Accident Investigation
The PEME Principle

IN TIMES OF KEEN COMPETITION AND LOW PROFIT MARGINS, LOSS CONTROL MAY CONTRIBUTE MORE TO PROFITS THAN AN ORGANIZATION'S BEST SALESMEN.

It is necessary for the salesman of a business to sell an additional $1,667,000 in products to pay the costs of $50,000 in annual losses from injury, illness, damage or theft, assuming an average profit on sales of 3%. The amount of sales required to pay for losses will vary with the profit margin.

Yearly Incident Costs	**PROFIT MARGIN**				
	1%	**2%**	**3%**	**4%**	**5%**
$1,000	100,000	50,000	33,000	25,000	20,000
5,000	500,000	250,000	167,000	125,000	100,000
10,000	1,000,000	500,000	333,000	250,000	200,000
25,000	2,500,000	1,250,000	833,000	625,000	500,000
50,000	5,000,000	2,500,000	1,667,000	1,250,000	1,000,000
100,000	10,000,000	5,000,000	3,333,000	2,500,000	2,000,000
150,00	15,000,000	7,500,000	5,000,000	3,750,000	3,000,000
200,000	20,000,000	10,000,000	6,666,000	5,000,000	4,000,000
	SALES	**REQUIRED**	**TO**	**COVER**	**LOSSES**

This table shows the dollars of sales required to pay for different amounts of costs for downgrading incidents; i.e.; if an organization's profit margin is 5%, it would be required to make sales of $500,000 to pay for $25,000 worth of incidents; with a 1% margin, $10,000,000 of sales would be necessary to pay for $100,000 of the costs involved with downgrading incidents.

THE REAL COSTS OF ACCIDENTS CAN BE MEASURED AND CONTROLLED

Like the tip of an iceberg, the insured costs of accidents are only a small part of the real costs that can be measured and controlled with modern Loss Control techniques.

Accident/Near Miss Investigation/Reporting Overview

We have found that accidents can be traced to deficiencies in one or more of the four PEME factors: people, equipment, material and environment. These four operating factors are the same ones that affect your firm's efficiency and profitability. By focusing on PEME, you can control losses and better manage your entire operation.

Accident Reporting Examples

A factory worker sprains his back while moving sheet steel. Seven work days are lost.

Action taken: the supervisor instructs the workers to be more careful.

A shopper slips on an ice-covered sidewalk. The shopper receives medical treatment costing $600.

Action taken: the storekeeper scrapes the ice off the sidewalk.

A delivery truck backs into a parked car. The cargo is delivered late and the truck suffers $180 damage.

Action taken: the dispatcher places a safety sticker on the truck's dashboard.

Are the actions taken going to prevent similar accidents from happening in the future? Most likely, no!

We should, of course, do everything possible to prevent accidents from occurring the first time. However, we realize accidents do happen. That's why our immediate goal is to convince you to analyze why the accident occurred and then to take corrective action to prevent similar accidents from occurring in the future.

The procedures and techniques discussed in this booklet can be applied to worker injury or illness resulting from employment to automobile accidents, and to accidents incurred by the general public or visitors on your premises.

What is in accident?

We define an accident as: An undesired occurrence resulting in personal harm or property damage.

What is a Near Miss?

Not only are accidents our concern, but so are near misses or incidents which we define as: An undesired occurrence that, under slightly different circumstances, could have resulted in personal harm or property damage.

What is an Accident/Near Miss Investigation?

An Accident/Near Miss investigation is a systematic effort to determine what happened, how it happened, why it happened and what must be done to prevent it from happening again.

PREVENTION: the main purpose for conducting an investigation, not to place blame.

Who Investigates?

Normally, supervisors are the best qualified people to conduct the investigation. Why? Because of the very nature of their job. They know the employees and their jobs, skills, experience, and attitudes. They also know the equipment, material and working environment. But most importantly, they have the authority in most situations to take corrective action to prevent future accidents. And if necessary, they may request assistance from the safety department or upper management.

When to Investigate?

As soon as the physical situation has been stabilized and any injured persons have been cared for, you should begin the investigation at the accident/near miss scene. Immediacy is important because delay can make it more difficult to conduct a complete and factual investigation. Those involved in the accident/near miss can quickly forget or alter facts- often unintentionally- as they begin to think about the incident. Witnesses standing around after an accident begin to compare observations and in so doing can influence what they will tell the investigator. Clean-up crews can disturb or remove valuable clues which damaged equipment or material can provide. Therefore, it is essential to begin investigating the accident as soon as possible.

Why Should You Use an Investigation Report?

As early as possible in your investigation, refer to your company's own Accident Investigation Report form. Use of such forms can guide you through a complete investigation, communicate your findings to upper management, and provide a written record of what corrective actions were or were not taken. An Accident Investigation Report is attached at the back of this booklet.

How Do You Investigate an Accident/Near Miss?

Using the form, conduct a thorough investigation by completing these four steps:

- Gather all related information
- Analyze the information
- Determine what corrective action must be taken to prevent a future accident
- Take corrective action

1. Gather All Related Information

Who was involved? What happened? Where did it happen? When did it happen? The first step in the investigation process is to gather all of the information you need to answer these questions. At this point don't try to answer WHY the accident occurred. If you conclude WHY before you have gathered all of the available information, you may not learn about less obvious yet vital facts which could prove important in determining what corrective action must be taken.

Let's take a closer look at some information gathering techniques.

Interviewing Involved Employees, Drivers, and Witnesses

You may encounter employees, drivers or witnesses who are reluctant to talk about what happened because they fear being reprimanded, fear placing the blame on a fellow worker, or fear getting involved in an investigation. In spite of their reluctance and fears, you still must get the relevant information. The following proven interviewing techniques can increase the chances of getting the desired information.

- Put the employee at ease. Remind him or her that the purpose of the interview is not to place blame, but to prevent a future accident.
- Conduct private and separate interviews.
- Ask for the person's own version of the accident. Don't interrupt until he, or she has completely described the accident. At that time, you can ask any necessary open-ended questions to clarify explanations.
- If you must ask any "why" questions, you should ask those questions last because they may cause the person to become defensive and unwilling to provide information which will be of real value to the investigation.
- Repeat the story to be sure you understand what was said. In this manner, you give the person an opportunity to clarify details or to correct earlier statements. This also serves to reassure the person that his or her version of the accident has been heard.
- Close with a positive reminder. You can further assure the employee that the purpose of the interview is to prevent a future accident and not to place blame.

Once you have interviewed the people involved in the accident, you should interview the witnesses. It may be necessary to consult experts, purchasing agents, professionals working in other company departments, equipment and material suppliers, and training personnel.

Studying the Accident Scene

When conducting the investigation, you can learn much by studying the accident scene. Damaged equipment may show signs of wear. Marks on damaged materials may indicate that a particular job was done without proper concern for prescribed procedures. Studying the environment may indicate the lighting, air ventilation or other conditions were at least partially responsible for the accident.

2. Analyze the Information. Use the PEME Question Guide.

Collecting information does not guarantee that you will take all of the corrective actions necessary to prevent a future accident. To avoid overlooking the less obvious but still important aspects of an accident, take time to analyze the information you gather by considering the PEME questions listed on the following two pages and on the back side of the Accident Investigation Report.

Safety Services has found that accidents stem from management deficiencies which result in the loss of control over one or more of the four operating factors- People, Equipment, Material and Environment. These are the same factors that affect all areas of your operation from quality control to profitability. By controlling these factors, you will reduce not only accidents, but material waste, equipment breakdowns and production delays.

Re-enacting and Reconstructing the Accident (not recommended unless no other option is available – use only for very serious incidents and with professional safety supervision)

Re-enacting the accident is another information gathering technique which you may find useful for non-automobile accidents. With this technique, the supervisor asks the involved workers to act out the sequence of events which led to the accident, or repeat the actions in slow motion and explain each step. If you decide to use this technique, be certain that the workers do not place themselves in dangerous positions. People have been injured a second time while re-enacting the original accident.

It is not necessary to re-enact every accident. Use this technique when:

- It is the only way to gather information
- It will assist in determining what preventative action should be taken
- It will verify a statement made by an employee or witness, or
- It can demonstrate a safety rule to a training group

When involved employees and witnesses are not available, you must reconstruct the accident. By studying the environment, damaged equipment and materials, try to

imagine what happened. During the reconstruction process, you may need assistance from the safety department, technical, and medical experts.

Researching Materials and Procedures

After using the more common information gathering methods, you may find that you still do no have all the information necessary for a complete investigation. At this point, you may have to research the materials and procedures used to gain a clearer understanding of what happened and what preventative action should be taken.

PEME Question Guide

People: Who was involved?

The Term "people" refers not only to all your employees, but also to others over whom you have some control such as vendors and subcontractors.

Placement: Job placement is probably the single most important element in controlling people. Select people whose skill and capabilities meet job requirements. Evaluate current job assignments and make new assignments, if necessary. For drivers of company vehicles, placement involved restriction of driving privileges to those drivers who have good past driving records.

Training: Whether through a formal classroom program or on-the-job instruction train your employees to perform their jobs correctly and safely. Training for new employees is essential, but do not neglect the training of experiences employees who transfer to new jobs and drivers who switch to different equipment or routes.

Enforcement: Establishing rules and standard operation procedures will be meaningless unless you enforce them. Insist that all required rules and regulations be adhered to including use of personal protective equipment and automobile seat belts, proper installation and use of machine guards, etc.

What qualifications are necessary to perform the task?

Who is most qualified?

What instructions or training were provided?

What additional training is needed?

What instruction or rules were not followed?

What addition rules or enforcement action should be established?

Equipment: What Equipment was involved?

By equipment we mean all the machinery, tools and vehicles necessary to produce your products or provide your services. Also included is all personal protective equipment (i.e. goggles, gloves, aprons, etc.) that employees should use to safety perform their jobs.

Design and Arrangement. To eliminate waste, delays and accidents, insist on the proper design and arrangement of equipment. Do not accept equipment that is delivered without required safety controls and guards. See that is it arranged in relation to other operations and equipment so that hazards and material handling are minimized.

Purchasing: The people in your organization who make the purchasing decisions have the responsibility to select the most efficient and hazard-free equipment, tools and vehicles. Before buying, evaluate the quality of design and workmanship, ease of operation and maintenance, and suitability for the intended use.

Maintenance: To assure that your equipment, tools and vehicles are properly maintained, establish a maintenance program. Depending on your particular circumstances, you may request an informal inspection of all tools before use. Or you may establish a formal program complete with specific procedures and mandatory written reports.

Why was this equipment used?

What equipment should be used?

What guards were or were not used?

What addition personal protective equipment should be provided?

Is the personal protective equipment properly fitted?

What additional design and arrangement controls are necessary?

How did the quality of the equipment contribute to the loss?

What additional purchasing controls are necessary?

What maintenance problems were evident?

When should maintenance be performed?

How can maintenance be improved?

Is personal protective equipment properly maintained?

Material: What Material was Involved?

Material consists of all raw materials, subassemblies, component parts, fuel and chemicals used in manufacturing your product or providing your service.

Design and Arrangement: To achieve maximum hazard control and material flow, develop a well-organized storage system. Consider proximity to equipment, machinery, walkways and emergency exits. Also, establish and enforce handling procedures for loading, unloading and securing cargo. Place easily seen warning signs on hazardous materials and cargo.

What design characteristics contributed to the loss?

How was the material arranged, handled and used?

How should the material be arranged, handled and used?

Where should the material be arranged?

Environment: What Environmental Factors Were Involved?

The environment refers to lighting, noise levels, air and water pollution in and around the building, yards and interiors of vehicles.

Design and Arrangement: Be sure to evaluate the many aspects of the design and arrangements of working environments. Your concerns will include: air ventilation, purification and exhaust systems, water purification systems, noise and vibration control, lighting systems, alarm and detection systems and general plant layout.

Purchasing: Use purchasing decisions to exercise control over the selection of tools equipment and vehicles that will provide the most hazard-free and healthful environment.

Housekeeping: Institute housekeeping controls by regularly scheduling the cleaning of buildings, equipment and vehicles. Attempt to remove contaminants before they interfere with lighting, exhaust, ventilation, filtration or purification systems.

Maintenance: Regularly maintain and properly repair buildings, environmental control systems and the operation cabs of vehicles. You will have the best possible environment if everything is operating efficiently.

Why was it designed and arranged this way?

How should it be designed and arranged?

What purchasing controls are necessary?

When should housekeeping be improved?

What maintenance problems are evident?

When should maintenance be performed?

How should maintenance be improved?

Material: What Material was involved?

Material consists of all raw materials, subassemblies, component parts, fuel and chemicals used in manufacturing your product or providing your service.

Design and Arrangement: To achieve maximum hazard control and material flow, develop a well-organized storage system. Consider proximity to equipment, machinery, walkways and emergency exits. Also, establish and enforce handling procedures for loading, unloading and securing cargo. Place easily seen warning signs on hazardous materials and cargo.

What design characteristics contributed to the loss?

How was the material arranged, handled and used?

How should the material be arranged, handled and used?

Where should the material be arranged?

3. Determine corrective action

Through your analysis of the management controls of the four operating factors, you can determine what corrective actions must be taken and what management controls must be evaluated. In some cases, you must take immediate temporary corrective action to eliminate or control serious hazards which could lead to another accident. In every case, you will take permanent action to eliminate the management deficiencies which allowed the accident to occur in the first place. List these actions and controls in the *Prevention* section of the report.

4. Take Corrective Action

Don't wait. Once you have determined what must be done, TAKE ACTION, especially immediate action which you have the authority to carry out. As you take each action place an "X" by the listing in the report to record what has been done and to remind you of what still has to be done. Occasionally other departments such as maintenance,

housekeeping, purchasing or personnel must take corrective actions. Don't make any assumptions. Follow-up to make sure that the other departments take the necessary corrective actions for which they are responsible.

Key Questions-Accident/Near Miss Investigations

Who

1. Who was injured?
2. Who saw the accident?
3. Who was working with him?
4. Who has instructed/assigned her?
5. Who else was involved?
6. Who else can help prevent recurrence?

What

1. What was the accident?
2. What was the injury?
3. What was she doing?
4. What had he been told to do?
5. What tools was she using?
6. What machine was involved?
7. What operation was he performing?
8. What instructions had she been given?
9. What specific precautions were necessary?
10. What specific precautions was he given?
11. What protective equipment should have been used?
12. What protective equipment was she using?
13. What had other persons done that contributed to the accident?
14. What problem or question did he encounter?
15. What did she or witnesses do when accident occurred?
16. What extenuating circumstances were involved?
17. What did he or witness see?
18. What will be done to prevent recurrence?
19. What safety rules were violated?
20. What new rules are needed?

When

1. When did the accident occur?
2. When did she start on that job?
3. When was he assigned on the job?
4. When were the hazard pointed out to her?
5. When has his supervisor last checked on job progress?

6. When did she first sense something was wrong?

Why

1. Why was he injured?
2. Why did she do what she did?
3. Why did other person do what he did?
4. Why wasn't protective equipment used?
5. Why weren't specific instructions given to her?
6. Why was he in the position he was?
7. Why was she using the tools or machine she used?
8. Why didn't he check with his supervisor when he noted things weren't as they should be?
9. Why did she continue working under the circumstances?
10. Why wasn't supervisor there at the time?

Where

1. Where did the accident occur?
2. Where was he at the time?
3. Where was the supervisor at the time?
4. Where were fellow workers at the time?
5. Where were other people who were involved, at the time?
6. Where were witnesses when accident occurred?

How

1. How did she get injured?
2. How could he have avoided it?
3. How could fellow workers have avoided it?
4. How could the supervisor have prevented it?- could she?

Identify the Immediate and Basic Causes

There are two levels of cause factors. These are the immediate causes and the basic causes. It is important to identify both.

The **immediate causes** are often called the symptoms of the problem. These are the *unsafe acts* and *unsafe conditions* which lead into the particular accident. Typical of these are:

Unsafe Acts	**Unsafe Conditions**
Operating without authority	Inadequate guards
Failure to warn or secure	Defective tools/equipment

Operating at improper speed	Congestion
Making safety devices inoperable	Inadequate warning system
Using defective equipment	Substandard housekeeping
Failure to use protective equipment	Fire/explosion hazards
Improper loading or placement	Air Contaminants
Improper lifting	Excessive Noise
Servicing equipment in motion	Radiation
Horseplay	Inadequate lighting
Drug or alcohol use	Inadequate ventilation

These symptoms are the result of one or more basic causes which produce them. The basic causes must be found if other accidents/near misses are to be prevented.

Basic Causes include:

Personal Factors	**Job Factors**
Lack of knowledge	Inadequate work standards
Improper motivation	Inadequate design or maintenance
Physical or mental problems	Inadequate purchasing standards
	Normal wear and tear
	Abnormal wear and tear

Dear Sir:

I am writing in response to your request for additional information. In block Number 3 of the accident reporting form, I put quote - poor planning - unquote as the cause of my accident. You said in your letter that I should explain more fully, and I trust that the following details will be sufficient.

I am a bricklayer by trade. On the day of the accident, I was working alone on the roof of a new six story building. When I completed my work, I discovered that I had about 500 pounds of brick left over. Rather than carry the bricks down by hand, I decided to lower them in a barrel by using a pulley which fortunately was attached to the side of the building, at the sixth floor.

Securing the rope at ground level, I went up to the roof, swung that barrel out, and loaded the brick into it. Then I went back to the ground and untied the rope holding it tightly to insure a slow decent of the 500 pounds of bricks. You will note in the block number eleven of the accident report form that I weigh 135 pounds.

Due to my surprise to being jerked off the ground so suddenly, ***I lost my presence of mind*** *and forgot to let go of the rope. Needles to say, I proceeded at a rather rapid pace up the side of the building.*

In the vicinity of the third floor, I met the barrel coming down. This explains the fractured skull and broken collarbone.

Slowed only slightly, I continued my rapid ascent, not stopping until the fingers of my right hand were two-knuckles deep into the pulley.

Fortunately, by this time I had regained my presence of mind and was able to hold tightly to the rope in spite of my pain.

At approximately the same time, however, the barrel of brick hit the ground- and the bottom fell out of the barrel. Devoid of the weight of the bricks, the barrel now weighed approximately fifty pounds.

I refer you again to my weight in block number eleven. As you might imagine, I began a rapid descent down the side of the building.

In the vicinity of the third floor, I met the barrel coming up. This accounts for the two fractured ankles and the lacerations of my legs and lower body.

The encounter with the barrel slowed me enough to lessen my injuries when I fell onto the pile of bricks and fortunately, only three vertebrae were cracked.
I am sorry to report, however, that as I lay there on the bricks in pain, unable to stand, and watching the empty barrel six stories above me- I again lost my presence of mind –

I LET GO OF THE ROPE!