



HOW TO DETERMINE THE ROOT CAUSES OF YOUR WORKPLACE INCIDENTS

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What is an Incident Investigation

Root Cause?

At SOS Safety Solutions, we believe that incidents are preventable. With this in mind, we work to prevent future incidents by identifying root causes and implementing corrective actions. Our incident investigation forms have been designed to help you with conducting, analyzing, and documenting incidents.

Ultimately, it comes down to an individual or team to investigate the root causes of an incident and to determine if the incident will likely be repeated in the future. Seldom is there only one root cause of an incident. For root causes to exist, a number of immediate or contributing causes must also exist.

It is widely understood that most incidents are the result of a chain of events where all the links in the chain become connected and an event occurs-often resulting in injury or property damage. It is also understood that the absence of any one of the links in the chain would have resulted in the event being far different, or possibly not resulting in an incident at all. In other words, root causes are found to be far deeper management system issues than the immediate causes that occurred just before the incident happened.

Immediate causes are circumstances that immediately preceded the event. They usually can be seen or sensed. Frequently, immediate causes fall into the categories of unsafe behaviors or substandard conditions. These are generally easy to identify while conducting an investigation.

Root causes are far different-they are the real causes behind the immediate causes. Root causes generally explain why a behavior or substandard condition was allowed to exist and occur. Because the immediate causes are generally readily apparent in an investigation, root causes take some probing and analysis to determine, and then ultimately control.

Only after we begin to identify the immediate and root causes can we then move to identifying corrective actions. The whole reason to do an investigation in the first place is to identify the causes and to put actions in place that permanently prevent the incident from recurring. Let's stick with our example; what if during the course of the investigation we find that:

- There was a second set of foot prints in the oil, indicating someone previously had stepped in it and kept right on walking.
- We discover the oil came from a forklift, and upon further investigation, we find that this particular lift has been leaking oil for months. It's been reported over and over again and still has not been repaired.
- We also find that pre-shift inspections were being completed, but because nothing was being done, the employees have stopped doing them altogether.

In simple terms, root causes are the factors which, when not dealt with, will allow for an immediate cause to develop into an incident. Karl Albrecht once said: "Prescription without diagnosis is malpractice whether it be in medicine or management." Therefore an incident investigation that doesn't diagnose to the root cause level will ultimately allow the incident to be repeated again and again.

Let's look at an example: A person is walking along and steps into a puddle of oil on the floor, slips, falls, and breaks an ankle. The immediate cause in this event is pretty simple because the person stepped in oil on the floor. They should have seen it and stepped over it, right? However, the root causes of the incident go far deeper than that. To get to the root causes, you have to ask much deeper questions such as:

- Why was there oil on the floor?
- Why did the person not see the oil and step over it?
- Why wasn't the oil spot barricaded off so people could see it and be directed around it?
- Why didn't someone clean it up?
- Where did it come from? And the questions go on and on...

Without a complete investigation aimed at getting to the root cause we might have stopped at the immediate cause level. We would have put corrective actions in place dealing with the behavior of the person who didn't see the oil and slipped in it or simply cleaned it up and figured the problem was fixed. We would have failed to understand the root causes and fixed them such as:

- Why are reported issues with forklifts not being addressed?
- Why would someone feel it is okay to see a hazard and not correct it?
- Why has our management system not discovered that no pre-shift forklift inspections are being done and that repairs aren't being made?

Root Cause Analysis: The Basics

"The Weed" Symptoms Surface Issues Obvious problems-(Conditions & Behaviors)



"The Root" Causes (diagnosis) Below the surface Not obvious

Only when the root causes are removed, will the immediate causes no longer exist. For this reason, it's critical in any investigation that corrective actions address all causes identified to ensure the incident isn't repeated.

The following are some questions to ask when helping to determine if your investigation contains good actionable corrective actions:

- Do they address the immediate and root causes?
- Will they prevent recurrence on a permanent basis?
- Do they monitor their implementation?
- Are they communicated to the appropriate people?

SOS Safety Solutions believes that a quality incident investigation process is an essential element of a safety program. A world-class safety program seeks out the root causes of incidents, learns from them, and puts into place corrective actions eliminating all causes from occurring over and over again.

"Root Cause Analysis aims to diagnose all of the underlying issues, not just the singular cause".

Root Cause Definitions

A root cause usually identifies a deficiency that goes beyond the actions of an individual or physical condition. This includes weaknesses in a hazard control system (e.g. a blood borne pathogens program or fall protection program) a management system (e.g. new hire orientation or hiring practices) or a group (e.g. entire maintenance department or HR System) are examples. Progressive incident investigation works like this;

- **Personal Accountability or Decision:** Any act involving an employee making an individual decision while fully aware (fully trained and knowledgeable) of safety requirements. The employee acted in contrast to expected procedures, rules, expectations, training, etc. An employee belief that taking shortcuts or not following standards and safety practices is acceptable. (e.g., employee, fully trained on LOTO policy, but chooses to work on equipment while it is running. Perhaps an employee is educated on defensive driving and the no cell phone policy, but chooses to text and drive.) On the other hand, an employee's behavior should only be considered a root cause if an adequate safety program, safety policy, training, and enforcement are all in place. If one of these components is missing, the employees' unsafe behavior is a contributing factor and should not be considered a root cause.
- Lack of Leadership or Enforcement: Facility leadership and supervisors do not adequately lead and enforce safe working behavior using positive reinforcement and progressive discipline.
- Lack of Pre-Work Hazard Planning: Lack of pre-work planning has led to hazards that have not been identified, assessed, and controlled.
- **Tools or Materials:** The proper equipment was not available, was not maintained in good working condition, and/ or was used improperly.
- • Employee Abuse or Misuse: The improper use of resources has led to the incident.
- **Maintenance System:** Equipment has not been maintained in good working condition as a result of poor maintenance programs, lack of maintenance department prioritization, and/ or lack of preventative maintenance.
- Individual Physical Capability: The demands of the work environment are at a higher level than the abilities of the

injured employee.

- Lack of or Poor Communication: The lack of safety communication or poor communication around a hazard and its safety controls has led to an incident. This may also include written communication such as warnings or labels.
- Act of Nature: Rare natural phenomena has led to an incident occurring (tornado, flood, etc.).
- Environmental/ Biological Factors: Conditions in the physical work environment that resulted in an incident such as atmospheric hazards, extreme hot and cold, or biological issues such as insect bites or poison ivy.
- **Poor Equipment Design or Construction:** Hazard identification and control methods were lacking during the equipment design, construction, and installation phase of a project.
- Lack of or Poor Management Systems: A safety management system (SMS) is established by leadership as a systemic tool for managing workplace risks. A good safety management system ties into the culture where safety is considered a top priority and is driven from the top down. This may be considered a root cause when an organization is operating outside of their SMS which leads to an incident. Examples include inadequate follow-up from previous incidents or the lack of a hazard detection system.
- Lack of or Poor Training: An employee's lack of knowledge has led to an incident. The lack of knowledge may be present from poor training or the lack thereof.
- Lack of or Poor Policies, Programs, Procedures: Written policies or procedures are not in place, or are lacking entirely.
- Materials: Defective or damaged materials (not tools) used by an employee contributed to the incident.
- Third-Party Actions or Inactions: Actions or the lack of actions of an individual resulted in an incident to another employee.

Identifying Contributing Factors

Contributing factors are the situations, circumstances, or conditions that increased the likelihood of an incident occurring. If we consider the accident weed noted previously in this document, contributing factors are the symptoms of the problem (unsafe conditions and behaviors). Contributing factors are distinct from root causes. If the root cause(s) of an incident are removed from the situation, the incident would not have occurred. In contrast, contributing factors do not cause the incident to occur by themselves. However, contributing factors enhance the likelihood that an incident will occur. Sometimes a contributing factor may not have caused the incident by itself, but in the presence of a second contributing factor, the incident occurs. For example, an employee may slip and fall on ice on their way into work in the early morning before dawn. The low lighting may have contributed to the incident, but without the other contributing factor of icy conditions, the fall would not have happened.

Consider the incident previously mentioned in the "What is an Incident Investigation Root Cause" section. What is a contributing factor in this example? If you said the oil on the floor, you are correct. We can now use the oil on the floor to determine what the root cause(s) are. Keep in mind that while we want to address the contributing factors, we don't want to stop here. If we only address the contributing factors, we will not get to the root causes of the incident, and won't be able to systemically prevent the incident in the future. After all, we want to pull the accident weed out by the root so it doesn't come back. If we only clean up the oil from the floor in our example, the hazard will persist because the leak will persist. We will later use the contributing factors to determine root cause(s) using the 5-why Analysis.

Often contributing factors can be grouped into five categories: Task, Material, Environment, Personnel, and Management. When investigating the causes of an incident, it is helpful to think in terms of these categories.



Identifying Contributing Factors

Below is a list of good questions to ask for each contributing factor category. Keep in mind that you may find yourself struggling to determine which category a contributing factor fits under. This is perfectly fine. Some contributing factors may fit well under two categories. What is important is that the contributing factors are identified, not where they fit.

Task	 For this contributing factor bucket, the work procedure (task) being carried out at the time of the incident should be explored. Here are some good questions to ask when investigating this category. Was a safe work procedure used? Did conditions change to make the normal procedure unsafe? Were the appropriate tools and materials available and were they used? Were safety devices working properly? Was lockout used when necessary?
Materials	 Both equipment-related issues and material issues fit under this contributing factor bucket. To determine contributing factors related to materials and equipment, ask these questions: Was there an equipment failure? What caused it to fail? Was the machinery/ workstation properly designed? Were hazardous products involved? Were the hazardous conditions clearly identified?
Environment	 Hazardous conditions in the physical work environment must also be identified. It is particularly important to note sudden changes to the work environment on the day of the event. Here are some good questions to ask: What were the weather conditions on the day of the incident? Did poor housekeeping contribute? Was the temperature too hot or cold? Was there a hazardous level of noise? Was there adequate light? Were toxic or hazardous gases, dusts, or fumes present?
	The contributing factor bucket considers the physical and mental condition of those individuals

investigating the incident is not to establish blame against someone. Consider the following factors for this bucket:

- Did the worker follow the safe working procedures?
- Was the proper Personal Protective Equipment (PPE) used?
- Should PPE have been used?
- Was the employee properly trained and educated in the use of PPE?
- Were workers experienced in the work being done?
- Had they been adequately educated and trained?
- Can the employee physically do the work?
- What was the health status of the injured employee?
- Was fatigue, shift work, or overtime an issue?
- Were they under stress (work or personal)?
- Was there pressure to complete the task by bypassing safety protocols?
- Was the task under a strict deadline?

Failures of management systems are often found to be direct or indirect causes. Management holds the responsibility to provide a workplace free from recognized hazards. Therefore, the role of leadership and supervisors must also be considered. These factors may also be called organizational factors. Ask questions such as:

- Were safety rules or safe work procedures communicated to and understood by all employees?
- Were written procedures and orientation available?
- Is there adequate enforcement of safe working procedures?
- Was there adequate supervision during the task?
- Were workers educated and trained to do the work?
- Had the hazards that led to the incident been previously identified/ assessed?
- Had procedures been previously developed to eliminate the hazards or lessen the risks?
- Was regular preventative maintenance of equipment carried out?
- Were regular safety inspections carried out in the incident area?
- Had the condition that led to the incident been reported beforehand, and was action taken?

Personnel

Management

5 - Why Analysis

One of the best tools used for determining root causes is the 5-Why Analysis which was first developed in Japan and put into practice at Toyota. This technique helps to quickly identify the root cause(s) of a problem and helps us differentiate between root causes and corrective actions. The technique is also fairly simple to use.

To determine why something happened, you first have to know what happened. To complete a 5-Why analysis, you first need a complete, clear picture of how the incident occurred. This includes identifying the contributing factors-the unsafe behaviors or conditions that were discussed in the last section. Like in our accident weed, we use the contributing factors to follow the stem down deeper to discover the root of the problem.

The 5-why method can seem complicated when you first try utilizing it. Keep in mind that root cause analysis (RCA) used after an incident is a social science. Sometimes you may find yourself using the technique, but you don't come to any useful conclusions. If you are struggling while using the technique, maybe start over with another line of reasoning. Perhaps ask yourself if you have all the information-the who, what, when, where, how, and why. I have found myself struggling while using this method, then I get a single piece of information a few days later, and all of a sudden the 5-why analysis now makes sense, and a root cause(s) was determined.

In order to use this technique, we need to continually ask why an incident occurred until we get to the heart of the problem, aka the root cause. We start with a contributing factor (an unsafe act or condition). Then ask why. In the example 5-Why Analysis below, the hydraulic fluid leak is our contributing factor (unsafe condition) that we start with. Ask why was there hydraulic fluid on the floor?

An employee tripped and fell from a hydraulic fluid leak

Why?

5-Why Example

The hydraulic fluid is a contributing factor. Start here to determine the root cause.

A hydra

Why?

A hydraulic

hose burst?

The wrong hydraulic fluid was used and it deteriorated the hose

Why?

In the following 5-Why example, imagine if we stopped investigating after the leak was identified. We would fix the leak and the hose that burst, but we would never solve the root cause of the problem-there are no written procedures. We would not have our new maintenance staff trained, and it is likely that other hoses would deteriorate in the future and the hazard would persist. When the root causes of an incident aren't addressed, we will see the same incident recur in the future.

Note: Asking 5 Why's is not always necessary to determine the root cause(s). Sometimes three or four why's will reveal the root cause(s). The mechanic was not aware of which fluid to use

Why? There are no written maintenance procedures

Root Cause

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Developing Corrective Actions

After identifying the root cause(s) of an incident, corrective actions should be developed. The corrective actions should correct the root cause(s) of the incident and prevent the incident from recurring in the future. It is important to understand that not all corrective actions are created equal. Some corrective actions will completely eliminate an exposure, while other corrective actions may rely on other factors or safe working behavior to be effective. Corrective actions are generally more effective when we focus on changing the work environment and management system, rather than focusing on the worker.

It is critical to consider the hierarchy of safety controls when developing corrective actions. Understanding this hierarchy will help you to consider all potential solutions and their effectiveness. Check out the graphic below. Notice that the safety controls at the top of the inverted pyramid are more effective. The controls become less effective towards the bottom of the pyramid.

- Elimination: The most effective corrective action will completely eliminate a hazard. An example may be contracting out dangerous work to a more proficient group. For example, a corrective action to fix a leaking skylight may be to hire a contractor who is used to working on roofs. Another example would be holding virtual training sessions during a global pandemic. These examples eliminate the hazards.
- Substitution: Substitution is another effective way to reduce a hazard, but it is not as effective as elimination. An example of substitution may be to replace a flammable solvent used for cleaning purposes, with a different cleaner with less hazardous properties.
- Engineering Controls: Engineering controls isolate workers from the hazard and are effective safety controls. Sometimes an engineering control can eliminate a hazard entirely, such as placing a fixed barrier guard around moving equipment so that workers cannot contact moving parts.
- Administrative Controls: Administrative controls usually entail changing procedures. Along with the new procedures, training is often required. In the safety field we have a common saying, "If you don't document it, it didn't happen." An example of an administrative control may be retraining an employee on a specific task or requiring all visitors to be escorted through the facility.
- Personal Protective Equipment (PPE): PPE is the least effective control we can use. However, PPE is the last line of defense from a hazard. The downside to PPE is that its effectiveness is highly dependent upon the user donning the PPE appropriately. An example may be requiring all employees to wear surgical masks to limit the spread of COVID-19.

Hierarchy of Safety Controls



Brainstorming Contributing Factors Worksheet Use this worksheet to brainstorm contributing factors.

Name of Employee and Incident ______ Date of Incident



Personnel

Management

5 Why Analysis Worksheet

Use this worksheet to determine root causes from contributing factors.

Name of Employee/ Incident ______ Date of Incident _____



-	
• Why?	• Why?
Root Cause:	Root Cause:
Personnel	Management
Act or Condition:	Act or Condition:
• Why?	• Why?
Root Cause:	Root Cause:
	9

References



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