

Root Cause Analysis Explanation Guide

How to get from the event to the root causes, and what to change. A companion to the web guide **How to Conduct a Root Cause Analysis** and the Root Cause Analysis Worksheet:
calgarysafetyconsultants.ca/safety-guides/incidents/root-cause-analysis/

About this guide

A root cause analysis follows the loss causation path used in the web guide: **actual or potential loss → event → immediate causes → root causes → system correction**. The web guide explains what each link means. This guide explains how to get from one link to the next: the questions to ask, the evidence to look for, what a specific finding looks like, and how to tell when you have reached a cause worth correcting.

Use it as a team, with the worksheet open. The categories and questions are prompts, not a checklist to tick and not a coding system. The finding is always your own plain-language description of what the evidence shows. One event usually has several immediate causes and several root causes, and you follow each one back separately.

The working rule: describe the event, identify the immediate condition or action, determine the human factor or job factor that explains it, then correct the system and verify the change.

Key terms

Term	Meaning
Loss	The actual harm, damage or other unwanted result: injury or illness, property or equipment damage, environmental impact or interruption to work.
Potential loss	The credible harm or damage that could have occurred in the circumstances.
Event	The unplanned occurrence that brought a person, property or another asset into contact with a hazard or hazardous energy.
Harm threshold	The level of energy, exposure or force at which harm or damage could reasonably occur in the circumstances.
Near miss	No loss occurred, but exposure came close enough that the harm threshold could reasonably have been crossed.
Hazard observation	A hazard is present, but no unplanned event or near-contact has occurred.

Step 1: Get the facts straight before asking why

Causes found without facts are guesses. Before anyone writes a cause, the record should give the event identifier, date, time and location; the people, equipment, materials or operations involved and the work being done; what happened, in sequence; the actual loss (or that there was none), the credible potential loss, the source of energy or exposure, the safeguards that were present and what each did, and the evidence collected: photographs, equipment condition, records, measurements and witness accounts.

Keep three lists apart: confirmed facts, assumptions, and open questions. Record conflicting accounts rather than choosing one; a disagreement between witnesses often tells you something about visibility, communication

or how the job is normally done. Build a timeline that starts well before the event, because conditions usually change, and decisions usually get made, before anything goes wrong.

For a near miss, assess the harm threshold: the level of energy, exposure or force at which harm or damage could reasonably have occurred. It often can't be stated as a precise number, so describe it from the evidence and the conditions at the time. Record what was exposed or nearly exposed, how close the event came to crossing the threshold, what prevented actual loss (a safeguard that worked, an object that missed, a person who moved, or luck) and the evidence for that judgment. A near miss where only luck prevented serious harm deserves the same depth of analysis as the injury it could have been.

Step 2: Map the energy, the exposure and the safeguards

A simple way to find the immediate causes is to trace how harm could reach someone or something. Ask four questions about the event:

- **What was the source of energy or exposure?** A moving load, a vehicle, stored pressure, electricity, heat, a chemical, height, a sharp edge.
- **What path did it take, or could it have taken?** The swing of the load, the travel of the vehicle, the release from the fitting.
- **Who or what was exposed?** A worker, a member of the public, equipment, the environment.
- **Which safeguards were meant to stand between them, and what did each one do?** For each guard, barrier, isolation, procedure, warning or person: did it work, was it missing, was it bypassed, or did it fail?

Every safeguard that was missing, bypassed or ineffective, and every condition or action that put the energy and the person together, is a candidate immediate cause. Write each one down separately.

Step 3: Name the immediate causes

Immediate causes are the conditions and actions closest to the event. Describe each specifically. "Unsafe work" or "unsafe condition" isn't a finding; a finding names what was present or what was done, where and when. The tables below give the questions and evidence for each subcategory, and an example of a specific finding.

Conditions

Equipment, tools or materials	
COVERS	Was the item defective, unsuitable, unstable, improperly prepared or positioned in a way that contributed?
ASK	• What condition was the item in, and was it right for this task and load? • Was it set up, secured and prepared as intended? Had it been modified?
EVIDENCE	The item itself (kept and tagged), inspection tags and records, the manufacturer's information, photographs and measurements.
SPECIFIC FINDING	The extension ladder's left foot had lost its slip-resistant pad, and the ladder was set on a smooth concrete floor.

Guards or protective devices

COVERS	Was a guard or device missing, inadequate, damaged, bypassed or ineffective?
ASK	• What guard or device should have been there, and was it fitted and working? • How long had it been missing or bypassed, and who knew?
EVIDENCE	The guard or device, an interlock function test, maintenance and inspection records, photographs, the manufacturer's drawings.
SPECIFIC FINDING	The conveyor's tail-pulley guard had been removed for cleaning and not refitted.

Work area or environment

COVERS	Housekeeping, access, lighting, surfaces, weather or other environmental conditions.
ASK	• What were the layout, access, lighting, surface and weather at the time? • Had anything changed since the job was planned or started?
EVIDENCE	Scene photographs and sketch, light readings, weather records, housekeeping and site inspections.
SPECIFIC FINDING	Ice had formed on the unheated loading ramp, which wasn't on the winter sanding schedule.

Hazardous energy or exposure

COVERS	Moving parts, falling objects, electrical energy, pressure, heat, chemicals or another source capable of causing harm.
ASK	• What energy or substance caused, or could have caused, harm? • Was it isolated, controlled, measured or contained, and was that verified?
EVIDENCE	Lockout and permit records, gas test or exposure readings, gauges, safety data sheets, isolation points.
SPECIFIC FINDING	The hydraulic line still held stored pressure when the fitting was loosened.

Warnings or protective arrangements

COVERS	Missing or ineffective warnings, barriers, separation or other safeguards.
ASK	• What separation, barrier, sign or alarm was needed? • Was it in place, visible, understood and effective?
EVIDENCE	Photographs, barricade or traffic plans, alarm tests, sightline checks.
SPECIFIC FINDING	The lift area was marked with cones only, with no barrier or spotter where the walkway crossed the load path.

Actions

Operating or using equipment	
COVERS	Operating without the required authorization, using equipment improperly, or at a speed or in a manner that contributed.
ASK	• Was the person authorized and qualified for this equipment? • Was it used as intended, and at a suitable speed for the conditions?
EVIDENCE	Authorizations and competency records, operator logs, telematics or data loggers, witness accounts.
SPECIFIC FINDING	The operator reversed the telehandler without a spotter while the rear camera was covered in mud.

Work method or sequence	
COVERS	An unsuitable method, a missed step, or steps in a sequence that increased exposure.
ASK	• What method was used, and how did it compare with the plan and with normal practice? • Were steps missed or done out of order, and why did that seem reasonable?
EVIDENCE	The procedure, hazard assessment or permit, and interviews about how the job is normally done.
SPECIFIC FINDING	The crew removed the last temporary support before the permanent brace was installed.

Position, lifting, loading or placement	
COVERS	Taking an exposed position, lifting improperly, or loading or placing materials in a way that contributed.
ASK	• Where was the person relative to the energy and its path? • How was the load lifted, loaded or placed, and was there another way?
EVIDENCE	Scene sketch with positions, photographs, load weights, witness accounts.
SPECIFIC FINDING	The worker stood between the reversing truck and the dock edge to guide it in.

Use of safeguards	
COVERS	Not using a required safeguard, or removing, bypassing or defeating it.
ASK	• What safeguard was required, and was it available and practical? • Was it removed or bypassed, and was that a one-off or common practice?
EVIDENCE	The safeguard, interlock logs, inspection findings, interviews.
SPECIFIC FINDING	The technician ran the machine with the door interlock bypassed by a jumper wire so the door could stay open during adjustments.

Use of defective equipment	
COVERS	Using equipment known, or reasonably identifiable, as defective.
ASK	• Was the defect known, or would a reasonable check have found it? • Was it reported or tagged out, and was there an alternative?
EVIDENCE	Pre-use inspection records, defect reports, the equipment, interviews.
SPECIFIC FINDING	The grinder was used with a cracked guard that had been noted on the previous day's pre-use inspection.

Communication or coordination	
COVERS	Failing to warn, confirm, coordinate or respond to a change in conditions.
ASK	• Who needed to know what, and when? • Was the message given, received and confirmed?
EVIDENCE	Radio logs, briefing or toolbox records, handover notes, witness accounts.
SPECIFIC FINDING	The signal person started directing the lift without confirming radio contact with the crane operator, who was on a different channel.

Response to a hazard	
COVERS	Entering an area or continuing work without first dealing with a recognized hazard.
ASK	• Was the hazard recognized, and by whom? • What did the person decide, and what made that seem reasonable at the time?
EVIDENCE	Witness accounts, timeline, permits and conditions recorded at the time.
SPECIFIC FINDING	The worker continued hot work after the fire watch had left the area.

An action is never, by itself, the explanation. It tells you where to start asking why.

Step 4: Ask why, three ways, for every immediate cause

For each immediate cause, ask three questions. Each one looks at a different part of the work system, and together they stop the analysis settling on the first answer.

Question	What it looks at	Example (cracked grinder guard)
Why did it exist?	How the condition or action came about: design, selection, planning, method, knowledge, pressure.	The guard cracked when the grinder was dropped on the deck during use.
Why did it continue?	Why it wasn't found, reported or fixed in time: inspections, defect reporting, supervision, follow-up.	The pre-use inspection recorded the crack, but the form had no step to tag the grinder out, and no one followed it up.
Why wasn't it controlled?	Why the planned controls didn't catch or stop it: procedures, separation, isolation, oversight.	There was no spare grinder on site, so the crew carried on to stay on schedule.

Each answer usually points to a human factor, a job factor or both. Back every answer with evidence, and keep asking until the cause passes the test in Step 7. A "why" with more than one answer branches; follow every branch.

Step 5: Work through the human factors

Human factors relate to the person's ability to do the task and the things that affected how they interacted with it. A human factor finding doesn't automatically mean the worker was at fault. It is almost never the end of the analysis: for each one, ask what in the work system shaped it, which leads to the job factors.

Capability	
ASK	Did the physical or mental demands of the task exceed the person's capacity in the circumstances (weight, reach, heat or cold, complexity, time)?
EVIDENCE	Task demands, weights and measurements, conditions on the day, any known work restrictions (handled privately).
THEN ASK	Was the task designed and assigned with those demands in mind? (Engineering and task design; Planning and resources)

Knowledge	
ASK	- Did the person know about the hazard, the required controls and the safe method? - Was that information given to them, and when?
EVIDENCE	Orientation and training records, the hazard assessment and who signed it, briefing notes, interviews.
THEN ASK	Why didn't the planning, orientation or briefing provide it? (Work standards; Leadership and supervision)

Skill or experience	
ASK	- Had the person shown they could do this task under these conditions? - Was it their first time, or a task they rarely do?
EVIDENCE	Competency assessments, assignment history, interviews.
THEN ASK	How are people assigned and assessed for this task? (Leadership and supervision; Planning and resources)

Stress, fatigue or attention	
ASK	Could hours worked, shift pattern, workload, distraction or competing demands have affected performance?
EVIDENCE	Timesheets and schedules, overtime, workload, interviews.
THEN ASK	How were hours, staffing and workload planned? (Planning and resources)

Motivation and expectations	
ASK	- Did workplace expectations, incentives or pressures influence how the task was approached? - Was the way the task was done normal practice on this crew?
EVIDENCE	Production targets, past practice, interviews with several workers, earlier reports.
THEN ASK	What has supervision accepted or rewarded? (Leadership and supervision; Monitoring and learning)

Communication and understanding

ASK	• Was information missing, unclear, misunderstood or not confirmed? • Were there language, noise or handover barriers?
EVIDENCE	Briefing records, radio logs, written instructions, handover notes.
THEN ASK	How is critical information planned, delivered and confirmed? (Work standards; Leadership and supervision)

Step 6: Work through the job factors

Job factors relate to how the work was designed, planned, equipped, directed and controlled. This is where management system decisions show up, and where most lasting corrections are found. The example corrections show the kind of change that addresses each factor.

Leadership and supervision

ASK	• Were responsibilities, direction, oversight and follow-up adequate? • Was the supervisor present, aware of the task and able to act?
EVIDENCE	Role descriptions, supervisor logs, inspection follow-up, interviews.
EXAMPLE CORRECTION	Name a lift supervisor for every critical lift, with a pre-lift check they sign and keep.

Engineering and task design

ASK	• Did the design of the task, equipment or work area create exposure or fail to control it? • Could the hazard be designed out?
EVIDENCE	Drawings, layouts, task analysis, photographs.
EXAMPLE CORRECTION	Relocate the valve so it can be operated from the platform instead of from a ladder.

Purchasing and selection

ASK	• Were hazards considered when equipment, tools, materials or services were chosen?
EVIDENCE	Purchase specifications, approvals, contractor prequalification records.
EXAMPLE CORRECTION	Add safety requirements to the purchasing checklist for powered equipment.

Maintenance

ASK	• Were inspections, servicing, repairs and defect reporting adequate? • Was there a way to take defective equipment out of service?
EVIDENCE	Maintenance records, work orders, defect reports, tag-out records.
EXAMPLE CORRECTION	Add a tag-out step to the pre-use inspection, and a guard-refit check before lockout is removed and the conveyor restarted.

Tools and equipment

ASK	• Were the right tools and equipment available, suitable and working? • Were people improvising?
EVIDENCE	Tool inventory, requests, interviews, photographs.
EXAMPLE CORRECTION	Keep a spare grinder on site so a defective one can be taken out of service without stopping work.

Work standards

ASK	• Were procedures or standards missing, unclear, impractical, out of date or not applied? • How does the written method compare with how the work is really done?
EVIDENCE	Procedures and revision dates, observation of the task, interviews.
EXAMPLE CORRECTION	Rewrite the procedure with the crew so it matches the task, and add the exclusion zone step.

Wear and deterioration

ASK	• Had equipment or materials deteriorated, and was that found and dealt with? • Is the inspection frequency right for the use?
EVIDENCE	Condition and age of the item, inspection history, manufacturer's information.
EXAMPLE CORRECTION	Set an inspection frequency and replacement interval based on use and the manufacturer's information.

Use or misuse

ASK	• Were normal use, foreseeable misuse and unauthorized changes considered and controlled? • Was the change reviewed before it was made?
EVIDENCE	Modification records, change approvals, interviews.
EXAMPLE CORRECTION	Require a documented change review before equipment or methods are modified.

Planning and resources

ASK	• Were time, staffing, coordination and other resources adequate for the task? • Was there schedule pressure?
EVIDENCE	Schedules, crew sizes, overtime, planning documents.
EXAMPLE CORRECTION	Add lift planning to the weekly schedule and staff a dedicated signal person.

Monitoring and learning

ASK	• Were earlier hazards, reports, inspections and similar events acted on? • Were previous corrective actions checked for effectiveness?
EVIDENCE	Incident and near-miss history, inspection findings, the corrective action log.
EXAMPLE CORRECTION	Review near-miss trends at monthly committee meetings and verify that related actions worked.

Step 7: Know when you've reached a root cause

There is no fixed number of "whys". You have reached a cause worth correcting when it passes all of these tests:

- **Evidence:** it is supported by what you found, not by assumption.
- **Counterfactual:** if it had not been present, the event would probably not have happened, or would have been less serious.
- **Control:** it sits within the organization's control, in how work is planned, designed, equipped, staffed, supervised or checked.
- **Reach:** correcting it would prevent this and similar events, not just a repeat of this one.
- **Action:** you can write a specific system correction for it.

The first three are the cause test from the web guide; the last two check that the cause is worth correcting.

Signs you stopped too early	Signs you went too far
• The finding names a person or a behaviour only. • It's a label: "lack of training", "procedure not followed", "complacency". • The only correction you can think of is a reminder, retraining or discipline. • It explains this event but nothing similar.	• The cause sits outside the organization's influence: the weather, human nature, a supplier's design decision.

If you've gone too far, step back to what the organization controls: how it planned for the weather, how it selected the supplier, how it designed the task around human limits. Most events have more than one root cause. Record each one that passes the tests and gives you a useful correction.

Step 8: Write findings that lead somewhere

Weak finding	Stronger finding
Worker error.	The worker entered the load's path because no exclusion zone was set and the pre-lift briefing didn't cover the load path.
Lack of training.	The worker hadn't been shown the lockout procedure for this machine; the orientation covered a different model.
Procedure not followed.	The procedure required two people, but the shift was staffed with one, and working alone on this task had become normal.
Unsafe condition.	Ice had formed on the unheated loading ramp, which wasn't on the winter sanding schedule.
Poor housekeeping.	Pallet wrap was left in the aisle because there was no waste bin at the wrapping station.

Two worked chains

The tables below show how each immediate cause is followed back to its human and job factors and then to a system correction. Both are illustrative scenarios.

Suspended load near miss (Event ID 2026-014)

A suspended load moved outside its intended path during a lift and struck a temporary barrier. No one was injured and nothing was damaged. Potential loss: a worker struck or crushed by the moving load. The table shows two of the immediate causes. The team would also trace why the load moved off its planned path, such as rigging, tag-line control, wind or signalling.

Immediate cause	Why?	Root cause	System correction
Condition: the lift area didn't separate the load's path from nearby work.	The lift plan didn't define the load path or an exclusion zone, and no one was assigned to keep the area clear.	Job factor: the lift plan and work-area arrangements didn't set up and maintain an effective exclusion zone (planning and resources; leadership and supervision).	Revise lift planning to define the load path, exclusion zone, responsible signal person and how workers are kept clear.
Action: a worker entered the area near the load during the lift.	The worker didn't recognize that the load's path could change. The team found the worker hadn't been included in a pre-lift briefing and hadn't been told the load path.	Human factor: knowledge; communication and understanding. Job factor: the lift procedure had no briefing step for workers nearby (work standards).	Brief affected workers before each lift. Observe a later lift to confirm the controls work, and record the check before closing.

Walkway leak near miss

A worker slipped on hydraulic oil on a walkway, regained their balance and didn't fall. Potential loss: a fall injury. The event came close to the harm threshold: the slip happened, and only the worker's recovery prevented a fall that could reasonably have caused injury.

Immediate cause	Why?	Root cause	System correction
Condition: oil on the walkway from a leaking fitting on the line above it.	The fitting had loosened over time and wasn't on any inspection list.	Job factor: maintenance; wear and deterioration.	Interim: clean up and cone off the walkway, and repair the fitting. Correction: add the line to preventive maintenance and fit a drip tray over the walkway.
Action: a worker who saw the leak earlier in the shift didn't report it or warn others (communication or coordination). When it was first seen, before anyone encountered it, it was a hazard observation.	The worker who saw it assumed maintenance already knew, and there was no simple way to report it quickly.	Human factor: communication and understanding. Job factor: monitoring and learning (no quick reporting route or feedback).	Set up a simple hazard report through the supervisor with feedback to the reporter. Check after 30 days that reports are being made and acted on.

Step 9: Turn root causes into system corrections

Each root cause you choose to address needs a system correction: the change intended to address the cause and prevent recurrence. Write down the specific change, the person responsible, the due date, any interim controls until it's done, how completion will be verified and how effectiveness will be checked.

Stronger corrections: change the work	Weaker corrections: rely on people remembering
• Eliminate the hazard or the task • Substitute a safer method, tool or material • Engineering controls: guards, barriers, interlocks, isolation • Redesign the task or layout • Simplify or standardize the process or equipment	• Reminders and toolbox talks on their own • Retraining that doesn't address a demonstrated gap • New signs and warnings • A new policy or procedure the work wasn't changed to support • PPE as the only control

Changes to staffing or workload sit between the two and are worth making when they drove the event. Check effectiveness in a way that would show if the correction failed: observe the task being done, re-inspect the area, test the guard or interlock, or watch the near-miss reports for the same kind of event. Close the action only after that check is recorded. If it shows the cause wasn't controlled, revise the correction and check again.

Before you close the analysis

- The event and its sequence are described using evidence.
- The actual and potential loss are identified.
- The harm threshold is assessed for a near miss, where it applies.
- The immediate causes are recorded as conditions or actions.
- Each immediate cause is traced to human factors or job factors.
- Findings are separated from assumptions.
- A system correction is identified for each root cause being addressed.
- Each action is assigned and has a due date.
- How completion and effectiveness will be verified is recorded.

Describe the event. Identify the immediate condition or action. Determine the human factor or job factor that explains it. Correct the system and verify the change.

General information, not legal advice. Investigation requirements differ between provinces, territories and federally regulated workplaces, so confirm the requirements that apply to your workplace. The scenarios in this guide are illustrative. Full guide, legal references and sources: calgarysafetyconsultants.ca/safety-guides/incidents/root-cause-analysis/