



Incident Investigation

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INTRODUCTION

A prime objective of incident investigation is prevention. By finding the causes of an injury and taking steps to control or eliminate them, we can prevent similar incidents.

Work environment, job constraints, and supervisory or worker experience can all play a part in an injury. These factors must be examined to determine what role (if any) each played in causing the incident. Once the causes are established, measures must be identified and implemented to prevent a recurrence.

Investigators must always keep in mind that effective incident investigation means fact-finding, not fault-finding.

Information on events before, during, and after the incident must be collected. Facts and events preceding an incident explain why and how the injury happened.

Investigators can determine incident conditions by

- examining physical evidence
- interviewing witnesses

Both of these steps are of equal importance and should be taken as soon as possible to ensure complete incident investigation.

This data sheet shows how to conduct a thorough incident investigation. The first part outlines a step-by-step procedure. Where appropriate, the data sheet lists information that the investigator should take into consideration. The second section introduces the reader to real-life situations through two case histories. Both start with the investigator learning of an injury on site and follow the investigation from start to finish.

Aspects of these investigations can be applied to different situations with the understanding that the objective of all investigations is the same, to prevent recurrence.

PART 1: INCIDENT INVESTIGATION

Preparation

It's not enough just to plan for incident investigation. Investigators must be prepared with the tools to carry out the investigation. The following items are a valuable part of an investigation kit:

- tape measure
- clipboard, pen, and paper (square or graph paper is recommended for illustrations)
- equipment tags for labels
- flashlight
- emergency phone numbers (police, ambulance, fire)
- barrier tape
- camera and flash (an instant camera is easy to use and provides immediate results)
- incident investigation forms
- investigation checklist.

Emergency Response

When an incident occurs, potential danger is not limited to those directly involved. When there is a gas leak or a fire, for instance, other workers on site and the general public may also be threatened.

Though not really part of the investigation proper, quick and efficient response to an incident can help your investigation. Proper emergency response will

- prevent the present situation from getting worse
- protect workers and public from further danger and injury
- provide first aid to injured workers
- protect material and equipment from further damage
- isolate and secure the area to ensure that nothing is disturbed.

When an incident occurs the steps outlined in Table 1 are recommended.

TABLE 1: EMERGENCY RESPONSE

Action	Reason for Action
Take charge. Do not panic.	Reduces confusion and establishes control.
<p>Immediately assess seriousness of situation. Priority should be personal injury followed by property damage.</p> <p>Questions to be answered immediately are:</p> <ul style="list-style-type: none"> • Can the present situation get worse? • Is anybody injured? • How can damage be minimized? 	Permits earliest possible corrective action.
Eliminate and contain hazards. If necessary, remove non-essential personnel from danger area immediately. Treatment of injured may have to wait until others whose lives are in danger are warned and removed from danger.	Improves existing situation. Aftermath of an incident such as fire or gas leak may not only endanger those already injured but also increase casualties. Attempts to save one life may injure or even kill others.
Provide first aid as soon as possible.	Helps stabilize and improve condition of injured persons.
<ul style="list-style-type: none"> • Call the ambulance. • Relay as much information as possible, including number of injured persons and nature and extent of injuries. • Have someone meet the ambulance and guide it directly to injury scene. • Ensure clear access for the ambulance. 	Allows medical personnel more time to react to situation, thus giving injured persons better odds of survival.
Secure area. Incidents attract crowds. Direct them away from scene.	Makes first aid easier and eases risk of crowd reaction. There are enough problems in an emergency without additional excitement created by crowds.
Find out where injured persons are being taken.	Provides information for families and investigators.
Inform senior management and, when necessary, Ministry of Labour.	Meets regulatory requirement for notification when there has been a critical injury, when a worker has lost consciousness, or following any other situation as defined by legislation.

SECURE SCENE

Once the injured have been attended to and the threat of further damage is eliminated, the incident scene must be secured and witnesses identified.

Gathering facts will be easier if the incident scene is not altered. When physical evidence is left undisturbed, investigators can relate the material, equipment, and environment to the injury with minimal speculation. The steps outlined in Table 2 will help secure the scene.

TABLE 2: SECURING THE SCENE

Action	Reason for Action
Take charge. Attend to injured persons. Be aware that a crowd will likely gather.	Injured persons always take priority.
Control crowd. Ask someone to assist. Ask onlookers whether they know how the incident happened. Identify witnesses. Tell them that their help will be needed later.	Stabilizes situation, slowly bringing it back to normal. While a crowd can hinder investigation, it can also provide valuable witnesses.
Isolate incident scene.	Ensures that incident scene and evidence will not be disturbed.
If incident occurred in a room, keep onlookers outside. Post someone outside until a barricade can be erected.	Ensures easier crowd control.
If possible, ask emergency crews to leave material where they found it. Only move and remove what is absolutely necessary.	Helps to reduce guesswork for investigators.
Secure area until the investigation is completed. Physically isolate area by locking up or fencing in.	Allows investigators to go back to scene and assess what may have been missed or overlooked.

Securing the scene keeps the situation under control and prevents further disturbance until the investigation is concluded. Unfortunately, injuries always attract a crowd. Evidence can be easily disturbed by people or vehicles. If the site is not secured immediately, fact-gathering can be difficult.

IDENTIFY WITNESSES

Witnesses can disperse quickly and never be seen again. This is especially true when passersby have witnessed a construction incident.

A good witness can provide an accurate description of the incident. This helps investigators put the pieces of the puzzle together. It is important to identify and interview anyone who

- a) saw the incident and/or
- b) was in the vicinity immediately before, during, or after the incident, including injured workers.

Table 3 outlines steps for identifying witnesses.

TABLE 3: IDENTIFYING WITNESSES

Action	Reason for Action
Make a list immediately of those directly involved in incident, including injured persons.	May not be able to contact them later if names not taken quickly.
If public is involved, go to them first.	Likely to shy away from incident since most have nothing at stake. May have other commitments that force them to move on.
Ask the person who was first on incident scene to help develop list. Approach these witnesses immediately.	The person may know who else was in the vicinity at the time.
Inform all prospective witnesses that the purpose of the investigation is fact-finding, not fault-finding. Tell them that their help is needed to prevent the injury from happening again.	May be reluctant to participate. May be afraid of being blamed or feel they must point a finger at one of their co-workers. Assuring witnesses that the process is not an inquisition will help encourage them to come forward and volunteer information.
Arrange interviews as soon as possible.	More information forthcoming when memories are still fresh.
Ask each witness for a list of who may have seen or otherwise have knowledge of incident. Contact these witnesses as necessary.	Expands network of information.

Some witnesses are eager to supply information. Others may be reluctant to speak and need coaxing. Some witnesses will not come forward because they are afraid of being blamed or do not want to get involved. Whatever the reason, they may walk away from the incident scene carrying vital information.

SURVEY SCENE

Surveying the scene as soon as possible is especially critical when the incident happened outdoors and evidence such as slip, tire, or impact marks can be wiped out by weather conditions. Surveying the incident scene as soon as possible also gives the investigator a feel for the environment at the time of the incident.

Survey the scene to

- collect and double-check evidence
- confirm witnesses' statements
- determine inconsistencies
- establish cause of injury.

Use measuring tape, camera, and sketches to record the scene as found by the investigating team. Note the location of any objects or persons removed from the scene. Detailed and accurate documentation is important for consistency. All information recorded at this stage must be corroborated with witnesses and other facts. Pictures are worth a thousand words. Documentation is also valuable in writing reports.

When surveying the incident scene, list and tag equipment and material involved before, during, and after the incident. Include items that may have been struck during the incident. The list may grow as the investigation proceeds. Do not overlook any piece of evidence until the investigation is completed.

This list provides an inventory of items to be investigated and is another important reason for keeping the incident scene undisturbed until the investigation is concluded.

List any environmental conditions at the time of the incident. Survey the scene and try to imagine how the incident could have occurred. All elements that may have come into play should be considered.

Table 4 lists specific areas to investigate.

TABLE 4: SURVEYING THE SCENE

Action	Reason for Action
<p>a) Weather</p> <ul style="list-style-type: none"> • Conditions • Temperature • Visibility 	<p>Extreme high or low temperatures or high winds may put workers in danger. Poor light may limit workers' view and restrict communication. Glare or bright flashes of light can temporarily blind workers.</p>
<p>b) Incident surroundings</p> <ul style="list-style-type: none"> • Are there marks that could provide clues to the incident? • Anything out of the ordinary? 	<p>Skid marks, scratches on the floor can be keys to more evidence and contribute significantly to investigation.</p>
<p>c) Work site</p> <ul style="list-style-type: none"> • Were floor and work areas clear and dry? • Was there a risk of slipping? • Could debris cause trips and falls? • Was the work area too confined? • Was access clear and open? 	<p>Slippery floors may not give workers or equipment proper footing. Lack of space may create additional materials handling or make a worker work closer to the equipment than recommended.</p>
<p>d) Equipment, materials, and tools</p> <ul style="list-style-type: none"> • Confirm location in relation to injured worker. • Match damage or other marks on equipment or tools to damage or marks on floors and walls. Are they consistent? • Check safety devices such as guardrails and safety catches. • Are machinery controls on or off? Confirm with the operator. • Photograph and record nameplate data, such as weights and load limits. • Check for equipment malfunction. • Check for structural damage as well as damage to equipment, piping, etc. 	<p>Safety guards are often removed.</p> <p>Establish consistency. Verify that what the operator said is correct. If not, there may be some problem with machine, equipment, or operator's familiarity with machine or equipment.</p>

GATHER EVIDENCE

Evidence can be of two kinds—physical objects and verbal testimony. Where appropriate, evidence should be gathered as witnesses are being interviewed. The witness can talk or point to objects and equipment, and together the investigator and the witness can examine physical evidence. The key to collecting evidence is to be thorough and inquisitive. A matrix is a valuable tool in this process.

It can be used, for instance, to follow details before, during, and after the incident. Categories can include people, equipment, and environment.

Table 5 illustrates a typical matrix

TABLE 5: INVESTIGATION MATRIX

	Before	During	After
People			
Equipment			
Materials			
Environment			
Processes			

Question marks should be placed where details are unknown. As the investigation progresses and more information becomes available, the matrix will slowly fill up and questions should disappear. The matrix may also grow as new items and personnel are added. Sometimes questions may remain unanswered, especially when there are no surviving witnesses and/or the person is unable to remember what happened.

Preparing a Matrix

- a) Prepare a list of questions for witnesses.

Interviews can be fast-paced where one question sometimes leads to another. A list helps focus the information and minimize risk of missing vital details. Check off the questions as they are being asked during the interview. Making a list is another way of being better prepared for the interview. Be prepared to add to the list as the interview generates new leads.

- b) List questions regarding physical evidence.

Investigation ensures validity of the information as well as providing consistency. This includes conducting tests where appropriate.

c) List details to be investigated by outside experts.

When dealing with a subject that is not within your expertise, get help.

d) Update matrix as new information is received.

New information may answer some questions as well as generate new ones. The updated matrix provides a running record on progress of investigation.

e) Continue using matrix until as many questions as possible have been answered.

Another way of gathering information is to re-enact the incident. However, this should be done only as a last resort.

Re-enactment can be a traumatic experience for those involved. It should only be done when

- information cannot be obtained in any other way
- it will aid in determining preventive action
- it is necessary to verify facts given by witnesses or victims.

Before re-enacting the incident ensure that those involved

- are emotionally fit
- consent to the re-enactment
- understand that they are to act out the events which preceded the injury, not the final triggering event (close monitoring is essential to ensure that nobody is in danger).

Participants must take the following steps.

- Explain what they are about to do before each step.
- Identify the triggering event.
- Understand the triggering event as the point at which the re-enactment is to be stopped.
- Explain what they are doing and demonstrate each step in slow motion. Slow motion enables the investigator to understand and observe the activity in greater detail and reduces the danger to those involved.

INTERVIEW WITNESSES

Interviews are best done when memories are fresh. This can be achieved by conducting interviews as soon as possible after the incident.

Partial interviews, especially of the injured, can take place while waiting for the ambulance.

Gently questioning the injured while awaiting an ambulance helps determine the seriousness of injuries. It also keeps the injured alert and keeps his or her mind off the injury. Asking questions at this stage can give an investigator some feel for what has happened.

Interview witnesses to

- confirm and explain what has happened
- corroborate other witnesses' accounts of the incident
- obtain suggestions on how the incident can be prevented.

Interviews may create as many questions as answers. However, cross-referencing with other witnesses and examining physical evidence should provide missing pieces of the puzzle.

When conducting interviews, keep in mind all potential contributors to the incident. Were the proper equipment and materials used in the operation? Was the correct procedure followed and did it affect the outcome?

When asking witnesses to recall what they saw or heard, it is important to pay attention to details on events **before** the incident. Most of the time, injuries occur as a result of events preceding the triggering event.

During the interview, the investigator should determine

- identity of people involved in the incident
- identity of people with possible knowledge of the incident
- events that occurred before, during, and after the incident
- timing and sequence of events
- location and direction of actions and events
- possible causes of each action and event
- witness' suggestions for preventing similar incidents.

It's also important to put the witness at ease. Table 6 outlines how to conduct an interview.

TABLE 6: CONDUCTING AN INTERVIEW

Action	Reason for Action
Conduct interview as soon as possible.	Events still fresh in witness' mind. No time to talk extensively with others who may influence witness' observations.
Keep an open mind. Be curious but careful not to put witness on defensive.	Closed minds tend to disregard important facts that do not match set theory.
Be as informal as possible. Again, tell witness purpose of investigation and interview. Reassure that it is fact-finding, not fault-finding.	Puts people at ease. Improves cooperation and may result in more information. People get defensive when questioned on events that have gone wrong, especially when they are involved.
Let witness know that information is needed to help improve job safety.	People are more cooperative when told someone needs their help.
Conduct each interview in private, on a one-to- one basis.	More personal and non-threatening. Keeps one opinion from swaying another. Two investigators asking questions may intimidate witness.
Hold interview at the witness' convenience, but stress that it should be done as soon as possible.	Makes witness feel important. Allows witness some control of situation. Shows that interviewer is considerate.
If possible, conduct interview at incident site.	Makes for easier recall. May trigger additional memories.
Ask for witness' account of incident. Let him/ her speak and describe observations. Let the witness tell the story twice. The first time just listen, the second time take notes.	Minimizes outside influence. Different perspectives provided by different witnesses. May bring out information needed to complete the investigation. Confirms what was first heard.
Take notes during interview. Let witness see what is being written.	Ensures that nothing is forgotten. Let's witness see that investigation is open.
Do not interrupt witness. Leave questioning the until end.	Disturbs train of thought. Can also put witness on defensive.

Action	Reason for Action
<p>Get witness to expand information through open-ended questions/statements such as:</p> <ul style="list-style-type: none"> • What do you think happened? • What was done? • Describe how the vehicle got into this position. <p>Avoid questions that can be answered by a simple <i>yes</i> and <i>no</i> such as:</p> <ul style="list-style-type: none"> • Did he turn on the ignition? • Was that the way he did it? • Did the collision with the forklift cause the vehicle to arrive at this position? 	<p>Results in more information Questions answered from the witness' perspective. May open other avenues of investigation.</p> <p>Questions answered yes or no limit the information received and close investigator's mind to other possibilities.</p>
<p>Ask <i>why</i> and <i>who</i> questions last.</p>	<p>Often puts people on defensive. Once they feel threatened, flow of information will likely stop.</p>
<p>Repeat witness' account as you understand it.</p>	<p>Confirms investigator's understanding. Speakers often do not listen to themselves talk. It gives witness a chance to correct any errors or oversights. Allows witness to think the story over again.</p>
<p>Close interview on positive note. Thank witness for helping and ask for suggestions on how injury can be prevented. Ask witness to contact investigators should other information come up.</p>	<p>Having to re-live and tell about an incident is often unpleasant. Your gratitude can make the ordeal worthwhile. Seeking suggestions makes witness feel that his/her opinions are worth considering. Encourages witness to come forward later with additional information. Reaffirms purpose of investigation.</p>

At the conclusion of each interview, highlight new questions that need answering by listing information retrieved, what was accomplished, and what needs to be completed. The matrix lets the investigator identify gaps in information and details that need to be confirmed.

ANALYZE FACTS

Once the scene survey and interviews are completed, the information should be sorted and analyzed to

- identify what has been found
- identify what may be missing
- determine next course of action
- eliminate unnecessary duplication.

One method is to use the matrix to connect people, equipment, and materials in a sequence of events that makes sense. *It's important at this stage to separate facts from opinions and conjecture*

After the matrix is filled in, all information can be confirmed by cross-referencing witnesses' stories, examining the evidence, and, if necessary, re-enacting the incident. Investigators should then know what happened step-by-step. Connections between details and the effect of one action on subsequent events should be understood.

Incidents are often symptomatic of hidden deficiencies. Some problems are direct causes, some are indirect. All deficiencies should be accounted for when determining incident causes.

PREPARE REPORT

The final report is designed to help people learn from the incident. Recommendations must also be included so that the injury will not be repeated. Recommendations must be evaluated and implemented by those with authority. Another purpose of the report is to help the industry analyze the problem should it occur again. The report should contain the following:

- Project location
- Date and time of injury
- Names and addresses of injured
- Nature of injuries
- Attending physician
- Names and addresses of persons involved
- Names and addresses of constructor and employer(s)
- Material damage, including costs
- Names and addresses of witnesses
- Description of incident, including equipment and machinery involved and type and circumstances of occurrence
- Immediate and underlying causes
- Recommendations for corrective action
- Signatures of those conducting investigation and preparing report.

Four factors are essential for the report to be effective and easy to understand.

1. Outline all events contributing to the incident in sequential order.
2. Point out deficiencies or breakdowns in the system as they occurred.
3. Summarize deficiencies.
4. Link all recommendations to deficiencies.

FOLLOW UP

Circulate results of the investigation to all company sites so others can learn.

Make changes in company operations and raise key issues with trade associations, other contractors, unions, and other groups as necessary.

PART 2: CASE HISTORIES

The following case histories allow the reader to experience two incident investigations, comparing these real-life incidents with the classroom situation cited in Part 1.

Incident investigation may not—and sometimes cannot—follow the steps outlined in the previous section. Instead, the investigators must adapt to the situation and make the best of what is available.

Both case histories are presented in two columns. The first column describes the story from the perspective of the investigation team. The second column provides comments and the investigators' reasons for action or lines of thought.

While the first case history is relatively complex, the causes of the majority of construction injuries are simple and obvious. Causes are immediately known.

The second case history falls into this category. It shows that, though the steps outlined in Part 1 still have to be followed, the situation allows the investigator to execute most of these steps quickly. Some were omitted completely.

CASE HISTORY 1: THE SLIPPING COMPRESSOR

The first incident occurred on a high-rise commercial project. As is common, the project superintendent was designated as the incident investigator.

What Happened?	Comments, Reason for Action, or Line of Thought
Superintendent is working in the site trailer when a supervisor radios in that there's been an incident.	The investigator is seldom the first person to find out about the incident.
"The refrigeration crew has had an incident. They were lowering the compressor through the roof opening when it slipped and hit a couple of the crew!"	As worker explains what has happened, superintendent assesses the situation.
Superintendent immediately calls his assistant superintendent over: "A couple of people are seriously hurt in the mechanical room. Call an ambulance and tell them someone will meet them at the front gate."	It's important to ensure that the injured get medical help as soon as possible. More details can be conveyed to the ambulance crew as they become available.
The superintendent then calls on the radio to get someone to notify the health and safety rep and send him over to the scene.	While getting someone on the scene as quickly as possible is important, superintendent should remain in the office long enough to ensure all emergency procedures are in place.

What Happened?	Comments, Reason for Action, or Line of Thought
<p>Superintendent then radios the supervisor on the scene for more information.</p> <p>“An apprentice says the fitter and a carpenter are hurt. The fitter was hit in the head—he’s unconscious. The carpenter has his leg pinned under the compressor. He’s in pain and screaming like crazy.”</p>	<p>Superintendent now has an idea that the incident involves at least the compressor, the crane, the refrigeration crew, and a carpenter.</p> <p>An apprentice somehow has knowledge of the incident but his role is otherwise unknown.</p> <p>Superintendent knows that, if the incident involves heavy equipment such as a compressor, the injuries to the two workers could be serious.</p> <p>Superintendent is taking charge and initiating emergency response. At the same time, he also realizes that some of the information is second hand.</p> <p>He needs to confirm the accuracy of the information.</p>
<p>The superintendent confirms the details and passes them on to his assistant, who can then provide further information for the ambulance crew.</p> <p>“Okay. Let the ambulance know that two people hurt, one head injury and one leg injury. The guy with the head injury is unconscious. From the sound of it, both guys may go into shock.”</p> <p>“Call head office and tell them we may need help. You know our emergency procedures, let’s get them going.”</p>	<p>Superintendent delegates other responsibilities to assistant to speed up the process. Assistant has been trained in emergency response and she will know what to do.</p>
<p>Assistant repeats what superintendent has just said: “Let’s see if I got all of it. Incident in the mechanical room, one head injury; one leg, both may be in shock. The guy with the head injury is unconscious.”</p>	<p>Before calling the ambulance back, assistant confirms that all information is correct, including location of the incident.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>“You want clear access for the ambulance, a person to meet it at the gate and you also want me to call head office,” assistant continues. “Do you want me to free the elevator for the ambulance crew as well?”</p>	<p>Assistant confirms with superintendent that the actions are the correct ones.</p> <p>Showing initiative, assistant suggests freeing the hoist, ensuring immediate access for medical help.</p>
<p>“Good thinking,” says superintendent. “I’m going! Stay put, will you? In case there is a change in the situation.”</p> <p>Then superintendent grabs a radio and first-aid kit and heads to the incident scene.</p>	<p>Superintendent hopes that first aid is already being provided.</p> <p>Treating serious injuries as soon as possible is critical. Superintendent is going to the incident scene ready to provide first aid. He takes the radio to keep him in constant contact with his assistant.</p>
<p>Assistant super calls the ambulance back, providing specific details and confirming where the ambulance should enter. “We have two people injured, one possible head injury, the other, leg. One guy is unconscious. There will be someone at the entrance waiting for you.”</p>	<p>Assistant is relaying all details including the possible extent of injuries so that the ambulance crew will arrive prepared to deal with this type of situation.</p> <p>Directions are very specific, right down to exact location of entrance.</p>
<p>Then, assistant radios one of the forepersons about the incident and asks him to make sure that the pathway to and from the incident site is clear.</p> <p>Assistant super tells him to make room for the ambulance at the hoist area and asks him to free the hoist.</p>	<p>Assistant is proceeding with the second priority in emergency response, making sure that the ambulance can get in and out quickly. The sooner the injured get medical help the better.</p> <p>Assistant then makes sure that the foreperson understands what needs to be done.</p>
<p>Assistant then calls a worker over and instructs him: “There’s been an incident on the tenth floor, the mechanical room. We’ve called the ambulance. I want you to go to the entrance and meet them, lead them to the incident scene. Use the hoist. Got it? Tenth floor mechanical room!”</p> <p>The worker nods and assistant goes back inside the trailer to call head office.</p>	<p>Assistant makes sure that worker sent to the entrance understands his responsibility. Again, everything is spelled out in detail.</p> <p>Back-up help may be needed and assistant is informing head office so they will also be prepared for the situation.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>As he arrives at the incident scene, superintendent scans the room quickly. The injured carpenter attracts his attention immediately because he is screaming in pain.</p>	<p>Superintendent must now assess the situation. He sees carpenter and recognizes that he is hurt.</p>
<p>Superintendent sees a bone protruding from the carpenter's leg. He continues to scan the room.</p>	<p>His first priority is ensuring that all personnel in the room are out of immediate danger. He must do this prior to anything else.</p>
<p>Superintendent sees that the compressor is sitting on some 4 x 4s and appears to be in no danger of moving or tipping over. He confirms with the mechanical foreperson that it has been stabilized.</p>	<p>Compressor appears to pose no immediate danger. Superintendent notes that it is not on the carpenter's leg. At least they've moved it.</p> <p>Confirmation assures that superintendent is not assuming that the hazard has been neutralized.</p>
<p>Superintendent is taking stock of incident scene as he tries to find injured fitter.</p> <p>"Where's your fitter?" he asks mechanical foreperson.</p> <p>"Around the corner!" comes the reply.</p>	<p>Superintendent has to quickly locate unconscious fitter and see how serious his head injury is.</p> <p>Has first aid been provided? Why was he left all alone unobserved? That's not good first aid practice. First aid has to be given as soon as possible.</p>
<p>As superintendent moves around compressor to provide first aid, he takes a quick inventory of the condition of the room, mentally summarizing what he knows so far.</p>	<p>A mechanical foreperson, carpenter, electrician, and fitter are all witnesses to the incident.</p> <p>Aside from comforting the carpenter, the mechanical foreperson has not provided him with further first aid. Does he know first aid or can he do anything here without the first-aid kit?</p> <p>As a foreperson and supervisor of the mechanical crew, he should know first aid and therefore probably have done more initially. That requires further investigation later.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>On the way to other side of compressor, superintendent trips over piece of rope. He notes other conditions: splinter of wood on floor; sling hanging off compressor in middle of room; one side of compressor badly scratched.</p>	<p>Superintendent will need these mental notes later to recollect the scene. Right now he has to check on the fitter. Everything else must wait.</p>
<p>Curious workers begin filtering in, pushing and elbowing past each other to see what has happened.</p> <p>Superintendent tells them to keep well away from incident scene.</p>	<p>Unfortunately, superintendent must also deal with crowd and secure scene before things get out of hand, making first aid difficult.</p> <p>This prevents onlookers from pushing into room, making later investigation more difficult. Superintendent shows the crowd that he is in charge.</p>
<p>Superintendent asks electrician for help in controlling the crowd.</p> <p>“Keep them out of this room and, while you’re at it, ask if any of them saw or knows what happened. Just jot their names on a piece of paper.”</p>	<p>Superintendent is making things easier by delegating. He lets electrician secure scene and handle crowd control until injured are taken care of.</p>
<p>Superintendent finds fitter on other side of compressor, face up on floor.</p> <p>Superintendent speaks loudly but gets no response. Fitter’s chest is still. He isn’t breathing and has no pulse.</p>	<p>Though superintendent sees blood on the worker’s temple, he must first check for breathing. It’s no good treating a man’s bleeding if he isn’t breathing.</p> <p>The fitter’s injury is more life-threatening than the carpenter’s.</p>
<p>Superintendent quickly performs CPR. After a few seconds, fitter starts breathing on his own.</p>	<p>Superintendent must restore breathing fast. He has been trained to do so through CPR.</p>
<p>Superintendent treats bleeding head with pressure bandage.</p>	<p>Now superintendent can treat worker’s other injuries. He knows that health and safety rep is now treating carpenter on other side of compressor.</p>
<p>Superintendent confirms with health and safety rep that everything is under control.</p>	<p>Superintendent ensures that conditions of injured workers are stabilizing and not getting worse.</p>
<p>Superintendent keeps a close watch on fitter, talking to him constantly. He monitors breathing, pupils, pulse, level of consciousness.</p>	<p>He must keep fitter awake, alert, and conscious so he can monitor his condition better. He does that by keeping fitter talking.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>While superintendent is giving the fitter first aid, mechanical foreperson is helping health and safety rep apply makeshift splint to carpenter's broken leg.</p> <p>Health and safety rep informs superintendent that he used two pieces of strapping found in the room as a splint for carpenter's injury.</p> <p>"Did you note anything unusual on the strapping?" superintendent asks.</p> <p>"Yeah, I saw some marks on the pieces we used," the rep replies.</p> <p>"We'd better have a good look at it when the hospital is through with it," the super says.</p>	<p>The wood is evidence that may be vital to investigation. Strapping must be retrieved later from hospital.</p>
<p>Ambulance arrives right after first aid is completed. Superintendent provides attendants with details on both of the injured. He also asks the attendant their destination.</p> <p>Superintendent informs attendants that he wants splint saved as evidence.</p>	<p>Superintendent obtains this information so that victims' families can be notified.</p> <p>Interviews with injury victims will likely involve a visit to the hospital.</p> <p>Wood used as splint in first aid must also be picked up.</p>
<p>Superintendent radios his assistant super, "Could you please call Ministry of Labour, the police, and head office for me? It's a bad incident, we've got to report it."</p> <p>"Could you also please get up here with the investigation kit? And, oh yeah, good job on the ambulance, they came quickly."</p>	<p>Superintendent is complying with the law. Such an incident must be reported to police and MOL.</p> <p>He must initiate investigation as quickly as possible after police and MOL are finished. Investigation should be conducted while events are still fresh in witnesses' minds.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>While waiting for the authorities, superintendent asks health and safety rep if he has learned more about the incident.</p> <p>The rep says that he talked to the mechanical foreperson when performing first aid.</p> <p>He learned that the foreperson, who was supervising the lift, was first person on the scene after the incident.</p> <p>“Both injured workers were using a rope to pull the compressor over to the concrete base. The injured carpenter said something about the roof opening not lining up with the concrete base.”</p>	<p>Superintendent is trying to fit pieces of puzzle together as quickly as he can. The more he learns about the incident, the better.</p> <p>He now knows what the injured workers were doing when the incident occurred.</p> <p>Still, this doesn't explain why his carpenter was involved with the rigging operation. Now he hears that the roof opening didn't line up with the compressor base.</p>
<p>Superintendent looks up and confirms that the roof opening does not line up with compressor base.</p>	<p>Superintendent doesn't need his tape measure to tell him that the alignment is off. He never thought that it mattered. Or does it?</p> <p>Situations such as this are not uncommon. As a matter of fact, he remembers other roof openings that did not line up with the mounts.</p>
<p>The health and safety rep continues: “The refrigeration crew had the apprentice on the roof, to signal the crane. There was confusion regarding the signals. The compressor slipped during the confusion.”</p>	<p>Now the superintendent learns that the apprentice was signalling. There was confusion as well. Incidents often happen because of confusion. Now he has to find out what caused the confusion.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>Superintendent inspects compressor for rope marks. But all he sees are scratches on one side indicating metal-to-metal contact.</p> <p>He moves towards the sling and finds paint marks the same colour as the compressor's.</p> <p>He carefully inspects pieces of broken strapping scattered on the floor for marks, paint chips.</p> <p>Strapping looks brittle to superintendent. He inspects remaining pieces of strapping on the floor. All of it looks of poor quality-brittle, and with cracks and knotholes.</p>	<p>Superintendent is checking to see where tagline was placed when workers were pulling load.</p> <p>If rope was tied to compressor, would the first people on the scene have had time to undo the rope during the confusion?</p> <p>His guess is that rope was slung over or tied to sling and not tied to compressor. Still, he has to confirm that with witnesses.</p> <p>He also has to determine the consequences of not tying the rope to load. Could it cause load to tilt over?</p> <p>He makes a mental note of marks on compressor. He can now confirm that sling came in direct contact with compressor during incident.</p> <p>Consequences of using poor quality wood must be investigated as well.</p> <p>Scratch on the compressor and broken wood on one side suggest that load was off-centre.</p> <p>Paint marks on sling also indicate that wire rope came in direct contact with compressor, which indicates that the softener must have slipped off sling sometime during the incident.</p>
<p>The authorities arrive and are brought over by assistant superintendent.</p> <p>Superintendent cooperates fully and then asks his assistant to stay and help in the investigation.</p>	<p>In confirming assistant superintendent's involvement in the investigation, superintendent is acknowledging that he needs help. Two heads are better than one.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>Once authorities have left, superintendent and health and safety representative start separate investigations.</p> <p>Superintendent decides to examine the room and opening in the roof first. Health and safety rep and assistant superintendent accompany him.</p>	<p>Superintendent and health and safety representative are conducting parallel investigations and will compare notes later.</p> <p>Health and safety representative is investigating on behalf of the workers. (His step-by-step investigation is parallel to superintendent's and, because of duplication, is not shown in this document.)</p>
<p>Superintendent and health and safety rep review list of possible witnesses:</p> <ul style="list-style-type: none"> • injured workers, the carpenter, and the fitter • mechanical foreperson • mechanical apprentice • electrician • crane operator 	<p>As the workers' rep, the health and safety representative may be able to retrieve more information from witnesses than the superintendent.</p> <p>The carpenter, fitter, mechanical foreperson, and electrician were all at the scene. The apprentice must be interviewed since he somehow has knowledge of the incident.</p> <p>The crane operator might not have seen the incident, but he may know something about how it happened.</p>
<p>Superintendent asks one of his workers to barricade incident scene with barrier tape.</p> <p>He and his assistant super each prepare another list of material and equipment involved in the incident:</p> <ul style="list-style-type: none"> • compressor • sling • strapping/wood • tagline • crane • concrete base • roof opening 	<p>Superintendent is gathering physical evidence. He must later relate the position of material and equipment to witnesses' accounts of the incident.</p> <p>Physical evidence must be consistent with witnesses' accounts.</p> <p>Superintendent and assistant compare lists to ensure that nothing is missing.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>With the help of his assistant, superintendent draws a sketch of room and material involved.</p> <p>He measures horizontal distance compressor had to travel from roof opening.</p> <p>He also draws a sketch of roof opening in relation to location of compressor base.</p> <p>Superintendent uses a camera and takes a picture of scratches on compressor and a chip he notices on one corner of concrete base.</p>	<p>Physical evidence is included in sketch and photographs.</p> <p>Sketches will help investigators describe incident. It will also help them write report.</p>
<p>Superintendent and assistant superintendent climb to roof, noting location of crane and confirming that operator would have no problem seeing signaller.</p> <p>They note damage to roof opening and scratch marks indicating metal-to-metal contact on structural frame of roof opening.</p> <p>They also detect some damage on roof deck. It looks as though the sling got snagged during the operation.</p>	<p>Superintendent must also inspect roof since the signaller was somehow involved. He confirms that, under normal circumstances, the crane operator should be able to see the signaller.</p> <p>Something has gone wrong somewhere. Superintendent must check with both crane operator and signaller.</p> <p>Evidence must also be added to his lists. He must investigate and confirm whether the scratches on roof were a significant result of the incident.</p>
<p>Once examination of physical evidence is complete, superintendent approaches witnesses.</p> <p>The apprentice is still near the mechanical room where the incident occurred.</p> <p>Superintendent explains, "The objective of this exercise is to find out what went wrong, not who is at fault. When we find the answer, we want to correct it so it will not happen again."</p>	<p>Superintendent is being honest about his motive. Witnesses must trust the investigator if they are to open up.</p> <p>By outlining the objective of the investigation, the witness is included as part of the team instead of feeling like an outsider.</p>

What Happened?	Comments, Reason for Action, or Line of Thought
<p>“Put yourself in my shoes. We have three more lifts like the one we did today. We don’t want any more people hurt and I’m sure you feel the same way. You can’t do anything about what happened today but you can sure do something about future lifts. We just want to find facts, not fault.”</p>	<p>Superintendent is relating the problem he has with the upcoming lifts. It is a problem that the apprentice can identify with and understand.</p> <p>By emphasizing that their help is needed and that they should not feel threatened, investigator encourages witnesses to open up.</p>
<p>Superintendent tells apprentice how interview will be conducted.</p> <p>“All you need to do is just tell me what happened. This is no inquiry, we’ll do it whenever you are ready. We are just going to talk, one on one. If you’d rather talk to the assistant superintendent, that’s fine too. If you want, you can have your union rep here when one of us talks to you.”</p> <p>“But we’d like to do this soon, while the details are still fresh in your mind. Anyway, you know where to find us. Just give us a call when you’re ready. I hope you can help us.”</p>	<p>Superintendent informs apprentice that interview will be one-to-one, on apprentice’s terms.</p> <p>He also lets the witness decide who he wants the interview with.</p> <p>Though superintendent lets the witness decide when the interview is to take place, he makes it clear that he would rather have it done soon, when information is still fresh.</p> <p>By asking for help, superintendent stands a good chance of getting cooperation from the apprentice.</p>
<p>Superintendent makes similar approaches to the rest of the witnesses. Then he returns to site trailer to map his plan of action.</p> <p>The health and safety representative approaches each witness in the same manner.</p>	<p>The labour representative wants to make sure he gets workers’ side of the story as well.</p>
<p>Superintendent draws up a matrix for all material, equipment, and personnel involved in the incident.</p> <p>He fills in all the information he knows (see accompanying table, pages 27-29).</p>	<p>Preliminaries are done. Examination of mechanical room is complete and all witnesses have been approached.</p> <p>It is time to make sense out of the information so far. The matrix makes it easier for investigators to spot missing information and identify next course of action.</p>

**INCIDENT MATRIX 1
(after examination of mechanical room)**

People	Before	During	After
Apprentice	?	Signalling on roof. Didn't want to signal. Did it anyway. Why?	Finds worker to radio office trailer about incident.
Fitter	Was he rigging load?	Pulling compressor over with carpenter.	Hit in head by compressor.
Carpenter	?	Helping fitter pull compressor over. Why involved in the first place? Does he have rigging experience?	Leg caught under compressor.
Mechanical foreperson	Was he supervising rigging?	Supervising rigging. How much does he know about proper rigging?	In mechanical room, looking after carpenter. Why wasn't first aid provided for carpenter? Does the mechanical foreperson know first aid or was he in a state of shock?
Electrician	?	?	In mechanical room, helping mechanical foreperson.
Crane operator	?	Lowering load through roof opening.	?

INCIDENT MATRIX 1
(after examination of mechanical room)

Equipment & Tools	Before	During	After
Compressor	Who rigged it, where, and when?	Being lowered through roof opening.	Slipped and injured carpenter and fitter. Scratches on one side match paint chip on strapping.
Rope	?	Was it used to pull compressor over base? How was it attached? Was it tied to compressor or was it slung over rope?	On floor.
Sling	Used as a cradle to lift compressor.	Slipped. When and how?	Hanging in middle of room. Did it come off completely or did mechanical foreperson take it off compressor after incident?
Strapping	Was it used as softener?	If it was used as softener, when did it slip off compressor and did that contribute to incident?	Broken pieces found at incident scene. Wood of poor quality. Does it matter? Used as splint, must get it back from hospital.
Crane	?	Lowering compressor into mechanical room.	?

INCIDENT MATRIX 1
(after examination of mechanical room)

Environment	Before	During	After
Concrete base	Did not line up with roof opening.	Caused crew to pull compressor over. Was it right procedure?	Chipped on one side where compressor landed.
Roof opening	Did not line up with concrete base.	As above. Scratches on the frame. Did the sling snag? If so, what effect did it have down below?	?

What Happened?	Reason for Action or Line of Thought
<p>Some witnesses prefer assistant superintendent over superintendent and vice versa. Superintendent complies with witnesses' wishes.</p> <p>Apprentice has agreed to the interview. He feels more at ease with assistant superintendent and wants her to conduct interview. Based on availability of other witnesses, the apprentice is interviewed first.</p>	<p>It's essential to make witnesses as much a part of interview scheduling and planning process as soon possible.</p>
<p>Before the interview, assistant superintendent reviews matrix and confirms with superintendent information that must be retrieved from apprentice, including:</p> <ul style="list-style-type: none"> • Who rigged compressor and was rigging inspected before lift? • Where did they rig the compressor? • What was each person's role during the lift? • Does apprentice know why carpenter was involved in the lift? • Can apprentice explain scratch marks on structural frame of roof opening? • Did apprentice see what happened? • What is apprentice's knowledge of what everybody did before, during, and after incident? 	<p>Assistant superintendent must be prepared and make sure that interview will give her the most information she can get.</p> <p>Reviewing matrix ensures that no question is left unanswered.</p> <p>Knowing where compressor was rigged will ensure that that site is also investigated.</p>
<p>Assistant superintendent meets apprentice in mechanical contractor's trailer.</p> <p>"Thanks for wanting to talk to me. I really appreciate it. Are you sure you are up to it?" Apprentice nods and says yes.</p>	<p>Meeting on witnesses' "turf" makes them more at ease and less defensive. A thank-you makes witness feel appreciated.</p> <p>Assistant superintendent also shows compassion in making sure that apprentice is all right and mentally prepared for interview.</p>
<p>"Like I said before, we just want to find the facts, not fault. We want to hear your version of what happened."</p> <p>"Then, if you could suggest to us a way we could prevent it from happening in the future, that would be great."</p>	<p>Assistant superintendent is explaining objective of investigation again to apprentice, trying to make him more comfortable.</p>

What Happened?	Reason for Action or Line of Thought
<p>Assistant superintendent continues: “I just wondered if we could talk in the mechanical room instead of here. It would probably be easier for both of us.”</p>	<p>It is better to conduct interview at incident scene. The environment may trigger or refresh memories of incident.</p> <p>It will also be easier for witness to tell investigator what has happened.</p> <p>It also gives interviewer a chance to examine surroundings and evidence as interview proceeds, picking up details not seen earlier</p>
<p>“You can describe and show me what you know. I can probably grasp the situation better if I see it as you describe it. But it’s all right if you don’t want to talk there, we can talk here.”</p>	<p>Assistant superintendent explains reasoning for wanting to conduct interview at incident scene. However, she is leaving it open for witness to decide.</p>
<p>Apprentice agrees to go to mechanical room.</p> <p>Once there, assistant superintendent asks: “Just take your time and tell me in your own words what happened.”</p> <p>Apprentice begins with his account of the incident:</p>	<p>Assistant superintendent just listens without interrupting, knowing that interruption can disturb train of thought or can be regarded as an offensive gesture.</p> <p>When questions are necessary, they are open- ended, designed to yield more information than yes-and-no questions.</p> <p><i>(For easier identification, italics indicate questions assistant superintendent will have to follow up on.)</i></p>
<p>“I only rigged a few loads before. They were mostly just sticking the hook through a ring. They told me to put the sling where the marks were and stick the softeners in between. So I did.”</p>	<p>Now assistant superintendent knows that the apprentice and injured fitter rigged load. By the sound of it, apprentice had little experience even in rigging.</p> <p><i>She must find the rigging details from apprentice and cross reference them with fitter’s story to see if they are consistent.</i></p> <p><i>Did anybody check rigging before lift? Was it proper? Apprentice didn’t say.</i></p>

What Happened?	Reason for Action or Line of Thought
<p>Then I went back up to the mechanical room. My foreperson asked if I knew hand signals. I said we took them at school.”</p> <p>“I ran through half a dozen for him and he said I could handle it. He told me to get up on the roof and be signaller. The experience would do me good. Well, I took signals, sure, but I really wasn’t ready for a heavy lift like this.”</p>	<p>Apprentice felt that he was not ready for lift but went on and did it anyway.</p> <p><i>Was he bullied or did he know he had the right to refuse dangerous work? Do first-year mechanical apprentices know about the right of refusal? Did apprentice just plain forget?</i></p>
<p>“I was nervous and I got confused when they wanted to boom up. Then the fitter shouted to let the thing down.”</p> <p>“I signalled ‘Down’ but I guess I didn’t signal ‘Slow.’ I heard a scraping noise and the fitter was yelling again, so I gave the ‘Stop’ signal.”</p>	<p><i>What does superintendent know about the scraping noise? What about communication between apprentice and crane operator? Did crane operator understand all apprentice’s signals or could he see apprentice clearly from his crane?</i></p> <p>From the apprentice’s story, there didn’t seem to be any miscommunication between the two. Better check with crane operator.</p> <p>There was confusion in the signalling; the load went down at a faster rate than expected.</p> <p><i>What exactly was said or yelled just before incident? Did apprentice understand what fitter wanted?</i></p>

What Happened?	Reason for Action or Line of Thought
<p>“Then there was a big crash and somebody screaming like hell. I didn’t want to signal. But when you’re an apprentice what are you going to do? I keep my mouth shut and do what they tell me.”</p>	<p>She must also check with the apprentice’s foreperson.</p> <p><i>Was the apprentice ever told to “put up and shut up” as an apprentice or was it just the apprentice’s assumption?</i></p> <p>She must devise a way to ask such delicate questions so that they will not embarrass the apprentice.</p> <p>It doesn’t seem that the apprentice saw what happened down below.</p> <p>Except for the crash and yelling from down below, everything that happened in mechanical room is still unknown.</p> <p>All that is known is that there was a delay between the actual crash and when apprentice signalled for crane to stop lowering. <i>But was it too late by then?</i></p> <p><i>Assistant superintendent still does not know where load was rigged. She must ask these details to fill in gaps in matrix.</i></p> <p>For now, assistant superintendent must review apprentice’s information.</p>
<p>“I want to make sure I’ve got the story right. Can you possibly tell it to me one more time?” assistant superintendent asks.</p>	<p>She must concentrate on details that still need clarification. Assistant superintendent is making sure that she heard right the first time. She also makes notes to be compared with matrix later.</p>
<p>As apprentice tells about incident for the second time, assistant superintendent takes notes. She ensures that apprentice can see what she is writing.</p>	<p>Letting apprentice see her notes shows that there is nothing hidden in the investigation.</p>
<p>After apprentice finishes telling his story, assistant superintendent compares the prepared questions with the apprentice’s story.</p>	<p>To make sure she has covered everything, assistant superintendent checks her list of questions.</p>

What Happened?	Reason for Action or Line of Thought
<p>She asks the apprentice any unanswered questions, leaving the ones that may put him on the defensive until last. Among questions she asks are:</p> <p>“Why was the carpenter involved in the lift?”</p> <p>“You said there was confusion and yelling. Can you tell me a little bit more of what was yelled and when?”</p>	<p>Questions such as “Why didn’t you tell your foreperson that you didn’t want to signal?” may put the apprentice on the defensive, causing him to refuse to answer more questions</p>
<p>Once she hears the apprentice’s version of incident, assistant superintendent slowly repeats story to him: “Just to make sure I don’t write things you didn’t say, I’ll repeat your story. You said that you were. . .”</p>	<p>She repeats information slowly and deliberately so that apprentice doesn’t miss anything.</p> <p>Repeating story gives witness another chance to correct her/his version. It also makes sure that what is put down on paper agrees with what witness is saying.</p>
<p>After a few clarifications, apprentice agrees with assistant superintendent’s record of the event. She then asks how such an incident could be prevented in the future.</p> <p>The apprentice says that he would not have signalled if he had the choice. He also wonders why they didn’t stop the load long before the incident happened if they knew they were in trouble.</p>	<p>Asking witness how incident can be prevented gives investigator additional suggestions to consider. It also makes witness feel important by indicating that his/her opinion and suggestions count and are being considered.</p>
<p>“Thanks for your time and input in this. You have been a great help,” assistant superintendent says. “If anything ever comes to mind about this incident and you think it might help, please call me, I’d appreciate it.”</p>	<p>By thanking apprentice, assistant superintendent lets him know that his time and help is appreciated. She also reminds apprentice that he should call her if he happens to recall anything more about incident.</p>
<p>Once the interview is finished, assistant superintendent goes back to site trailer and compares notes with superintendent.</p> <p>They add the new information to matrix and prepare a list of new questions for the next witnesses.</p>	<p>It is always important to keep focus on what has happened.</p> <p>The new information has answered some of their questions as well as pointing to other areas to be investigated.</p>

What Happened?	Reason for Action or Line of Thought
<p>The scraping noise is confirmed by superintendent when he points to damage to the roof opening. It still doesn't tell them whether load snagged during the operation.</p>	<p><i>The mechanical foreperson, the carpenter, the electrician, and the fitter must be questioned about the possible snag.</i></p>
<p>Information superintendent has after apprentice's interview: Apprentice and the fitter rigged compressor on truck bed at side of building.</p>	<p>Superintendent makes note to inspect truck bed area and see if he can find anything.</p>
<p>Apprentice and fitter used wood strapping as softeners. Superintendent questions quality of wood but does not know the consequences of using such poor quality material.</p>	<p>Superintendent will have to contact outside experts on the consequences of using poor quality wood as softeners. Softeners somehow slipped off sling.</p>
<p>According to apprentice, the rigging was casually checked by fitter prior to lift. The apprentice and fitter went to mechanical room to meet mechanical foreperson to complete the loading. The apprentice acted as signaller while the fitter and carpenter were working down below.</p>	<p>Superintendent still doesn't know the sequence of events in mechanical room just before incident. <i>What was electrician doing in room? When did he come in? Did he participate in lift? Apprentice did not know.</i></p>
<p>The mechanical foreperson was supervising and was assumed by the apprentice to be standing inside mechanical room. The apprentice didn't know how carpenter got involved. Apprentice didn't want to signal but was told by his foreperson to do it anyway. Apprentice did not verbally refuse the assignment. He was unaware of the right to refuse. At this point, the apprentice seemed competent in directing compressor to roof opening.</p>	

What Happened?	Reason for Action or Line of Thought
<p>Operation was going fine until fitter yelled “Boom up” to bring load closer to crane, moving compressor closer to its base.</p> <p>Apprentice became confused and may have forgotten the proper signals.</p>	<p><i>Did load tip at all during the operation?</i></p> <p><i>Evidence indicates that it most likely did, but they need confirmation.</i></p> <p>Based on scratches and marks on sling, compressor must have become unbalanced.</p> <p>Question marks remain. Superintendent and his assistant must obtain this information from other witnesses.</p> <p>New details that are known are added. See Matrix 2.</p>
<p>When fitter called up “Slow,” apprentice did not convey correct signal. That was when scraping noise was heard.</p> <p>For some reason, fitter yelled “Stop,” which apprentice promptly relayed to crane operator. Then apprentice heard the crash.</p>	<p>Superintendent and assistant assume this was when the workers below were pulling compressor over.</p> <p><i>Still, the way compressor was pulled to concrete base remains unclear.</i></p>
<p>Similar interviews were conducted with each witness and matrix updated accordingly.</p>	

INCIDENT MATRIX 2
(after interview with apprentice)

People	Before	During	After
Apprentice	Rigging compressor on truck bed with fitter. Rigging casually checked by fitter.	<p>Signalling on roof. Didn't want to signal.</p> <p>Did it anyway because he didn't know he had the right to refuse. Was he ever taught the regulation by either school or employer?</p>	Found worker with radio who informed superintendent of incident.
Fitter	Rigging load with apprentice Did he actually check the rigging?	<p>Pulling compressor over with carpenter.</p> <p>How was rope placed on load?</p> <p>Did load shift off-centre when he pulled it?</p> <p>Did he see compressor slip? At what point did he hear scraping noise?</p> <p>Did load also snag?</p> <p>When? Did apprentice understand him with all the yelling? When did he tell apprentice to stop lowering?</p> <p>What happened after apprentice signalled for a stop and before actual crash? Details are still sketchy.</p>	Hit in head by compressor.

**INCIDENT MATRIX 2
(after interview with apprentice)**

People	Before	During	After
Mechanical foreperson	Not supervising installation of sling.	Supervising rigging. Did he ever explain to apprentice the right to refuse? How much does he know about proper rigging? Can he fill in details on what was happening to compressor during all this? See above questions to fitter and carpenter.	In mechanical room, looking after carpenter. Did he undo rope or was the rope on the floor already? Why wasn't first aid provided for carpenter? Does mechanical foreperson know first aid or was he in a state of shock?
Electrician	?	?	In mechanical room, helping mechanical foreperson.
Crane operator	Sitting in cab.	Lowering load into roof opening. Did he understand all signals?	Nothing.

INCIDENT MATRIX 2
(after interview with apprentice)

Equipment & Tools	Before	During	After
Compressor	Rigged on truck bed. Must check condition.	Being lowered through roof opening. What happened? When did it slip? When did scratch occur? Did it tip off centre?	Slipped and injured carpenter and fitter. Scratches on one side match paint chip on sling. When did this happen?
Rope	?	Was it used to pull compressor over base? How was it attached? Was it tied to compressor or was it slung over rope?	On ground.
Sling	Used as a cradle to lift compressor.	Slipped somewhere along the line. When and how? Must ask mechanical foreperson, electrician, carpenter, and fitter.	Hanging in middle of room. Did it come completely off or did mechanical foreperson take it off compressor after incident?
Strapping	Used as softeners. Could poor quality contribute to incident? Must check with operating engineers.	When did softeners slip off compressor? Did that contribute to incident? When did they break? Must ask carpenter, electrician, mechanical foreperson, and fitter.	Broken pieces found at scene. Used as splint. Must get back from hospital. Are they as poor quality as the ones that broke?
Crane	Loading compressor after it was rigged.	Lowering compressor into mechanical room.	Stopped completely.

INCIDENT MATRIX 2
(after interview with apprentice)

Environment	Before	During	After
Concrete base	Did not line up with roof opening. Does it matter? Check with operating engineers.	Caused crew to pull compressor over. Compressor fell, damaging one corner.	Chipped on side where compressor landed.
Roof opening	Did not line up with concrete base. See above.	Same as above. Scratches on frame. Did sling snag? If so, what effect did it have below? Check with mechanical foreperson, electrician, carpenter, and fitter.	?

What Happened?	Reason for Action or Line of Thought
<p>Once all physical evidence is collected and interviews complete, superintendent and assistant superintendent sort and analyze information.</p>	<p>It is time to see which questions on matrix remain unanswered.</p>
<p>The way compressor was pulled with the rope is reviewed in detail. The investigators find that both the mechanical foreperson and fitter have pulled similar loads the same way with no problems. The tagline was attached to the sling, rather than the compressor.</p> <p>Superintendent asks operating engineers' school about proper procedure for such a lift. The two procedures are compared.</p> <p>Superintendent also inquires about use of poor quality wood for softener.</p>	<p>Sometimes, expert or outside opinion must be obtained.</p> <p>The investigators need to know if the pulling method was used for the first time on this lift.</p> <p>As it turns out, the mechanical foreperson and fitter have been performing this incorrect rigging practice for a while and got away with it until this incident.</p>
<p>Assistant superintendent contacts mechanical apprentice program director to find the extent of the apprentice's training.</p>	<p>This confirms apprentice's training and compares it to what he knows.</p>
<p>Superintendent and his assistant prepare table listing events and deficiencies in procedures, material, or equipment.</p> <p>They compare and exchange their information with health and safety representatives. Matrix is then updated and a sequence of events chart prepared (see accompanying table).</p>	<p>Incidents are often symptomatic of hidden deficiencies in the system. Some problems are direct causes, some are indirect. All deficiencies have to be accounted for when determining the causes of incident.</p>

Sequence of Events	Deficiencies/Immediate Causes	Indirect Causes
<p>Rate of descent was too fast.</p> <p>Apprentice, unfamiliar with all the signals, got confused and signalled “Down,” but not “Slow.”</p> <p>Mechanical foreperson realized problem and headed to roof.</p> <p>At this point, sling got caught in roof opening, causing load to tip even more.</p> <p>Combination of tipping action and rope pulling on sling caused sling to shift position on compressor.</p>	<p>Apprentice was confused.</p> <p>Load kept lowering faster than workers below anticipated.</p> <p>Descent should have been stopped altogether.</p> <p>Workers didn’t have enough sense to stop and correct the condition before going further. Instead, they kept hold of rope and continued with descent, making situation worse.</p>	<p>Lack of experience and training.</p>
<p>Fitter yelled to apprentice and ordered crane to stop. Apprentice did as he was told.</p> <p>This caused load to slip even further.</p>	<p>Crew below still failed to realize danger they were in.</p> <p>Sudden jolt caused great pressure that was too much on softeners. Defective softener failed under pressure and broke into two.</p> <p>The fitter and carpenter were still holding onto rope instead of letting go.</p>	<p>Lack of training.</p>
<p>They realized that their signal to descend slowly was somehow miscommunicated.</p> <p>The only thing they thought about was stopping the descent.</p> <p>They still didn’t think that compressor would slip off sling completely.</p> <p>As the softeners failed, load continued to slip off sling, hitting and injuring the two workers.</p>	<p>Lack of training and common sense in identifying that they were in serious danger.</p>	

Once they identify events and deficiencies, the superintendent and his assistant prepare recommendations for each deficiency.

Deficiencies and corresponding recommendations are listed below.

Deficiencies/Breakdown in System	Recommendations
Mechanical foreperson, carpenter, and fitter lacked knowledge of proper rigging practices.	<p>Submit a letter to subcontractor and union recommending that safety and rigging refresher courses be mandatory for journeypersons and forepersons. Case history of incident should be part of the course.</p> <p>Tailgate safety talks should include safe rigging practices.</p> <p>Rigging operation should only be done by experienced and trained workers.</p>
Apprentice not familiar with hand signals.	<p>Recommend better course in hand signals for apprentices.</p> <p>Ensure that someone experienced is on hand when apprentices are signalling. This practice should be continued until apprentice has full knowledge and experience in signalling.</p>
Apprentice didn't know he had the right to refuse work that he believed might be dangerous.	<p>Health and safety regulations should be among the first courses apprentices receive.</p> <p>Their awareness of the <i>Occupational Health and Safety Act</i> should be reviewed briefly by employer prior to sending them on the job.</p> <p>Employer should inform apprentices that they should not be performing tasks they consider dangerous.</p>
Mechanical foreperson not trained in first aid.	Supervisors and forepersons should be trained in first aid.

Assistant superintendent helps superintendent compile the incident report including:

- names of witnesses and those injured
- date and time of incident
- details of incident, including sketches and photographs
- all deficiencies and recommendations.

Since most of the recommendations involve more than one trade on more than one site, the report will be sent to the head office of all involved companies, workers' unions, and various agencies as required by law. Among those receiving copies are:

- Superintendent's head office
- Mechanical contractor's head office
- Mechanical trades union training centre
- Carpentry trades union training centre
- Safety committee
- Ministry of Labour
- Workplace Safety and Insurance Board.

The following was done as a result of the incident.

- A letter was sent to all unions whose members were involved, outlining training recommendations.
- The mechanical foreperson and all other forepersons on site without up-to-date first-aid certificates took first-aid training.
- The mechanical foreperson and the fitter took refresher rigging courses provided by their employer.
- A review of safety regulations was held for all supervisors and workers on site.
- Copies of the *Occupational Health and Safety Act* and construction regulations were provided to each subcontractor with instructions to post them where everyone has access to them.
- The refrigeration employer instituted a safety policy and supporting program. All workers were informed of the policy, which was incorporated into new worker orientation.

CASE HISTORY 2: THE LEANING LADDER

The second incident occurred on a residential low-rise project. As with the first case history, the superintendent was also designated as the incident investigator.

What Happened	Comments, Reason for Action, or Line of Thought
<p>The superintendent of a two-storey townhouse project steps out of his job trailer expecting the arrival of the coffee truck. Suddenly he hears a yell, then a crashing sound.</p> <p>He identifies the sound as an extension ladder crashing to the ground.</p>	<p>Something on site has just occurred. Someone or something has fallen. It involves an aluminum extension ladder.</p>
<p>Grabbing his first-aid kit and portable phone, he follows other workers to the source of the sound. A worker on the roof yells, pointing to the incident site: "Over here, it's the roofer!"</p>	<p>Though not sure that anybody is hurt, the superintendent is playing it safe by taking his first-aid kit and his telephone with him.</p> <p>The yell from the worker on the roof identifies the worker involved in the incident. However, the superintendent still doesn't know if the roofer is hurt.</p>
<p>By the time the superintendent arrives, most of the workers on site are on hand to see what happened. An extension ladder is lying about 10 feet away from the roofer.</p> <p>The superintendent sees the roofer on the ground holding his ankle. Though he is grimacing in pain, it doesn't look like the roofer's injury is life-threatening.</p>	<p>Incidents attract crowds. The superintendent still doesn't know exactly what happened. The position of the extension ladder confirms what he just heard moments earlier.</p> <p>The superintendent is assessing the situation. He notes the position of the ladder but continues to look at the overall situation.</p>
<p>Superintendent continues to survey the situation around the incident. He sees no danger on the ground level. Then he looks up. There is no risk of material falling from edge of the roof.</p>	<p>Going through his priorities, he sees that there is no further danger to the roofer or anyone else on site.</p>

What Happened	Reason for Action, or Line of Thought
<p>Superintendent moves in front of the workers and asks them to move back and give him room.</p> <p>He then tells the roofer not to move: “Take it easy and don’t try to get up. Is it your ankle?”</p> <p>Roofer confirms by nodding. Superintendent takes a closer look. He quickly examines the roofer for any other injuries that may not be obvious. Only the ankle seemed to be injured.</p>	<p>Superintendent is taking charge.</p> <p>He now has to examine the roofer closer and perform first aid if necessary.</p> <p>The superintendent is making sure that the roofer is not suffering other injuries. He confirms with the roofer that it is his ankle that hurts and nothing else.</p>
<p>Several workers start clearing incident debris. The superintendent stops them and tells them that, while he appreciates the help, the area must be left undisturbed.</p> <p>He explains that, since the roofer was hurt, an investigation has to be conducted.</p> <p>He asks the workers to cordon off the area and stay clear of the incident scene.</p>	<p>Superintendent needs to investigate and secure the scene of the incident. This includes leaving the scene untouched.</p> <p>Asking the workers to stay clear of the area gives the superintendent some room to maneuver.</p>
<p>The roofer’s ankle is badly swollen. He has suffered either a bad sprain or fractured bone.</p> <p>As the superintendent starts opening his first- aid kit, he yells to the workers barricading the area: “Who can drive him to the hospital?”</p> <p>A carpenter who is a close friend of the roofer volunteers.</p>	<p>Superintendent could call for an ambulance, but the injury is not life-threatening and will receive low priority amongst other emergencies. It is faster for one of the workers to take roofer to the hospital.</p>

What Happened	Comments, Reason for Action, or Line of Thought
<p>As the superintendent provides first aid, he says: “Well, it doesn’t look like you’re going to play ball tonight. What happened?”</p>	<p>The superintendent is keeping roofer’s mind away from the injury by getting him to talk.</p> <p>It also gives the first aider a good indication of the victim’s level of consciousness and helps keep the injured worker alert.</p> <p>At the same time, the superintendent is asking a few questions to learn more about the incident.</p> <p>Normally, an interview should be conducted one-on-one. In this case, the superintendent’s question is a non-offensive one commonly asked of any person involved in an incident.</p> <p>The superintendent should be able to extract enough information from this conversation to start his investigation.</p>
<p>The roofer explains what happened:</p> <p>“I should have fixed that ladder!! Earlier this morning we were on the roof setting the shingles near the edge. I hit the ladder a couple of times with my feet when I was doing it. That ladder wasn’t straight to begin with, so I guess every time I hit it, it just got worse.</p> <p>“I was going to straighten it out, but one thing led to another ... I never got around to it.”</p> <p>“I was listening to this joke when I stepped on the ladder to get coffee. I really wasn’t paying attention.”</p> <p>“The next thing I knew, I was up in the air and boom! Well, you know the rest.”</p>	<p>The picture of what happened is becoming clear.</p> <p>The roofer was working on the roof.</p> <p>His statement that the ladder kept moving as he hit it with his foot indicates that it could not have securely been tied at the top.</p> <p>The superintendent must confirm his assumption. The ladder wasn’t positioned plumb to begin with. It kept tilting as the roofer kept hitting it with his foot when he was positioning the shingles.</p> <p>The roofer’s inattention to his activity also led to the incident.</p>

What Happened	Comments, Reason for Action or Line of Thought
<p>The superintendent briefly repeats what the roofer has said and clears up any discrepancies.</p>	<p>The case is simple. The superintendent feels that he has a good grasp of what happened. He does not feel that the roofer has to repeat his story again.</p> <p>Just to make sure, he repeats what the roofer told him. It gives the roofer a chance to re-evaluate what he told the superintendent and correct any misunderstandings.</p>
<p>He finds that the roofer erected the ladder himself first thing in the morning.</p> <p>The superintendent asks if it was possible that the roofer actually slipped on the roof. The roofer replied that both his feet were on the rungs when he fell.</p> <p>Superintendent also confirmed with the roofer that the ladder was never tied at top to prevent it from moving.</p> <p>The roofer laughed: "If I did that, none of this would have happened, would it? Well, I never thought of it, maybe I should start doing it when I get back to work."</p>	<p>Superintendent uses the opportunity to consult roofer on details he is not sure of:</p> <ul style="list-style-type: none"> • Who erected the ladder? • Was ladder secured to roof? • Why wasn't ladder secured to roof? • Did roofer fall off ladder rather than roof? <p>The roofer's offhand comment is his recommendation of what should be done to prevent something like this from happening again.</p>
<p>Superintendent asks roofer if anybody ever trained him in safe ladder practice. The answer is negative.</p>	<p>Superintendent wants to locate the deficiency. Is it because the roofer was never trained in proper ladder use or is it because the roofer knew but chose to ignore the practice?</p>
<p>Once the superintendent finishes first aid, he and a few workers help roofer to the car that will take him to the hospital.</p> <p>The superintendent confirms which hospital the roofer will be driven to.</p>	<p>Superintendent must know where the roofer is taken so that he can inform the authorities and the roofer's employer.</p>

What Happened	Comments, Reason for Action or Line of Thought
<p>As he goes back to his trailer to contact MOL and the roofer's employer, he approaches the roofer's co-worker.</p> <p>He explains that he just wants facts, not finger pointing.</p> <p>The co-worker recites his version of the incident, a story consistent with the roofer's.</p> <p>He confirms that the ladder was crooked at the start but didn't realize that it had been made worse when it was bumped several times. He also confirms that the roofer was listening to one of the other workers while he was getting onto the ladder and wasn't paying much attention to the ladder. And yes, both feet were off the roof when the roofer fell.</p>	<p>Superintendent has to reassure the co-worker of the purpose of incident investigation.</p> <p>The co-worker's testimony backs the roofer.</p>
<p>Superintendent asks if any of the crew have received ladder safety training. The answer is negative.</p> <p>Just like the roofer, the co-worker indicates that securing top of the ladder to roof would have prevented the incident.</p> <p>The superintendent thanks the co-worker for his help.</p>	<p>Superintendent wants to see if lack of training is restricted to one person or relates to the whole company.</p> <p>Superintendent ends interview on a positive note by thanking co-worker.</p>
<p>Superintendent picks up his tape measure and note pad and goes back to incident scene.</p>	<p>Superintendent is going to examine the physical evidence to confirm roofer's story.</p>

What Happened	Comments, Reason for Action or Line of Thought
<p>Superintendent examines incident scene. He makes a list of material and equipment involved. It's a short one—ladder and shingles on roof.</p> <p>He draws a sketch of what happened. He includes the ladder's position relative to the townhouse. Its location on the ground was consistent with the roofer's story. He saw no rope or wire tied to the top part of the ladder.</p> <p>Superintendent examines top rungs. No missing rungs, a bit of tar, but no mud or oil on them. He runs his fingers on them, feeling for anything that may have caused the roofer to slip off the rungs. Nothing. Good grip all around.</p> <p>Superintendent climbs up on roof and sees that the shingles are at the edge of roof. No boot marks to indicate that someone has slipped off roof.</p>	<p>Superintendent completes the investigation by looking at all the physical evidence.</p> <p>Everything must be consistent and one piece of evidence must support the other.</p> <p>The roofer and co-worker's testimony seem solid. Their stories match all the evidence.</p>
<p>Superintendent goes through the incident one more time. Everything seems to be in order. All questions are answered.</p>	<p>Superintendent has all the evidence he needs to complete report. He concludes his research and starts writing his report.</p>

The authorities arrive and the superintendent cooperates fully.

Superintendent goes back to the trailer and fills out the incident report form. Since it was so straightforward, there is no reason to create a matrix. Instead, he lists the chain of events and deficiencies that led to the incident.

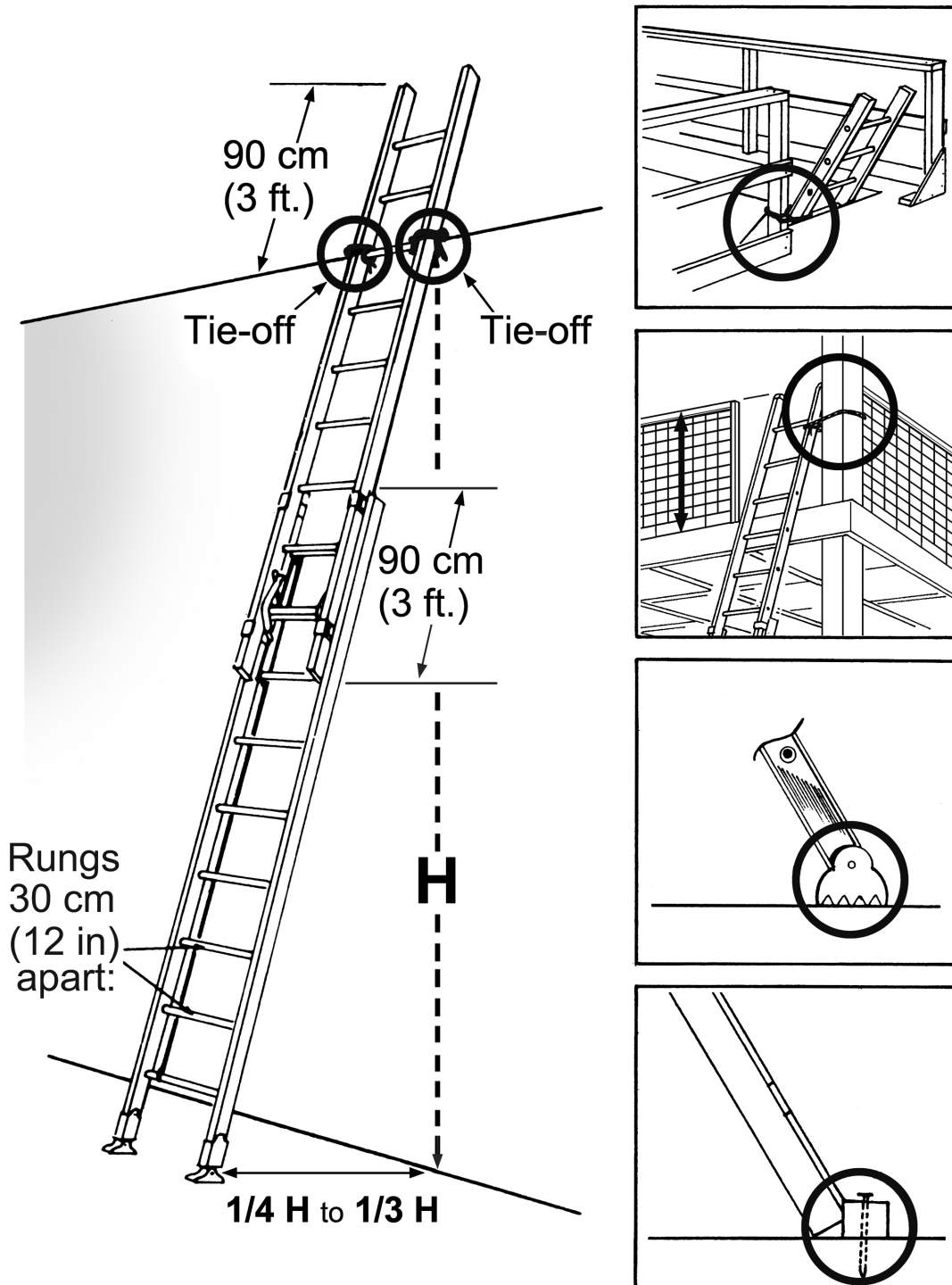
Sequence of Events	Deficiencies	Indirect Causes
Rofer erected ladder. Ladder was leaning to one side.	Ladder not secured at top.	Lack of training.
Rofer bumped ladder when arranging shingles, making ladder lean even more.	As above.	
Rofer climbed down ladder, did not concentrate fully on what he was doing.	Inattention to activity.	
Rofer fell down with the ladder.	Ladder not secured at top. Inattention to activity.	Lack of training.

Superintendent recommends to head office that all subcontractors on site should train their personnel in ladder safety. Proper use of ladders should be reinforced on all sites.

He forwards a copy of his report to the roofer's employer. Superintendent follows up by:

- ensuring that proper use of ladders is practiced on all his projects
- checking on proper use during his daily site surveys.

Proper Ladder Set-up



PART 3: APPENDICES

APPENDIX A: WHEN MUST AN INCIDENT BE REPORTED?

An accident or incident must be reported to the Ministry of Labour, the Joint Health and Safety Committee, Health and Safety Representative, and trade union in the circumstances listed below.

Circumstances	How Soon
When it involves a fatality or critical injury.	Immediately by either telephone, telegram, fax, or any direct means, followed by written report within 48 hours of the occurrence detailing information outlined in the construction regulations.
When a person requires medical aid, misses the next shift, or is disabled from doing his or her usual work.	In writing, within four days. In these cases the Ministry of Labour must be notified only if an inspector requires such notification.
<p>When an accident or incident involves:</p> <ul style="list-style-type: none"> • a worker falling a vertical distance of 3 metres or more. • a worker whose fall is arrested by a fall arrest system other than a fall restricting system. • a worker becoming unconscious for any reason. • overturning or structural failure of crane or similar hoisting device. • structural failure of falsework designed by, or legally required to be designed by, a professional engineer. • structural failure of scaffold supports. • structural failure of a principal supporting member such as column, beam, wall, or truss. • failure of an earth- or water-retaining structure such as trench, shaft, tunnel, caisson, or cofferdam. • failure of excavation wall, which a professional engineer has specified in writing will not endanger workers. • contact by backhoe, shovel, crane, similar device, or its load with a live powerline of more than 750 volts. • contact by a worker or by a worker's tool or equipment with energized electrical equipment, installations, or conductors. 	In writing, within two days.

APPENDIX B: INCIDENT INVESTIGATION REPORT

Part A: Identifying Details

Employer

Name _____ Address _____

Type of business _____

Injured Employee

Last name _____ *First name* _____ *Occupation* _____

Address _____

Age _____ *Experience at work involved* _____

Nature of injury _____

Other Employee Involved

Last name _____ *First name* _____ *Occupation* _____

Address _____

Age _____ *Experience at work involved* _____

Incident/Injury

First aider _____ *Medical treatment* _____

Name and address of doctor/surgeon _____

Hospital _____

Date and time of incident _____

Project and location of incident _____

Date and time incident reported to supervisor _____

Date and time incident reported to MOL _____

Name of MOL representative who took the call _____

Date and time incident reported to head office _____

NOTE: Items in italics are mandatory under health and safety legislation.

Names and addresses of witnesses

Background

Who made the work assignment _____

Directions the employee received before starting work _____

Were any specific procedures involved? Yes _____ No _____ N/A _____

Description of machinery or equipment involved

Part B: Incident Description

Explain what happened (what, where, when, who, how) _____

Sketch/Diagram

Immediate Cause	Underlying Cause

How can the incident be prevented from happening again?

Actions taken to prevent recurrence

Action by: _____ Report prepared by: _____

Part C: Reviews of Incident Report

Name _____ Date _____
(print)

Health and Safety Representative (if applicable)

Signature _____ Date _____

Health and Safety Committee Members (if applicable)

Signature _____ Date _____

Signature _____ Date _____

Signature _____ Date _____

Signature _____ Date _____

Chief Executive Officer

Signature _____ Date _____