scene starting with far-away shots and moving in close. Number each photo and label it with the orientation of the shot (N,E,S,W) and object being viewed. Draw a sketch of material evidence and the accident scene. Sketches are

very useful because you can show motion through time, the precise position of material evidence, and include a lot of other information. (See Appendix 4: Sketching Techniques)

Written Statements

It is a good idea to obtain written statements from witnesses. Written statements can be quite valuable in writing follow-up questions for interviews. To ensure candor while making statements, witnesses should be isolated from each other when making their individual statements. Inform witnesses that their written statements, although shared, will be used for accident prevention purposes only. Make sure witnesses thoroughly describe the “who, what, where, when, how” related to what they saw and heard. Always ask the question, “What did you see and hear?”

Make sure those completing written statements answer the following questions:

- Name, work address, and phone number
- Work station (location) and position (job title)
- Description of what happened. Begin when you first noticed something
- Technical background, skills, or knowledge
- Connection or working association with those involved in the accident?
- Time of the accident
- What attracted your attention to the accident
- The position of the vehicle or equipment and individual involved in the accident when first seen
- The direction of travel, fall, or final resting place of the vehicle or equipment and individual involved in the accident (draw a diagram, if appropriate.)
- The weather at the time of the accident. Was it clear and sunny? Was it rainy or smoky? What were the wind conditions (e.g., velocity, gusty)?
- Actions taken at the accident site
- Other eyewitnesses around
- Any additional information you would like to provide?

(Ref: U.S. Dept of the Interior)

Interviews

After the site visit, interview the “eye-ear witnesses” and others. Eyewitnesses may be your best or only source of information for determining the accident sequence of events. It is important interview as soon as possible.

The mental state of the witnesses in regard to critical accident stress should be taken into account. They may be in shock or traumatized following the accident. They may also be on medication and require the approval of the attending physician before making statements or being interviewed. On the other hand, they are frequently anxious to talk about the accident to anyone who will listen. Providing them with an opportunity to talk about the events surrounding the accident may be helpful to their psychological recovery.

You will want to interview the victim, if possible, co-workers, supervisors, maintenance personnel, trainers, and others who might have some relationship to the accident.

Interviews need to be conducted in quiet, private, comfortable locations that are free of disruption. Provide frequent breaks. Depending on the amount of information needed, an interview may need to be divided up and held in subsequent sessions. Most likely, after you've developed the sequence of events in Step 3, below, you'll need to contact witnesses to ask follow-up questions.

Questioning the Interviewee

Control questions should be developed and used. Control questions provide consistency and ensure that pertinent information is collected in all interviews. Always ask for the following information basic questions during the interview:

"What did you see and hear?"

"Can you tell me more about that?"

"What you think might have caused the accident?"

"How can we prevent this accident in the future?"

Asking the above question will generate more questions. Don't forget to ask follow-up "why" questions. For instance, if you ask *"How long had the victim been working that day?"* and the response is, *"Twelve hours,"* you might ask, *"Why had the victim been working for 12 hours?"* Be careful when asking "why-you" questions because they may be perceived as accusatory. (See Appendix _ for more question examples)

Ensure the name, work address, phone number, date, and name of the interviewer are included in the interview document. In some instances, witnesses may have to be taken to the accident site after the initial interview for clarification of their statement.

There should be no objection if an employee would like a co-worker, supervisor, or other person included in the interview. Anything you can do to help the interviewee be comfortable providing facts is appropriate. Never send any kind of message that you are attempting to conceal information.

The idea behind questioning is to get the interviewee to tell you everything he/she knows without being influenced by either the question or by what he/she thinks you want to hear. Usually, it is advantageous to move from general to specific questions and from the known to the unknown.

The interview begins by thanking the interviewee for participating in the interview, telling the interviewee why the process is important, reviewing name, work address, and phone number, position (job title), and his/her location during the accident for accuracy.

The best approach is to first ask the person to explain, in his or her own words, what happened. Ask them to start when they first noticed something. This usually helps put the person at ease and gives you a pretty good idea of what they know.

Interview Do's

- Read the witness' written statement (if available) before the interview. Develop questions from the statement.
- Explain who you are and what you are doing
- Be sensitive to the emotional state of the individual Allow witnesses to tell the story in their own words (do not interrupt).
- Distinguish "thoughts" from "feelings." They are not the same. Ask for both. Thoughts reflect ideas. Feeling described how the person felt about something.
- Tell the interviewee why he or she is being interviewed. Tell them why it's important to get at the facts and that they can be a great help in that effort.
- Explain that you need his or her help to understand, as accurately as possible, what happened
- Emphasize open-ended questioning and requests rather than closed "yes-no" response questions.
- The most important question "and then what happened?"
- Asking "why" questions, such as, "Why did the equipment stop working?" is fine. Use the "5-whys" technique. Keep asking why to each response. This technique can help you uncover root causes.
- Take notes and when finished let the interviewee read, add information, and initial that the notes are accurate.
- When possible "walk through" the actions of the individual (people recall things best in order of occurrence)
- Take your time. You're after quality as well as quantity of data.
- Whenever possible, limit team members participating in the interview to two members.
- Remember, you're trying to create a mental movie

Interview Don'ts

- Resist asking "why-you" questions, such as, "Why did you fail to reset the switch?" Doing so may cause the interviewee to think you're being accusatory. If that happens, the interviewee will become defensive or suspect that you're really searching to find fault.
- If the interviewee appears defensive, it may indicate they perceive what you've said or your tone of voice as accusatory, belittling, or otherwise blaming. Apologize if needed and rephrase the question.
- Do not come across as trying to establish truth from lies. Most of the time, people will tell you the truth. If you come across as judgmental or accusatory the interviewee will be more likely to be untruthful in some way.
- Do not prejudge a witness. Keep an open mind so you can be receptive to all information, regardless of its nature. Be serious. Maintain control of the interview. Don't make promises you can't keep. Avoid contemptuous attitudes. Avoid controversial matters. Respect the emotional state of the witness.
- Avoid collective interviews (interviewing more than one witness at a time). Be a good listener. Be unobtrusive when taking notes. Maintain your self-control during interviews. Don't become emotionally involved in the investigation.
- Do not assist the witness in answering questions.
- Avoid revealing items discovered during the investigation to the witness.

PHASE TWO: ANALYZE THE FACTS

The second phase in the accident investigation begins the actual analysis process. In this phase you will organize and analyze the facts gathered during Phase One. To organize the facts, you'll develop the sequence of events that occurred prior to, during, and after the accident. To analyze the data you'll examine each event to identify surface causes, and then by asking "why," you'll attempt to discover underlying root causes.

Step 3. Develop the Sequence of Events

A near miss or injury is the final event in a series of events

In this step, take the information you have gathered to determine the events prior to, during, and after the near miss/injury accident. It's important to note that a serious injury accident can easily be the result of 20 or more events. Events can occur any time, any where, any place, and by anyone. It's possible that pertinent events may have occurred many weeks or months before the accident. There are four categories of events:

- **Actual Events.** These are events that you are able to determine actually occurred.
- **Assumed Events.** These are events that must have happened but have not yet been verified. Flag these somehow to remind you that more investigation is needed.
- **Non-Events.** Although these describe events that did not occur, they should be captured because they may help discover conditions and behaviors relevant to the investigation.
- **Simultaneous Events.** It is possible for two events to occur at the same time. Each event would describe different actors and actions.

Developing the sequences of events that occurred prior the near miss or injury takes time, but it's a critical process for a number of reasons. You can:

- more accurately validate and verify the facts
- discover holes in the accident sequence
- eliminate the need to "memorize" what happened
- write a more accurate report
- uncover a greater number of surface and root causes

Each event in the unplanned accident process identifies:



An "actor" - The actor is the person or thing that accomplishes an action. An actor **initiates a change** by performing or failing to perform an action. An actor may participate in the process or merely observe the process.

An "action" – An action is the behavior the actor accomplishes. Actions may or may not be observable. An action may describe something that is done or not done.

Charting the Sequence of Events

Some experienced accident investigators develop the sequence of events using index cards taped to a wall or table. (See example below) This will allow you to rearrange the sequence as facts are learned.

The sequence of events represents a timeline of unique occurrences. Note that increasingly greater negative integers are used to label events prior to the injury event. The injury/near miss event is labeled as the "zero" event. Events occurring after the accident (0 event) are labeled with increasingly positive integers.

Be sure that you include only one actor and one action in each event. Don't number events until you're finished developing the correct sequence of steps. To help develop the sequence, remember to ask, "What happened next?" Put the source of the information on the back of the card.

Event -11 Feb 2 - 1330
Bob gets the six-foot step ladder from the storage room in the warehouse.

Event -10 Feb 2 - 1335
Bob carries ladder to the overhead light in the warehouse that needs replacement.

Event -9 Feb 2 - 1336
Bob notices oil on his workshoes and wipes it off with a rag.

Event -8 Feb 2 - 1337
Ralph tells Bob to hurry up because the filter on the air conditioning needs replacement.

Event -7 Feb 2 - 1337
Bob grabs the florescent light with his left hand and climbs the step ladder.

Event -6 Feb 2 - 1337
Bob lays the florescent light across the top platform of the ladder.

Event -5 Feb 2 - 1337
Bob positions his feet on the fourth rung of the ladder (second from top).

Event -4 Feb 2 - 1338
As Bob reaches to remove the defective florescent light, the replacement bulb begins to roll off the ladder platform.

Event -3 Feb 2 - 1338
Bob is startled and quickly reaches to catch the moving bulb before it falls to the floor.

Event -2 Feb 2 - 1338
The right side of the fourth rung of the ladder separates from the leg of the ladder.

Event -1 Feb 2 - 1338
Bob's right foot slips through the space between the fourth and fifth rung of the ladder.

Event 0 Feb 2 - 1338
Bob's left leg buckles and he falls back striking his back and head against the ladder.

Event +1 Feb 2 - 1338
Ralph and Betty see Bob falling and rush to help him before the ladder falls.

Event +2 Feb 2 - 1338
Ralph tells Betty to hold the ladder and carefully lifts Bob and helps him out of the ladder.

Step 4. Uncover the Surface and Root Causes

For every effect, there is a cause

Now that developing the sequences of events is accomplished, the next step is to analyze each event to see which contain conditions and behaviors that may have contributed to an accident. By continuing to ask "why" for each condition and behavior you may eventually discover their underlying root causes for those conditions and behaviors.

Surface and Root Causes