JOSOP - 609
Incident Investigation and Reporting Procedure
Joint Operations

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1 PURPOSE & OBJECTIVE

This document establishes the Joint Operations (JO) requirements for notification, investigation and reporting of all Environment Health and Safety (EHS) incidents which have the potential to harm people, assets, environment or company image.

This document shall provide guidance on notification, investigation, reporting and tracking of preventive actions in order to mitigate adverse impact and to prevent recurrence of incidents.

2 SCOPE

Incident Notification, Investigation and Reporting procedure applies to all activities and locations under Joint Operations control, including activities performed by contractors and/or sub-contractors.

An EHS incident includes the following work related incidents:

- Injury Incident
- Environmental Incident
- Motor Vehicle Crash
- Fire
- Non Compliance Incident
- Significant EHS Incident covered in JO Emergency Management Process
- Near misses
- Property damage

3 DEFINITIONS

For the purpose of this document, the following definitions shall apply:

3.1 Days Away From Work (DAFW) Case

Cases where the employee or contractor is away from work one or more days after the day of a work-related injury or illness. Incidents are still considered to be a DAFW case even if the first day of work missed is several days/weeks/months after initial date of incident.

3.2 Fatality

The death of an employee or contractor engaged in a work-related activity, which results from an event or exposure in the work environment. The individual need not actually die in the work environment.

3.3 First Aid Case

A work injury that requires first aid treatment only. The injured person returns to work on the same day.

3.4 Restricted Work Day Activity case (RWC)

Where the employee or contractor as a result of work-related injury or illness:

a. Was assigned to another job on a temporary or permanent basis.
b. Worked at his or her permanent job but less than a full day. (Restriction limited to day of injury/illness is not recorded)

c. Could not perform routine functions associated with his or her permanent job or can't work the full workday.

3.5 Medical Treatment Case (MTC)

Medical Treatment Cases are more serious than first aid cases. Medical treatment refers to management and care of persons to combat disease or disorder and excludes visits for observation or counseling and conduct of diagnostic procedures.

3.6 Motor Vehicle Crash

A company motor vehicle crash includes any event involving all light duty and heavy duty vehicles, including buses or coaches, and motor vehicles (owned, leased, or rented by the company - or a personal vehicle being operated for company business) that results in death, injury, or property damage, unless such vehicle is properly parked at the time of the event.

3.7 Spill (Petroleum)

Includes any accidental or unplanned spill that:

- Escapes from primary containment onto land or water or surface (including permeable materials like soil, sand, silts, gravel etc.)
- Escapes from primary containment into secondary containment (concrete/impermeable dyke areas), and is not associated with routine operating practices, scheduled maintenance or authorized discharge.
- Results from company owned and/or operated transport of oil products.

If a spill contains both petroleum and chemicals, the spill of each substance should be considered separately.

4 INCIDENT RESPONSE & NOTIFICATION

4.1 Immediate actions to be taken in the event of an incident

- **The First Priority during any incident is Life and Health.**
  If any person is injured, assess the immediate need for First Aid and / or Medical Treatment. Contact F & S dispatcher or the KOC and/or SAC clinics for medical assistance as required. DO NOT MOVE AN INJURED PERSON until medical assistance arrive, unless an imminent threat of additional injury or death exists.

- **Second Priority – Notification**
  Notify F&S Dispatcher and/or immediate JO Supervisor or asset owner when an EHS incident occurs. Provide factual information about the incident regarding WHO, WHAT, WHEN and WHERE

- **Third Priority – Secure the Scene of the Incident**
  It is critical that JO employees and contractors understand their responsibility NOT TO DISTURB the scene of any EHS incident. Incident location shall be preserved for investigators to collect evidences and identify causes.

All kind of incidents, however minor, shall be immediately informed to Fire & Safety Dispatcher. All JO and Contractor employees are responsible to make this notification.

Contact phone numbers of F&S Dispatcher are the following:
State Line: 2398-4444
Mobile: 6647-1717
JO Phone: 2398-3639 ext. 2222 or 2444

4.1.1 Cases involving personal injury

1. The injured person or the person who is aware about the incident or anyone at site shall report injury to F&S Dispatcher and the injured person's supervisor.
2. F&S Dispatcher shall contact the SAC or KOC Medical Clinic to dispatch ambulance if required. F&S Dispatcher shall also immediately notify the EHS Duty Engineer and/or the EHS Superintendent.
3. If ambulance is required SAC or KOC Medical Clinic shall dispatch ambulance with paramedic.
4. Clinic shall provide medical treatment and refer for further medical treatment as necessary. Preliminary medical report shall be forwarded to EHS Division within the next working day.
5. Immediate JO or contractor supervisor shall secure the incident location and gather preliminary information.
6. EHS Duty engineer and/or Fire & Security Dispatcher shall immediately notify EHS Division Superintendent in case of major injuries (RWC or DAFW Cases).
7. JO Supervisor shall Inform Division Superintendent ASAP or the next morning in case of first aid and medical treatment cases. Major injuries (RWC or DAFW cases) and fatalities shall be notified to Division Superintendent immediately.
8. JO Supervisor shall investigate the incident if the incident is a first aid case or medical treatment case and submit investigation report to EHS Superintendent within two working days.
9. JO Supervisor shall assist investigation team if an investigation team is formed.
10. In case of major injury (RWC or DAFW Cases) EHS Superintendent shall form an investigation team and electronically notify JO BMT within the next working day.
11. In case of major injury (RWC or DAFW Cases) JO Manager shall notify non-operators within the next working day.

4.1.2 Fatality

1. The nearest person or anyone who is aware about the incident shall immediately report to F&S Dispatcher and / or to the JO Supervisor.
2. Fire & Security Dispatcher shall immediately report to JO clinics, EHS Duty Engineer, EHS Superintendent and/or Manager EHS, F&S. and VOIPD.
3. EHS Superintendent shall immediately notify Manager EHS, F&S and/or JO Manager.
4. The JO Manager shall notify the non operators (SAC and KGOC) immediately.
5. The JO Supervisor or anyone at site shall secure and preserve the incident location for investigators.
6. EHS Superintendent shall send out an incident alert to all JO employees within the next working day
7. JO Manager shall form an investigation team ASAP or within the next working day

8. The investigation team shall start the investigation immediately.

4.1.3 Motor Vehicle Crashes

1. All motor vehicle crashes within JO area shall be reported immediately to F&S Dispatcher and immediate JO Supervisor.
2. In case of MVC involving injury or fatality sections 4.1.1or 4.1.2 shall be followed
3. F&S Dispatcher shall notify Kuwait Police in case of damage requiring police report.
4. The JO supervisor of the driver shall submit a preliminary report to EHS Division within the next working day.
5. In case of major Motor Vehicle Crashes, EHS Superintendent shall notify JO BMT within the next working day.

4.1.4 Oil Spill or any other Environmental Incident

1. Immediately notify F&S Dispatcher and provide information about the incident.
2. F&S Dispatcher shall immediately notify the concerned division superintendent (asset owner) and EHS Duty Engineer and provide information about the incident.
3. In case of oil spill, Production Operations Division Well Operations Supervisor or Field Production Coordinator shall notify the Kuwait & Saudi Government Gaugers ASAP.
4. If it is a major incident (more than 50 Bbls), the concerned asset owner shall contact EHS Duty Engineer/EHS Superintendent for any assistance immediately.
5. In case of major incident F&S Dispatcher shall notify VOIPD.
6. Asset owner shall submit report within the next working day.
7. In case of major oil spills, EHS Superintendent shall notify JO BMT within the next working day

4.1.5 Unexploded Ordnance

1. DO NOT attempt to handle, or disturb any suspicious objects discovered in the field. Immediately notify Fire & Security Dispatcher.
2. Evacuate immediate area and establish a security perimeter of at least 30 meters away from object. Maintain site security until appropriate EOD clearance personnel are on-site.
3. F&S Dispatcher shall notify F&S Superintendent and VOIPD immediately.
4. F&S Superintendent shall contact Kuwait Government EOD Clearance authority as soon as possible.

4.1.6 Breach of Security

1. Immediately report to the F&S Dispatcher.
2. F&S Dispatcher shall notify VOIPD and F&S Superintendent immediately
3. F&S Superintendent shall notify JO Manager after assessing the situation.

Emergency Response Plan to be referred for further action.

4.1.7 Other Significant EHS Incidents like Fire or Major Gas Leak

1. Evacuate the area immediately
2. Notify F&S Dispatcher and immediate supervisor/ asset owner if available

3. Fire & Security Dispatcher shall notify and dispatch fire fighting crew if it is a fire incident and inform EHS Duty Engineer/ Fire & Security Superintendent.
4. The asset owner shall investigate the incident and submit a preliminary report within two working days
5. In case of major fire or other major EHS incident, JO Emergency Response Plan shall be activated
6. In case of major incidents, an investigation team shall be formed by EHS Division Superintendent or JO Manager based on the severity of the incident

5 RESPONSIBILITY

Most Senior / Nearest person at site	• Ensure safety of personnel at the location • Isolate the site • Inform Fire & Security Dispatcher • Inform Job Supervisor • Secure the scene of incident.
Fire & Security Dispatcher	• Dispatching ambulance and / or fire fighting team as required • Informing EHS Duty Engineer / EHS Superintendent/ F&S Supdt. • Inform VOIPD as required in case of Fatalities, Major Fire etc. • Inform Kuwait Police in case of fatalities • Carryout the responsibilities described in JO Emergency Management Process
Clinic/Physician	• Send ambulance to location of accident • Provide medical treatment • Refer for further medical treatment as necessary • Submit medical report to EHS Superintendent
Supervisor	• Preserve incident site for investigation and collect evidence. • Inform Division Superintendent and EHS Superintendent • Investigate Level 1 incidents using ‘5 Why’ method. • Submit investigation report to EHS Division within next working day. • Assist investigation team in case of Level 2 or Level 3 investigation.
Division Superintendent	• Make available all resources required to control the situation after the incident • Depute necessary personnel for investigation team and provide all information & documents required • Initiate / follow-up action items assigned to his division

EHS Superintendent	• Review incident investigation reports submitted by various divisions in case of Level 1 investigations • Appoint an investigation team in case of RWD or DAFW injuries, or any incident with 'High Risk' potential • In case of recordable incidents, notify BMT • Follow-up actions taken on recommendations and close out. • Present status report of recommendations to BMT
EHS, F&S Manager	• Co-ordinate with Kuwait Police and other Government agencies in the event of fatality or major fires etc.
JO Manager	• Notify JOC Members and non operators in case of fatality, major fires etc. • Form and sponsor investigation team in case of fatality and major fires • Review fatality investigation report and present it to non operators.
Investigation Team	• Collect evidence and pictures • Interviews witnesses and collect statements • Conduct 'Why Tree' Root Cause analysis • Determine remedial actions/recommendations • Present findings and recommendations to BMT • Submit report to EHS Superintendent & BMT
Business Management Team (BMT)	• Review 'Why Tree' Root Cause analysis investigation reports • Review and accept investigation reports • Endorse/ assign action items • Review actions taken on recommendations

6 INVESTIGATION AND REPORTING

All incidents shall be investigated using a 'WHY TREE' or 'FIVE WHY' method and reported. Level of investigation shall be decided based on the Potential Risk, not only by the actual severity of the incident.

All Level 1 incidents requires a 5 Why investigation by the responsible supervisor or a RCA Facilitator.

All Level 2 incidents involving a DAFW, Fatality, Spills and incidents classified as Potential High Risk incidents including near misses shall be investigated by a team using 'WHY TREE' method.

The investigation report should contain the following as a minimum:

- Description of incident
- Medical Reports (In case of injuries)
- Witness statements
- Photographs and graphical representation.
- Incident Timeline

- Cause and event chart
- List of immediate causes and root causes
- Recommendations with responsible parties and targeted completion date.

The incident investigation team leader or the Supdt of responsible division shall present the report to Safety Leadership Team. BMT shall review the report, endorse recommendations in the report, and assign responsibilities and target dates.

Guidelines and details of investigation procedure is given in Appendix – 1 (JO Incident Investigation Procedure)

7 ACTION ITEMS AND CLOSE OUT

EHS division shall enter the recommendations made by the investigation team into the 'II&R Database' and follow up the actions taken by responsible parties.

EHS Superintendent shall track status of actions taken on recommendations and present to BMT once in a month and BMT shall review the status of action items until all items are closed out.

8 APPENDIX – 1 – JO Incident Investigation Procedure

9 APPENDIX – 2 – Risk Assessment Matrix

10 APPENDIX – 3 – JO Incident Reporting Forms

Appendix–1
JO Incident Investigation Procedure

Overview

This procedure provides the framework for Joint Operations incident investigation process. The objective of an incident investigation is to determine the **root causes** of an incident or near miss, so that a repeat of the incident can be avoided. This procedure describes the following three tasks:

- Determining the level of investigation required
- Identifying the requirements for each level of investigation
- Performing the root-cause analysis incident investigation

Determining the Level of Investigation Required

An incident is an event or exposure that has an impact or effect on an employee or contractor, a Joint Operations owned or leased property, the community or the environment. Table 1 outlines the criteria that shall be used in Joint Operations to determine the **level** of investigation required for various types of incidents based on the probable consequences of the incident. Four types of consequences are used in the criteria: personal injury, environmental damage, cost of incidents and damage to reputation. Incidents are classified into one of three levels based on severity, with Level 3 being the most severe.

A near miss is any unplanned event having a potential but unrealized consequence for injury or damage to property, the environment, the company's reputation or financial performance. Joint Operations requires that near misses shall be investigated at the same level as if the potential incident had occurred. Therefore, the probable consequences for a near miss (instead of the actual consequences) shall be used to determine the level of investigation required.

Table 1: Investigation Criteria

Level of Investigation	Level 3	Level 2	Level 1
Injury to a Person	• Fatality • Permanent disability • Multiple recordable injuries	• Lost time injury • Recordable injury	• First aid
Motor Vehicle Crashes (MVC)	• Catastrophic	• Major • Serious	• Light
Environmental	• Hydrocarbon spill > 50 bbl • Chemical spill > 8,000 kg • Environmental incident with irreversible impact	• Hydrocarbon spill 5 to 50 bbl • Chemical spill or release 160 kg to 8,000 kg • Environmental incident with serious but reversible impact • Reportable to any outside agency	• Hydrocarbon spill < 5 bbl • Chemical spill < 160 kg • Environmental incident with minor and reversible impact
Cost of Incidents	• Total Cost of Incident > $3MM	• Total Cost of Incident $3MM to $1MM	• Total Cost of Incident < $1MM

Level of Investigation	Level 3	Level 2	Level 1
Reputation	• Incidents that could have national or international impact on JO's reputation • Incidents that attract national or international media attention	• Incidents that could have a local impact on JO's reputation • Incidents that attract local media attention	• Incidents that have little impact on JO's reputation • Incidents that attract little or no media attention

*Cost of Incidents is defined in 2010 OE Data Requirements and Definitions – Final.

Identifying the Requirements for the Level of Investigation

Table 2 outlines the JO's **requirements** for each investigation level.

Table 2: Investigation Requirements

Level of Investigation	Level 3	Level 2	Level 1
Root-Cause Method	• Use of Why Tree technique required	• Use of Why Tree technique required	• Use of Five Why technique at a minimum
Team Membership and Sponsorship* ***Includes: providing resources, reviewing makeup of team, kicking off the team with supporting comments and reviewing the team's findings**	• Investigation team required (people involved in incident, first line supervisor, internal and external SMEs as needed) • JO Manager's sponsorship of investigation team required	• Investigation team required (people involved in incident, first line supervisor, internal SMEs as needed) • General Superintendent's sponsorship of investigation team required	• Team optional, may be done by one person • First line supervisor sponsorship
Facilitator	• JO/External RCA Facilitator required	• JO RCA Facilitator required	• Investigation done by supervisor or designee that is trained in the Five Why method
Time for Report Completion	• 1 month	• 2 weeks	• 1 week
Documentation Criteria	• IIR Database	• IIR Database	• IIR Database

Performing the Root-Cause Analysis

The following section describes the steps of the standardized root-cause analysis for the incident investigation procedure to be used in all JO locations. Additional information can be found in the ChevronTexaco Root Cause Analysis Incident Investigator Facilitator Handbook provided by Energy Technology Company (ETC). The steps outlined in this procedure include the following:

1. Gathering data
2. Forming the investigation team
3. Developing the sequence of events
4. Identifying protective systems
5. Determining root causes (Why Tree, Five Why)
6. Verifying potential causes
7. Developing recommendations
8. Documenting the investigation
9. Reviewing and issuing the report
10. Categorizing the root causes

All of these steps are discussed in greater detail in separate sections of this procedure; however, Table 3 describes which steps are required for each investigation method.

Table 3: Required Steps for Investigations

Steps	Level 3 and Level 2 (Why Tree)	Level 1 (Five Why)
Gathering data	Structured process required	Scalable, less structured, gather data as needed
Forming the investigation team	Team required	Scalable, may be one person
Developing the sequence of events	Required	Optional, use as needed
Identifying protective systems	Required	Optional, use as needed
Determining root causes	Why Tree method	Five Why method at a minimum
Verifying potential causes	Required	Optional, use as needed
Developing recommendations	Required	Required
Documenting the investigation	Required	Required, 1 page format available
Reviewing and issuing the report	Required	Optional
Categorizing the root causes	Required	Required

Gathering Data

General

Data gathering is collecting all the facts that are associated with the incident. The sooner the information is captured, the higher the quality will be. In most cases data gathering is required before an investigation team can be formed; therefore it is important that the local incident investigation procedure specifies who shall be responsible for gathering data. A disciplined approach to data gathering is very important. All data needs to be properly identified and labeled. Data needs to be organized and stored in a secure location until the investigation is completed.

Securing the Area

Safety of life and health is more important than incident investigations. Do not begin the incident investigation until medical care has been given to anyone who has been hurt or the abnormal situation has been brought under control and the area secured. **Do not take any incident investigation actions until they can be done safely.**

Responsibility

Generally, the first line supervisor is on the scene and is tasked with the initial steps to gather data. If a team is needed for the investigation, the team leader or facilitator shall take over the responsibility for continued data gathering.

Initial Steps

The initial data gathering often is critical in determining the cause of the incident. The following steps shall be taken as soon as possible after the incident site is secured and any safety issues are resolved:

- Protect physical data at the incident area. Rope or tape off the area to keep people out. Sometimes physical data is destroyed because people track through the area or try to clean up the mess.
- Interview people who were involved in the incident as quickly as possible and before their shift is over. As an alternative, have the witnesses and persons involved in the incident prepare a written statement of their observations and actions leading up to and including the incident.
- Take pictures of the area. Draw sketches. Record what the area looked like after the incident.
- Take necessary samples. Sample handling is discussed later.
- Capture process data before it is lost.

The 4 P's of Data Gathering — People, Position, Parts and Paper

Data can be found or obtained from various sources. The 4 P's is a convenient way to remember these sources.

People

People are important as data sources because they can relay information about everything that they were aware of before and at the time of the incident.
Interviews and written statements are the two methods for documenting people's recollections of what happened leading up to and after the incident. Often, combining the two is the most effective approach.
The purpose of interviews is to obtain information which can be used to prepare the sequence of events and to determine the root causes. At this point in the investigation you are interested in figuring out what happened and in gathering data. Interview people who were involved in the incident as quickly as possible and before they leave the facility. If appropriate, interview emergency response personnel to determine if their response had an impact on the area or on the physical data.

The quality of the interviews is critical to the success of the incident investigation. The following are guidelines for successful interviews:

- Interview people, if possible, before they talk to each other or to others not involved in the incident.
- Choose a setting that is comfortable for the person being interviewed. A place where the person works or relaxes is sometimes a good place. Walking through the facility or site of the incident might also be a good idea.

- Use one or two interviewers. Two is a good number since one person can ask the questions and the other can keep notes.
- Do not interview more than one person at a time. In general, group interviews reflect only the views of one or two people in the group.
- During the interview, put the person being interviewed at ease before questioning; explain that your purpose is fact-finding, not fault finding. Empathize with how they might feel as a result of the incident.
- Ask open-ended, non leading questions. For example, ask, "What was the next step?" instead of "Did you close the valve next?" When you have asked the question, listen for the complete answer. Try not to interrupt before the person being interviewed has completed his or her answer.
- Don't imply blame in your questions. Avoid the use of the word "you" in your questions because it puts the interviewee on the defensive.
- Keep your notes in the format of a timeline so that they can easily be transferred to the sequence of events.
- Analyze what is said and obtain agreement, i.e., ensure that your understanding and written notes accurately reflect the intended message of the interviewee. This is done using the "repeat back" process both during and at the end of the interview.
- Close the interview and thank the interviewee.

Position

Position refers to what the status was before the incident occurred. This includes the following:

- Weather conditions
- Job and process status (i.e., normal operations, startup, shutdown, maintenance)

Paper

Paper refers to the document trail both before and after the incident including the following:

- Logs, charts, control data notes, turnovers/handback logs, work orders, permits, JSAs, tags or printouts which indicate what was going on at the time or the state of equipment when the incident occurred
- Electronic records and data in control systems, including trends of process variables and listings of alarms
- Lab reports, metallurgical reports of broken parts (You may need to send off for these if they are important to the investigation. Your safety team or engineering department can help.)
- Copies of standing orders, procedures in use or applicable to the situation when the incident occurred
- Training records

Parts

Parts refers to how the incident site looks after the incident occurred and what the physical data indicates.

Examples of physical data to gather include the following:

- Parts, pieces and other things that you can pick up and carry away. Gather and save physical data like parts, pieces and other small objects, recording the location where they are found. Especially gather things that might be moved, cleaned up or damaged if they are left where they are. If the physical data is

too large to move or would need disassembly, make notes to investigate those things when the team is formed.

- Pictures, videos, sketches or diagrams of the scene, equipment involved or what was going on at the time. For pictures and videos, use the time/date logger on the camera to help understand when they were taken.
- Take necessary process and equipment samples. Record all samples taken on a sample log. If litigation is expected, chain of custody procedures may be necessary. Contact your quality control personnel or ETC fire and process safety team for chain of custody forms. Document all samples with the following information:

    - Name of person collecting the sample
    - Date and time sample taken
    - Exact location/source of sample

Forming the Investigation Team

Size of the Team

There is no “right” size for an incident investigation team. The number of people on the team can vary according to the complexity of the incident and the skills needed to determine the root causes. Each team member shall add value to the investigation process. Table 2 gives some basic guidance for team membership that is determined by the size of the incident.

Choosing Team Members

Regardless of the size of the incident, the team shall have the right mix of skills and knowledge to get to the root causes of the incident. The roles listed below are useful to consider, but remember that one person may be able to fill more than one position:

- A trained facilitator
- The employee(s) or contractor(s) involved in the incident (It is important to have the people directly involved with the incident on the team. They feel less threatened and are more candid when included in the process. Having them on the investigation team improves the credibility of the investigation.)
- The supervisor of the people involved in the incident
- A design or process engineer, if the incident involves technical issues
- Specialists or subject matter experts, if appropriate (Specialists may be included as regular team members or may be consulted by the team if the issues in question are simple.) Specialists could include the following people:

    - Safety/Environmental specialists
    - Material specialists
    - Equipment inspectors
    - Maintenance mechanics
    - Rotating equipment specialists
    - Vendor representatives
    - Fire protection specialists
    - Emergency response specialists

Developing the Sequence of Events

A sequence of events is a compilation of the incident events arranged in a chronological sequence. The sequence of events provides an easy visual reference so that someone looking at the sequence can quickly grasp what events occurred and when. The sequence of

events is an excellent way to organize the data from an incident and to prevent the team from jumping to conclusions.

There are a number of formats for a sequence of events. Timelines and events charts are two that are frequently used. For simple Level 1 incidents, this step may not be necessary. Timelines are more useful for Level 1 and less complex Level 2 incidents. Table 4 shows a sample timeline sequence of events.

Table 4: Sample Timeline Sequence of Events

Date	Time	Event
July 1		Last inspection/pressure test
July 17	09:00	Pipeline not leaking
	?	Pipeline develops leak
	10:17	Contractor smells, discovers leak
	10:30	Operations notified of leak
	10:37	Operator brings tools to repair leak
	10:38	Operator overcome by fumes
	10:41	Operator rescued
	11:35	Leak repaired

Events charts should be used for all Level 3 investigations and for more complex Level 2 investigations and near misses. Figure 1 shows a sample events chart sequence of events.

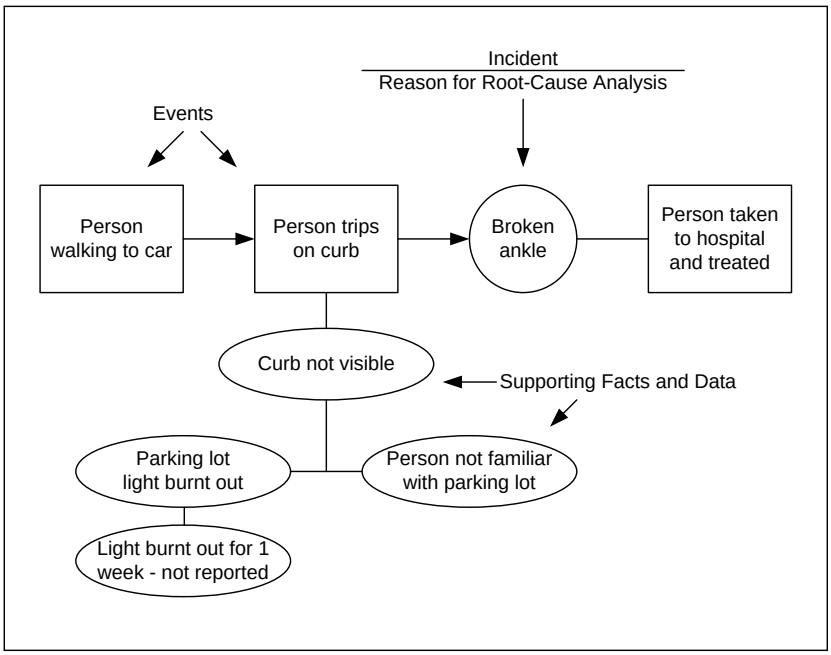


Figure 1: Sample Events Chart Sequence of Events

Whichever format you choose, use the following guidelines:

- Start the sequence of events at a point where the operation is normal. This may mean stepping back a few days, weeks, months or even years before the incident actually happens.
- Put all known **facts** on the sequence of events. These can come from interviews, records reviews, analyses, samples, etc.
- Include the response to the incident on the sequence of events if it has an impact on the size of the incident.

Identifying Protective Systems

Just prior to determining the root causes, develop a list of all the protective systems (those that already exist and those that do not exist) that may be associated with the incident. A protective system is defined as any management system or hardware system that reduces the potential for having the incident (probability) or the consequences of the incident (severity). Table 5 lists examples of protective systems.

Table 5: Examples of Protective Systems

Hardware	Systems and Procedures
Shutdowns/Alarms	Operating Procedures
Inert systems	Job Skills Training
Purge systems	Preventive maintenance
Fire suppression systems	Safe work practices (permits)
Hazard detection systems	Management of Change
Emergency block valves	Personal Protective Equipment

If relevant, incorporate the status of the protective systems in the sequence of events (i.e., shutdown activated, inert system turned off, level alarms not functioning, etc.). This is an excellent way to ensure that factors that contributed to the incident are not missed.

Determining the Root Causes

JO shall use two methods (Five Why, Why Tree) for root-cause analysis. The Why Tree method can be used on all levels of events but shall be required for Level 2 and 3 events. The Five Why method shall only be used on Level 1 events.
The following is a quick review of the basics of root-cause analysis. Causes of incidents fall into the following three categories:

Physical Causes are the equipment failures or changes in physical conditions that lead to an incident. Some examples of physical causes are: piping broke/leaked, pump was vibrating, temperature indicator failed, furnace tubes developed coking, tank was struck by lightning or electrical circuit was shorted out.

Human or Behavioral Causes are human actions or lack of action that cause the undesirable physical condition or action or, in conjunction with the physical cause, lead to an incident. Examples of human/behavioral causes are: did not open the valve, did not perform inspections for corrosion, did not follow the furnace lighting procedure, read the gauge incorrectly, used the wrong design code or skipped a step in the shutdown procedure.

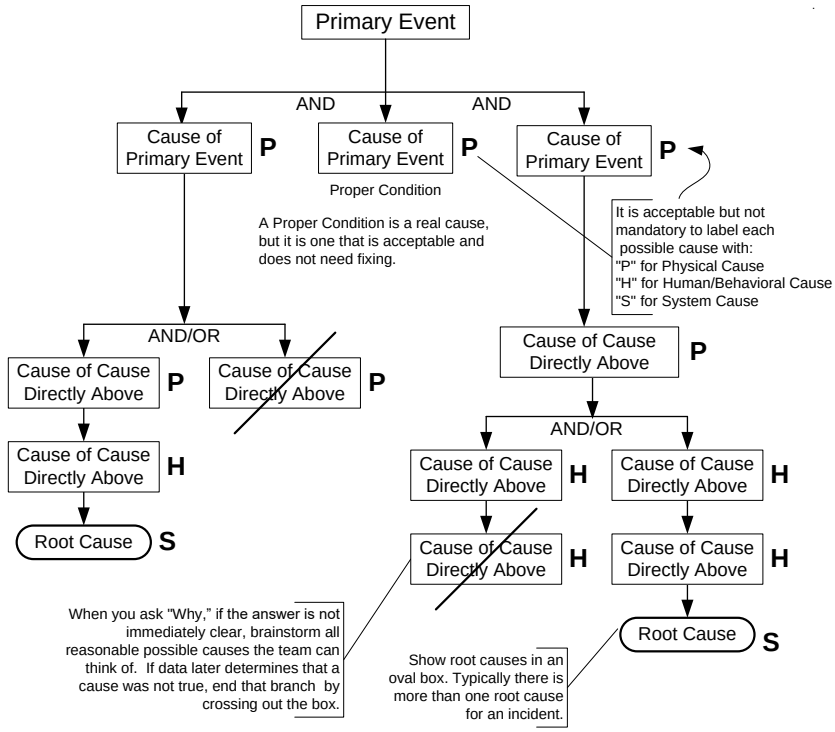
Deciding to take action or not to take action is a human cause. These may or may not be human error because sometimes the human may be following a procedure that is incorrect.

System-Level Causes are generally management system failures which result in physical causes or human causes. Management systems constitute a mix of policies, procedures, roles and responsibilities, controls, training, people, culture and work processes that make up the support network for individuals. Management systems are formalized work processes used to do work. Examples of system-level causes include procedures not enforced, preventive maintenance procedures not documented and previous deficiencies not corrected.

In general, fixing the physical and human causes leads to short-term fixes. **The goal of your incident investigation system is to work through physical and human/behavioral causes to find and remove the system-level root causes that result in incidents.** Root causes are the most basic causes that can reasonably be identified and that can be fixed. In general, root causes are system-level causes.

The Why Tree Method

Figure 2 depicts a Why Tree with the parts labeled.



- After the first-level causes are determined, move down the tree one branch at a time to the end of the branch.
- Usually one or more physical causes come first, followed by one or more human/behavioral causes, followed by a single system-level root cause.
- As each box is added, ask if this is the direct cause of the event or cause of the box immediately above.
- There are three ways that a branch can end:
  - A root cause is discovered
  - A proper condition is discovered
  - The potential cause is found not to be a factor in this incident and is crossed out but is left on the tree to add clarity.

Figure 2: A Why Tree Method Schematic

Steps in Developing a Why Tree

The following are the steps that are involved in developing a Why Tree:

1. Identify the primary event at the top of the tree using the sequence of events data. Take into account all of the event consequences in determining the top event because the different consequences may have had different causes.
2. Identify the two or three physical or human/behavioral causes that directly caused the primary event. These causes set the directions that shall be explored in the major

branches. They should be very simple and basic, directly related to the event, and they should contain only one issue.

3. Next, working one branch at a time to its end, brainstorm all of the physical causes that **reasonably** could have caused the initial actions or conditions. Include any protective systems, such as trips, alarms and so forth, that may have failed.
4. Systematically rule out brainstormed physical causes by applying the facts learned and the verification steps discussed in the next section. If you determine that a potential cause wasn't valid in this particular case, cross it off.
5. If you determine that it was a valid cause, but is a proper condition, end the branch with the words "Proper Condition" below the cause. A proper condition is a condition within which the equipment or process was designed to operate and is accepted by the team as not needing to be fixed.
6. There are often several successive physical causes. Add as many as are needed to capture the details.
7. Identify the possible human/behavioral causes for each physical cause. A human/behavioral cause is something that a person did or didn't do. These causes are primarily identified on the basis of interviews.
8. Identify possible management system causes for each human/behavioral or physical cause.
9. Continually look for failed protections using the list of protective systems identified in the sequence of events.
10. Stop asking "Why?" under the following circumstances:
    - Proper condition (a condition that is a real cause but is one that is acceptable and does not need fixing) has been reached
    - System-level root cause that you have control to fix has been found
    - A cause has been verified as not true or not a factor in this incident
11. Put root causes in ovals on the Why Tree to easily distinguish them from basic physical and human/behavioral causes.

Why Trees take many forms. Depending upon the complexity of the incident, Why Trees can be single or multiple pages. Excel and Visio are excellent tools for constructing Why Tree diagrams. If two or more pages are necessary, try labeling the bottom of a branch with a reference to the continuing page. For example, branch B continues on page X.

The Five Why Method

The Five Why method is a simplified version of the Why Tree method. It is designed for use by a single individual or a small team on simple, straightforward incidents. The thought process and objectives are very similar to the Why Tree method except that with the Five Why method, the focus is on the one or two root causes that most likely would have prevented the event.

The Five Why method can be broken up into the following steps:

1. Define the top-level incident.
2. Investigate a failure by simply asking and answering the question "Why?" This can be done graphically as shown in Figure 3, or it can be done by writing out the questions and answers. (**Don't do it in your head!**)
3. At each level, verify the result before moving on — don't make assumptions.
4. The root cause is likely to be determined by the fifth answer or level. However, it can take more than five questions. Continue until you have reached a system-level cause.
5. Identify the one or two root causes that most likely would have prevented the event.
6. If you determine that there are clearly multiple branches and root causes, stop and initiate a Why Tree investigation.

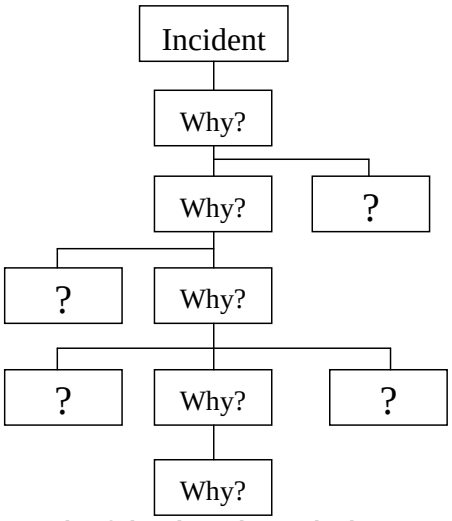


Figure 3: Graphical Example of the Five Why Method

Verifying Potential Causes

In systematically confirming or ruling out possible physical and human causes, verify your assumptions as to whether a cause is real or not. Use the following methods to rule out causes:

- **Visual** – Eye witness observations (e.g., the operators saw the fire at the bleeder valve, the inspection indicates the block valves are kept closed, the inspection of the failed part).
- **Testing/Lab Analysis** – Metallurgical tests on parts, failure analyses, lab tests on oil samples, body, etc.
- **Expert Theory** – Educated opinions by subject matter experts based on their experience or calculation (e.g., with the suction pressure noted, the pump specialist felt that cavitation would occur).
- **Conventional Wisdom** – Conditions known to exist by experienced personnel (e.g., the head operators know that every time the injection system is started up, the system pressure increases).
- **Written Data** – Design documents, procedures, specifications, repair histories.
- **Interviews** – Often used to verify human causes.

Table 6 shows a sample verification log that can be used to systematically verify or rule out causes.

Table 6: Sample Verification Log

Potential Cause	Verification Method	Verification Result	Action By	Date due

Working through Human/Behavioral Causes

Often incident investigation teams struggle with human/behavioral causes (especially when procedures are not followed) and with knowing when discipline is appropriate. Figure 4

provides guidance for developing Why Trees beyond the human/behavioral causes down to the latent/system-level causes.

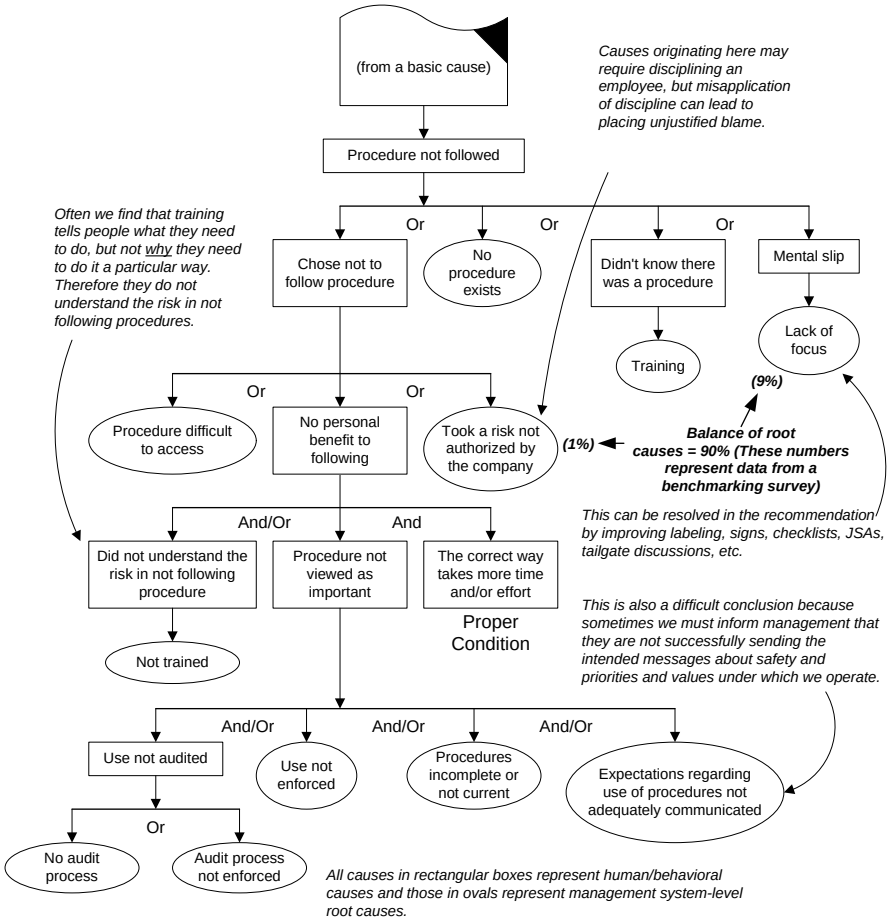


Figure 4: Guidance Template for Human/Behavioral Causes

Developing Recommendations

The investigation team needs to identify recommendations which address the immediate hazard and eliminate the system causes identified in the incident. Use the following steps to identify and document the recommendations:

1. List all the root causes and categorize them by basic-cause category (see Table 7 for more information).
2. Identify those root causes which had the greatest impact on the incident. If these causes are eliminated, they will eliminate or greatly reduce the likelihood of a similar incident recurring in the future. It is not unusual on a Level 2 or 3 investigation to have five to 10 root causes, of which two to three had the most significant impact on the incident.

3. Identify immediate recommendations to prevent recurrence. For example, if the cause of an incident was a design flaw that could still exist or could exist on similar equipment, then immediate steps need to be taken to identify that equipment and take the necessary safeguards.
4. Identify recommendations on the basis of the root causes. There may be recommendations that address multiple root causes. That is why it is important to look at the root causes in total.
5. Develop **SMART** recommendations:
   - **S**pecific – Does the recommendation pinpoint what needs to be done? Ask yourself, "If I was assigned this recommendation, would I know what to do?"
   - **M**easurable – Can the recommendation be measured quantitatively?
   - **A**ccountable – Is the recommendation assigned to a person with a target date for completion?
   - **R**elevant – Will the recommendation prevent or significantly reduce the odds of this problem happening again? Is it cost effective, feasible and practical, and can it be implemented? Will this recommendation cause any problems? Has someone who is independent from the team reviewed the recommendation for unintended negative impacts on the process or the people?
   - **T**ime limits – Is the due date for the recommendation reasonable?

Tracking Recommendations

A process needs to be in place for tracking incident recommendations to completion. All of the incident recommendations shall be kept in a centralized database which can be easily updated and audited. Key information to maintain for each recommendation includes the following items:

- Incident number
- Date of incident
- Description of recommendation
- Recommendation owner
- Status (open, complete)
- Date of last update
- Actions taken

Recommendations shall be tracked on II&R database.

Documenting the Investigation

Appendix A is a basic report template for a Why Tree investigation. Appendix B is a Five Why fact sheet that tracks similar information for the Five Why method. These reports are critical and shall be used by the investigation team to gain consensus on the root causes and by those tasked with correcting the root causes. In addition, the reports shall be used as the primary tool for communicating the results of the investigation to management and the employees.

The following are three keys to writing an effective report:

- It is generally not effective to have the group write the report. For smaller, less complex incidents, it works best for the facilitator to generate the first draft. For more complex incidents, the facilitator can generate the report outline and delegate specific sections to other team members.
- Keep the base report simple and concise. You can always include attachments.
- The base report should tell a story so that the description of what happened can be logically linked to the root causes and recommendations.

Reviewing and Issuing the Report

Particularly for Level 2 and 3 investigations, the review process plays an important part in gaining buy-in on the results of an investigation. It is also an opportunity to review the findings with management. The review process generally has the following steps:

1. Investigation team issues a draft report.
2. The Senior RCA Facilitator is copied on the report and reviews the report for consistency and quality, as needed.
3. The team leader reviews the draft report with Business Management Team (BMT). BMT may ask for reconsideration if they feel that there are issues that the team missed. Alternatively, they may want to consider using a review board for serious incidents.
4. The investigation team may need to reconvene to incorporate the review comments into the report and issue the final report.
5. The team leader submits the final report, following local reporting requirements. This is normally when the incident investigation team disbands.

Incidents shall be documented in II&R Database.

Categorizing the Root Causes

One of the best uses of root-cause analysis data is to find repeating causes or common causes of incidents or operability problems. Repeating causes, if viewed singly, can be dismissed as one-time, anomalous causes. Keeping data can help spot trends. The incidents and their root causes can be categorized any number of ways — by equipment type, Operational Excellence Expectation or financial loss, for example.
Table 7 lists the basic-cause categories that have been developed as a guide for putting root causes into a database. In any incident, several of these basic causes may play a role.

Table 7: Basic-Cause Categories and Examples

Basic-Cause Category	Explanation	Example Root Causes
Risk Assessment	Were the risks perceived correctly? Were the risk management processes used correctly? Was there a failure in the Process Hazard Analysis (PHA) process?	Risk ranking not used or required Job Safety Analysis (JSA) not completed
Procedures and Safe Work Practices	Are specific and/or general plant procedures in place? Were they used correctly? Were safe work practices, such as hot work, lock out/tag out and confined space entry, employed?	No lock out/tag out procedure Procedure not adequate Use of procedure not emphasized/supported
Design	Was there a design review? Were codes and standards followed? Was human/behavioral engineering considered? Does design incorporate the principles of inherent safety?	No design review required Design did not consider human factors CPDEP not used
Pre-Startup Safety Reviews (PSSR)	Was the PSSR procedure established and followed? Was the PSSR adequate?	No PSSR conducted prior to startup, not emphasized by management
Inspection/ Quality Control	Were the appropriate inspections requested and made? Were the proper materials used? Were they installed correctly? Is there an inspection schedule and was it followed?	Wrong material installed – no positive material identification process

Basic-Cause Category	Explanation	Example Root Causes
Preventive Maintenance/ Repeat Failure	Was recommended maintenance carried out, either scheduled or due to prior failure?	No preventive maintenance program
Human Factors	This includes confusion, fatigue, substance abuse and all causes where human factors are not due to failure of other systems, such as training deficiencies or scheduling of work.	Alarms not prioritized because human factors review not included in design process (this could also fall under design or training)
Management of Change (MOC)	Was there an MOC system in place? Did the MOC system fail? Was it followed?	No MOC process MOC not used – commonly viewed as not worthwhile
Training	Did a training deficiency contribute in any way to this incident?	Employee missed training session and no system to ensure all training carried out
Contractor Safety	Is there a process that ensures that all contractors hired meet the standards for company systems?	Contractor safety records not audited by company
Communications	Have instructions been conveyed clearly? Have recommendations been passed on and confirmed? Are turnover logs used as a communication tool? What systems ensure correct interpretation of communication?	No end of shift written turnover required Instructions not understood and no process to confirm understanding
Supervision	Was there adequate oversight to understand the “big picture?” Did supervisors and management hold employees accountable for their actions? Did they audit the process? Did they foster teamwork?	Job planning was less then adequate Supervisor was not aware of the activity
Incident and Near Miss Investigation	Did a previous incident or near miss recommend action that would have prevented this incident? Did lack of investigating a previous incident contribute to this incident?	Near miss reporting and investigation not required
Emergency Response	Did emergency response contribute in any way to the magnitude of this incident? Could better emergency response have mitigated or terminated this incident sooner?	No system to ensure local fire department trained in hydrocarbon firefighting techniques
Natural Phenomenon	This includes items out of our control – flood, earthquake, tornado, hurricane, etc.	

Document Control Information

Table 8: Document Control Information

Description		
Approval Date	18-October-06 (Initial)	
Next Revision Due	November-2010	

Description		
Control Number		

Table 9: Document History

Version Number	Date	Notes
1.0	18-October- 06	
2.0	5-November- 07	
3.0	18-Decemeber-10	

Document List

The following table provides a list of documents referenced in this procedure.

Table 10: Document List

Attachment Title	File Name
Chevron OE 2010 Data Requirements and Definitions	2010 OE Data Requirements and Definitions.pdf
ChevronTexaco Root Cause Analysis Incident Investigator Facilitator Handbook	Rev 7 Master Incident Investigator Handbook.doc

Appendix A: Incident Report Template

Incident Investigation & Reporting **Incident Investigation–Why Tree Method**

Date of Incident	Date Investigation Began	II&R Case Number	Brief Incident Description

Incident Consequences (Check all that apply)

☐ Environmental Impact ☐ Fire/Explosion ☐ Injury or Illness ☐ Motor Vehicle Crash
☐ Near Miss ☐ Non-Compliance ☐ Property/Equip Damage or Loss ☐ Spill/Release

Incident Location	Type of Facility	Type of Equipment	Incident Costs (KD) Direct: Lost Profit:

Team Leader	Team Members (Name, Title, Organization)		
RCA Facilitator			

Summary of Incident

Response to Incident

Sequence of Events (Show timeline here or link to a separate file.)

Date / Time (Optional)	Describe event

Root Causes

Basic Cause Category	Cause Description
1. (select from list)	
2. (select from list)	
3. (select from list)	
4. (select from list)	
5. (select from list)	
6. (select from list)	
7. (select from list)	
8. (select from list)	

Tenets Broken

☐ 1. Operate within design or environmental limits.
☐ 2. Operate in a safe and controlled condition.
☐ 3. Ensure safety devices are in place and functioning.
☐ 4. Follow safe work practices and procedures.
☐ 5. Meet or exceed customer's requirements.
☐ 6. Maintain integrity of dedicated systems.
☐ 7. Comply with all applicable rules and regulations.
☐ 8. Address abnormal conditions.
☐ 9. Follow written procedures for high risk or unusual situations.
☐ 10. Involve the right people in decisions that affect procedures and equipment.

Recommendations

Action Item	Ownership Assigned To	Target Date
1.		
2.		
3.		
4.		
5.		

Date Submitted:	**Team Leader or RCA Facilitator:** send completed form via **email** to "JO Incident Report."

Management Review and Authorizations

Findings and Action Plan Approved: _____ Date _____ Date _____ Date
General Superintendent General Superintendent Manager, Joint Operations

EHS Review Reviewed by Date	EHS Comments:	Entered in Database ☐ Yes Initial

Attachments: (hyperlinks)

Appendix B: Five Why Fact Sheet

Incident Number:	**Location:**	**Facility Name:**
Incident Date:	**Type of Process:**	**Type of Equipment:**
Team Members:		
Incident Description:		

Five Whys

1. Why did "above" happen?	**Verification**
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
5. Why did "4" happen?	
6. Why did "5" happen?	
7. Why did "6" happen?	
8. Why did "7" happen?	

Root Cause(s): What were the root causes of your failure?

1		Basic-Cause Category:
2		Basic-Cause Category:
3		Basic-Cause Category:

Solution(s): (List actions that will be taken to eliminate the root cause of the failure.)

1		Due Date:	Owner:
2		Due Date:	Owner:
3		Due Date	Owner

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