State of Arizona
Division of Military Affairs
1 August 1994

DEMA DIRECTIVE 70.

LOSS CONTROL PROGRAM

1.0 GENERAL

The Department of Emergency & Military Affairs is committed to ensuring occupational health and safe conditions by actively identifying and eliminating safety hazards and violations to keep personnel and monetary losses to a minimum. State personnel working at military-unique workplaces are governed by the respective Safety directives of the Army and Air National Guard. Where such regulations or directives already exist, they will be used to meet the standards established by this program.

1.1 Plan Organization

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2.0 DEFINITION

Loss control is defined as those measures designed to eliminate and/or reduce loss of human, financial or physical resources both to the state and general public. Such measures include risk assessment, employee education, hazard prevention, inspections, maintenance, and emergency procedures.

3.0 PROGRAM RESPONSIBILITIES

3.1 Loss Control Coordinator

The State Loss Control Coordinator is charged with overall responsibility for the implementation and compliance with directives of the state and reports to the State Resource Manager.

3.2 Division Directors

Each Division Director is responsible for loss control measures in their corresponding divisions. They will ensure that safety/loss control issues are addressed in the annual budget request as needed and that loss prevention and training efforts are supported.

3.3 All Supervisors

All supervisors are responsible for their respective work locations to provide a safe work environment, a high level of safety awareness, eliminate unsafe conditions, and to allow for appropriate loss control training of the work force to include dissemination of this program and appropriate loss control programs to all employees. The supervisor will also insure that the OJT program for each new employee includes adequate guidance on Loss Control. The senior supervisor at each location is responsible for the establishment of loss control programs appropriate to the location.

3.4 Loss Control Committee

A committee is appointed to implement safety and loss control procedures as required by Risk Management. Its composition is comprised as follows:

State Resource Manager	Chair
Loss Control Coordinator	Member/Recorder
Assistant Director for Admin, ADEM	Member
Executive Officer NADA	Member
Administrative Services Officer	Member
State Safety Officer	Member
State Environmental Manager	Member
Executive Officer, 161 ARG	Member
Executive Officer, 162 FG	Member
Sergeant Major, WAATS	Member

The committee will meet quarterly and report its activities to TAG. Specifically the committee will:

a. Review incidents relative to agency losses

b. Review existing programs for sufficiency in loss reduction/prevention

c. Establish and Monitor employee education programs relative to loss control

d. Review agency compliance with OSHA requirements

e. Update policy and review programs to insure currency

f. Disseminate loss control program requirements

g. Prepare annual Loss Control Plan

3.5 All Employees

All employees are responsible for the proper exercise of their functions in accordance with applicable regulations and established procedures. It is incumbent on all employees to follow all rules and procedures and to report unsafe acts to an appropriate person who has responsibility for the area of concern. All employees with loss control responsibilities will have those responsibilities indicated on their PDQ and their annual EPA.

3.6 Accountability

All supervisors and employees are accountable for their actions and appropriate entries regarding loss control; factors will be made on employee performance appraisal documents. Supervisors are thus held accountable for training and all employees are accountable for performance. The following will receive specific mention on employee appraisal documents and may be cause for disciplinary action to include dismissal:

a. Unsafe acts due to negligence

b. Violation of established safety procedures

c. Disabling of safety mechanisms or systems

d. "Horseplay'

4.0 EDUCATION AND TRAINING

4.1 Purpose

To ensure that all employees receive the training and orientation necessary to perform their assigned tasks in the manner prescribed by the applicable statutes and regulations and in a manner consistent with established safety requirements.

4.2 General

There are two types of training requirements:

- General
- Technical or occupational

General training is that which has a broad application to all career fields and includes new employee orientation and new supervisor training programs. Technical or occupational training is that which applies to a specific occupation and includes on-the-job-training (OJT), specialized safety programs and specific skills training.

4.3 Responsibilities

The Department Administrative Services Officer (DEMA-RMA)

Will develop and conduct new employee training programs for all new employees and supervisor orientations for all new supervisors. These are to cover a wide range of topics as determined by the needs of the department and should provide adequate information as to the general functions of DEMA as well as employee rights and responsibilities. These classes will be mandatory for all new employees/supervisors. This requirement will be met within three months of appointment.

This office will also provide information regarding the DOA Training programs and serve as the official liaison between DEMA and DOA Staff Development and Training, and the DOA Risk Management training programs. Requests for special training programs should be processed through this office. State training records will be maintained by DEMA-RMA.

SUPPORT PERSONNEL MANAGEMENT OFFICER

Will develop and conduct new employee training programs for all new employees and supervisor orientations for all new supervisors. These are to cover a wide range of

information as to the general functions of DEMA as well as employee rights and responsibilities. The SPMO will coordinate training opportunities for federal employees. Such training programs will include specialized training requirements as required.

Division Directors

Will establish and distribute specific training requirements for each career series as required. The written outline of the OJT programs will be maintained with the supervisors training files. This will include specialized training requirements as required.

All Supervisors

Will establish formal and informal OJT programs for all new and transferring employees. Such programs will include all safety requirements. Supervisors are also responsible for providing safety training for new procedures and remediation as required. Records of such training will be retained by the supervisor and a copy will be furnished to DEMA-RMA.

4.5 On-the-job-training

Supervisors will develop OJT programs and insure that all new and transfer employees receive training appropriate to their new position. The written outline of the OJT programs will be maintained with the supervisor's training files. This training will include as a minimum:

a. Tasks required for function

b. Reporting and work relationships

c. Employee appraisal requirements

d. "Hands-on" training time to learn skills, functions and procedures

e. Safety requirements of the position

f. Orientation to the work area to include safety factors

g. Issuance and use of protective clothing and equipment (required and recommended)

h. Accident reporting procedures

Personnel and property security requirements and procedures

5.0 EMERGENCY PLANS

5.1 Purpose

An Emergency Plan is required to establish and document procedures, should an emergency situation arise. Established emergency plans serve to protect human life and minimize the loss of materials and equipment.

5.2 Applicability

All Facility Managers throughout the Department of Emergency and Military Affairs will establish an emergency plan for their facility, in accordance with DEMA Directive 70.3. The plan will apply to all persons working in the facility for which the plan is designated, even if the person does not work under the control or influence of the Facility Manager. The Facility Manager is responsible for developing, training, and executing the emergency plan.

5.3 General

The plan shall include procedures to follow in the event of serious injury, fire or other emergency that can be reasonably foreseen at specific facility locations.

Provisions shall be made for the following items:

Designating employee(s) responsible for formulating, implementing, testing, and maintaining the emergency plan.

Establishing written procedures for notification of emergency personnel and safe evacuation of people. Evacuation plans shall be posted throughout the facility.

Providing or arranging for first aid, medical treatment and emergency transportation in the event of a serious injury.

The plan shall also include the following procedures for:

a. Notification of emergency reaction personnel and evacuation notification of personnel from danger areas.

Training of emerg

c. First aid treatment in the event of serious injuries.

d. Maintaining written records for establishing, training, ANNUAL testing, and evaluation of the emergency plan.

5.3.3. Testing of Emergency Plans

"Per OSHA regulations, 29 CFR 1910.38, each facility manager will conduct a test of it's published emergency plan/fire evacuation plan NLT than once annually".

5.4 Summary

The plan will serve as a means to identify and justify the requirement for appropriate protective equipment for both personnel and facilities.

6.0 SAFETY INSPECTIONS

6.1 Purpose

To establish responsibility and scope for safety inspections.

6.2 General

Supervisors are responsible to inspect worksites and review work practices to insure compliance with established safety procedures and identify procedural, structural or training requirements.

6.3 Responsibilities

Each supervisor will establish inspection schedules within his/her designated area. These inspections will inquire into areas of proper performance, environmental, equipment and structural safety, safety training, effectiveness, use of protective clothing and equipment and proper dissemination of information.

Check lists or reports will be maintained for each inspection. These will be retained by the supervisor with a copy provided to the second-line supervisor until the subsequent inspection unless otherwise required by directive. In those areas where regulations have been published, compliance with those regulations will be the standard by which the inspection will be measured. Where external inspections are conducted, the supervisor will maintain records of each inspection and follow up on any discrepancy.

It is the supervisor's responsibility to be aware of applicable safety procedures in his/her instructional area. Although a supervisor may assign others to conduct a safety inspection, the responsibility for the inspection and follow-up remain with the supervisor.

Superior supervisors are responsible for inspection programs in all levels under their supervision.

7.0 ACCIDENT/INCIDENT INVESTIGATION

7.1 Purpose

Accident/incident investigations are performed with the intent to prevent further occurrence. They are not conducted to place blame.

7.2 General

Every accident/incident will be investigated under the supervision of the senior supervisor/manager of the work unit. The extent of the investigation will be commensurate to the seriousness of the accident itself. The purpose of the investigation is to determine the facts of the accident, the actual cause, the effect of the event and make a recommendation for immediate and long-term remediation. Reporting requirements specified here are for incidents involving State resources or personnel.

7.3 Responsibility

The senior supervisor of the functional area is responsible for the investigation and report preparation for each accident.

7.4 Procedures

Absent an established procedure (by regulations or directive) the generic investigation format at Appendix I may be used to conduct any investigation. Once the investigation has been completed, a report will be submitted to the Loss Control Coordinator (DEMA-RM-G). As a minimum, the report will contain:

a. A description of the event including the environmental conditions

b. Sequence of events leading to the accident.

c. Cause (direct and indirect) of accident.

d. Recommendations or remedial and corrective actions required to prevent subsequent accidents.

e. Where external investigatory and/or reporting requirements exist, they will be consolidated with this report wherever practicable.

f. DEMA-RM-G will maintain a file on each accident/incident as provided by records retention guidelines.

8.0 MAINTENANCE AND OPERATIONS SAFETY

8.1 Purpose

To protect the investment which the property, structures and equipment represent and to extend its useful life, a sound, well-planned program of property maintenance is necessary. A Property Maintenance Control System (PMCS) will provide a method of recording, organizing, controlling and carrying out the proper maintenance of DEMA facilities.

Applicability

All Facility Managers throughout the Department of Emergency and Military Affairs (DEMA) will establish a precise, preplanned program of routine inspection of property, structures and equipment under their control. The Facility Manager is responsible for developing and executing the program.

8.3 General

The program shall include an inspection of all capital equipment, installed equipment, properties and structures.

Provisions shall be made for the following items:

Designating an employee responsible for submitting the Facility's Purchase or Work Request.

Establishing written procedures for notification by personnel within the facilities in the event of an equipment, structural or utility failure or breakage.

Identifying utility shut-offs or control points to preclude damage in the event of a utility failure or breakage.

8.3.2 The plan shall also include the following procedures:

Notification of Facilities Management Office or corresponding civil engineering element personnel in the event of an emergency structural or utility failure or breakage.

Train personnel how to shut off water and gas valves, electrical circuit breakers and electrical disconnects.

8.4 Summary

The Facilities Management Office (FMO) or corresponding civil engineering element will receive all written and telephonic requests for repair of facilities equipment, property and structures, and respond in a timely manner. The inspection program administered by the Facility Manager will interface with the FMO/Civil Engineering PMCS to:

- Enhance routine maintenance procedures and servicing.
- Develop a system of reporting and permanently recording all pertinent facts of the physical condition of the property into a computer format and database beginning at the start-up of construction, and thereafter being continuously updated.

9.0 SECURITY

The military security unit responsible for each work site will establish appropriate security requirements and measures. Every supervisor is responsible for compliance with these requirements.

10.0 PROPERTY PROTECTION

10.1 General

All employees are responsible for the protection of state property. All persons who have access to property are responsible for the proper use and security of that property while they are using it.

The Directors of Emergency Management and Military Affairs are responsible for establishing procedures and systems to provide for Personnel and Assets security. Appropriate Army, Air Force and National Guard Regulations provide guidance for physical security plans with local commanders and facility managers supplementing as needed to provide control procedures.

Responsibility

The property manager in the Administrative section (DEMA-RMA-A) is responsible for overall accountability of state property (real and personal). This position establishes the overall inventory management policy for DEMA. This will include the coordination of procedures and administrative requirements for all employees who have property responsibility.

10.2.1 Reporting

All state property losses and incidents involving harm to state employees will be reported to DEMA-RM-G within five days of the occurrence. This written report will include date, time, circumstances, nature of loss, and tentative cause of loss. The Resource Manager is responsible to review the investigation reports of such losses and provide appropriate loss analysis to prevent further occurrences.

10.2.2 Employee Responsibility

Every employee who is assigned to work with property or has it assigned to his/her control is responsible for its proper use both in terms of safety and operational use as well as its legitimate application.

10.2.3 State Inventory

Paragraph 10.2 Responsibility - (ADD) DEMA-RMA-A will insure that an inventory of all personal capital property as defined by the Arizona Department of Administration will be conducted annually. No personal capital property will be taken to an Annual Training (AT) site.

Information access, control and protection

Recorded information is an asset of the state and must be protected accordingly. File cabinets should be locked and computer passwords employed when appropriate. Computer backup disks will be stored at separate locations when appropriate. When security of an information system is essential, passwords or other security measures will be employed.

11.0 ENVIRONMENTAL PROTECTION

The environmental protection plan will be developed and monitored by the environmental office responsible for that area. Specifically, each air base has an environmental officer; the

Army has an environmental officer located in the Facilities Management Office and Camp Navajo has an environmental officer for that location. PPMR is under the responsibility of the Army Environmental Officer.

INDUSTRIAL HYGIENE

(RESERVED)

MOTOR VEHICLE SAFETY

13.1 References

- A.R.S. 41-623
- Risk Management Division - Establishment of a Loss Control Program.

13.2 Purpose

To establish a program for safe driving habits, proper use of vehicle to include seat belts, and regular maintenance.

13.3 Applicability

To all elements using State vehicles.

13.4 General

The Director, Facility Management and the Director, ADEM are responsible for Motor Vehicle Safety in their respective divisions. They are to insure all drivers of state vehicles are schooled in the proper maintenance of the vehicle, that all laws are strictly followed, and that all Department of Administration Interagency Motor Pool rules are adhered to. They will develop a written plan to insure proper vehicle usage and safe operation.

The plan shall include the following procedures:

a. Training personnel in proper handling of the vehicle, seat belt usage, operator and preventive maintenance (to include spare tire), reporting of accidents, and corrective action to be taken.

b. Establishing written procedures for notification of all personnel in the proper use of the vehicle and who to notify in case of emergency or questions about the vehicle.

13.4.1 The plan also includes:

a. Ensuring all drivers have a valid driver's license and are insurable.

b. That maintenance logs kept in the vehicles are up-to-date and writing is legible.

c. That emissions testing of Department-owned vehicles is done and any tickets or other violations are reported.

Vehicle Operator Qualifications

No Employee will operate a motor vehicle without the appropriate operators license for that vehicle. The supervisor will verify that each employee possesses the appropriate license prior to the assignment of any operating duties. DEMA-RMA-P will obtain the status of the driving license of each new employee with the employee is in-processed. This information will be verified through DOA Risk Management section. If a license is suspended or revoked, the supervisor will be notified and driving duties will be suspended until the license has been reinstated.

All drivers will be encouraged to take a defensive driving course, such as the one provided by DOA Risk Management. Loss of operators license by an employee whose position requires the operation of a motor vehicle may result in a change of employment status to include separation.

14.0 CONSTRUCTION ACTIVITIES

General

The Facilities Management Office or Civil Engineering Office having responsibility for construction activities is charged with ensuring that all safety requirements are met at the site during all phases of the project. The term "construction" refers to outside contractors as well as remodeling work by DEMA personnel.

Responsibility

Supervisors of projects performed by DEMA personnel will ensure that employees are properly briefed on the safety aspects of each project. This includes OSHA requirements as well as any peculiarities to that particular site. Workers will be briefed and required to use necessary personal protective equipment or clothing as appropriate.

SOP's for all construction activities will conform to OSHA Safety and Health Standards of the Construction Industry (29CFR 1926).

15.0 EMPLOYMENT LIABILITY

General

The Administrative Services Officer (DEMA-RMA) is responsible for the development and promulgation of the DEMA Personnel Manual. This manual includes procedures and practices which if followed, will minimize employment liabilities.

Responsibility

Supervisor

Each supervisor is responsible for his/her attendance at the first supervisor training session subsequent to his/her appointment. Supervisors are also responsible to see that his/her subordinate employees and supervisors attend new employee seminars and supervisor training respectively.

15.2.2 Administration Services Officer

The Administrative Services Officer will provide special training programs as required in the personnel management area.

Employment Practices

Supervisors are responsible for proper employment practices for all positions under their responsibility. They are also responsible for background checks where appropriate. Supervisors are strongly encouraged to contact prior employers before making any hiring decision.

Americans with Disabilities Act

This department will comply with the "Americans with Disabilities Act (ADA)" where appropriate. All facilities covered by the Act, will be designed, constructed, or altered at a minimum in compliance with the ADA accessibility guidelines or other standards permitted under the law. We will provide reasonable accommodations to our employees who have physical and mental limitations and also qualified applicants.

16.0 JOB HAZARD ANALYSIS

General

When hazards have been identified, alternate procedures or measures should be established when possible. Where OSHA standards apply, they will be adhered to.

Procedure

Supervisors will review each activity or function with the incumbent who performs that function. This review focuses on the functions performed and not on the employees ability or proficiency. The check list on attachment IV may be used to analyze a function.

16.2.1 Priorities

Positions with the highest incidence of injury, illness or loss or "close calls" should be reviewed first.

16.2.2 Elements of review

Each activity should be reviewed as follows

a. Evaluate the environment in which the function is performed to discover any environmental problems.

b. Break the function down to its essential steps

c. Examine each step to identify any hazardous elements.

Revising the function

For each hazardous element that is identified for a position an alternate element should be established to eliminate the risk. Supervisors should consult with employees who perform the function to determine possible alternate activities. Such alternatives may include:

a Elimination of the step itself if necessary.

b It is not unreasonable that entire functions may be deleted due to the magnitude of the risk.

c. Consideration should also be given to making equipment changes.

16.2.4 Training

training programs must be established and SOP's published to minimize exposure and ensure safe practice of all procedures by the affected employees.

BY ORDER OF THE GOVERNOR:

THE ADJUTANT GENERAL

COL John A. McMurdie
Resource Manager

APPENDIX I

7. ACCIDENT/INCIDENT INVESTIGATION

7. a INTRODUCTION

(SEE APPENDIX 4 - ACCIDENT CLASSIFICATIONS)

Accident investigations are conducted with accident prevention in mind. They are **NOT** conducted to place blame.

An accident is any unplanned event that results in personal injury or in property damage. The personal injury is considered minor when it requires little or no treatment. The personal injury is considered serious if it results in a fatality or in a permanent total, permanent partial or temporary total (lost-time) disability. Similarly, property damage may be minor or serious. All accidents should be investigated regardless of the extent of injury or damage.

Accidents are part of a broad group of events that adversely affect the completion of a task. This group of events is known as incidents. For simplicity, the procedures discussed refer only to accidents. They are also applicable to incidents.

This section introduces you to basic accident investigation procedures and describes the accident analysis that can be used. You may wish to consult other references.

Accidents are usually complex and may involve 10 or more individual events that can be considered causes. A detailed analysis of any accident will normally reveal three cause levels: basic, direct and collateral or indirect. At the lowest level, an accident results only when a person or object receives an amount of energy or hazardous material that cannot be absorbed safely. This energy or hazardous material is the DIRECT CAUSE of the accident. The direct cause is usually the result of one or more unsafe acts or unsafe conditions, or both. These unsafe acts and conditions are the INDIRECT CAUSES or collateral symptoms. In turn, indirect causes are usually traceable to poor management policies and decisions or to personal or environmental factors. These are considered the BASIC CAUSES. Examples of direct, indirect and basic causes are listed at the end of this section.

NOTE: Most if not all of the following in Section 7.b - 7.e may be used as an Accident Investigation Checklist.

7.b INVESTIGATIVE PROCEDURES

Each Agency should develop the specific procedures appropriate for their organization and location. In general, responsible officials will appoint an individual to be in charge of the investigation.

Define the scope of the investigation.

Select the investigators. Assign specific tasks to each (preferably in writing).

(3) Present a preliminary briefing to the investigating team, including
- a. Description of the accident, with damage estimates.
- b. Normal operating procedures.
- c. Maps (local and general), floor plans, etc.
- d. Location of the accident scene.
- e. List of witnesses.
- f. Events that preceded the accident.

Visit the accident site to obtain updated information.

Inspect the accident scene.
- a. Secure the area. Do not disturb the scene unless a hazard exists.
- b. Prepare the necessary sketches and photographs. Label each carefully and keep accurate records.

(6) Interview each victim and witness, those who were present before the accident and those who arrived at the scene shortly after the accident. Keep accurate records of each interview. A tape recorder may be used if desired and if approved by each individual.

(7) Determine:
- a. **What** was not normal prior to the accident.
- b. **Where** the abnormality occurred.
- c. **When** it was first noted.
- d. **How** it occurred.

(8) Analyze the information obtained in step 7. Repeat any of the prior steps, if necessary.

(9) Determine:
   a. **Why** the accident occurred.
   b. A likely sequence of events and probable causes (direct, indirect, basic).
   c. Alternative sequences.

   Evaluate each sequence against the information from step 7

   Determine the most likely sequence of events and the most probable causes.

   Conduct a post-investigation briefing

(13) Prepare a summary report, including the recommended actions to be taken to prevent a recurrence. Distribute the report in accordance with applicable instructions.

NOTE: An investigation is not complete until all the information has been analyzed and a final report is prepared. In practice, the investigative work, data analysis and report preparation proceed simultaneously over much of the time spent on the investigation.

7.c EQUIPMENT AND SUPPLIES

The equipment and supplies used in conducting a particular investigation depend on the nature and location of the accident. The following items are useful on many occasions:

(1) Suitable clothing and protective equipment (coveralls, hard hat safety glasses, safety shoes, etc.)

(2) Credentials; travel authorization

(3) Bound notebook

(4) Tape recorder (preferably miniature)

(5) Camera and film

(6) Tape measure or rule.

(7) Sample bottles, labels and tape.

(8) Pencils, chalk and cord

Report forms

Gas, vapor and/or fume detectors.

First aid kits.

Carrying bag(s).

(13) Portable lamp or flashlight.

Additional equipment may be needed on occasion. This need will usually be obvious during the preliminary briefing phase of the investigation.

7.d METHODS

Fact-Finding

Evidence is gathered from numerous sources during an investigation. Information is obtained from witnesses and reports and by observation. Witnesses should be interviewed as soon as possible after an accident. Similarly, the accident site should be inspected before any changes occur. Photographs and sketches should be made of the accident scene and all pertinent information should be recorded on plans or maps. Copies should be obtained of all relevant reports. Documents containing normal operating procedures, flow diagrams, maintenance charts or reports of difficulties or abnormalities are very useful. Complete and accurate notes should be kept in a bound notebook. Pre-accident conditions, the accident sequence and post-accident conditions should be recorded. In addition, the location of victims, witnesses, machinery, energy sources and hazardous materials should be documented.

In some investigations, a particular physical or chemical law, principle or property is needed to explain a sequence of events. Such laws should be included in the notes taken during the investigation that may lend itself to analysis by these laws, principles or properties. If an extended discussion is needed in the final report, it can be included in an appendix.

Interviews

In general, interviews should be conducted by experienced personnel. Where appropriate, the team assigned to this task should include an individual with a legal background. In conducting interviews, the team should:

Appoint a speaker for the group.

(2) Get preliminary statements as soon as possible from all witnesses - those who arrived on the scene shortly after or shortly before the accident.

(3) Locate the position of each witness on a master chart (including the direction of view).

(4) Arrange for a convenient time and place to talk to each witness

(5) Explain the purpose of the investigation (accident prevention) and put each witness at ease.

Listen, let each witness speak freely and be courteous and considerate.

(7) Take notes without distracting the witness. If a tape recorder is to be used insure consistent application of that policy with all witnesses; i.e., treat all witnesses the same.

(8) Use sketches and diagrams to assist the witness.

(9) Emphasize areas of direct observation Hearsay should be labeled accordingly.

Be sincere and do not argue with the witness

Record the exact words used by the witness to describe each observation. Do not "put words into a witness' mouth."

(12) Word each question carefully and be sure the witness understands.

(13) Identify the qualifications of each witness (name, address, occupation, years of experience, etc.).

(14) Supply each witness with a copy of his or her statements Signed statements are desirable.

After all witnesses have been interviewed, the team should analyze each witness' statement. They may wish to reinterview one or more witnesses to confirm or clarify key points. While there may be inconsistencies in witnesses' statements, investigators should assemble the available testimony into a logical order. This information can then be analyzed along with data obtained at the accident site.

In an investigation, each investigator must bear in mind that not all people react in the same manner to a particular stimulus. For example, a witness involved in an accident may have an entirely different story from one who saw it at a distance. Some witnesses may also change their stories after they have discussed it with others; additional clues may be obtained by determining why the change was made.

A witness who has had a traumatic experience may not be able to recall the details of the accident. A witness who has a vested interest in the results of the investigation may offer biased testimony. Finally, eyesight, hearing, reaction time and the general condition of each witness may affect his or her powers of observation. Entire sequences may be omitted because of a failure to observe them or because their importance was not realized.

PROBLEM-SOLVING TECHNIQUES

Accidents represent problems that must be solved through investigations. Several formal procedures have been developed for solving problems of any degree of complexity. A number of these procedures are considered in this section.

The Scientific Method

The scientific method forms the basis of nearly all problem-solving techniques. It has been used for hundreds of years to conduct research. In its simplest form, it involves the following sequence: making observations, developing hypotheses and testing the hypotheses.

Because even a simple research project may involve a large number of observations, a researcher records all observations immediately. A good investigator must do the same thing. Where possible, the observations should involve quantitative measurements. Quantitative data are often important in the subsequent development and testing of the hypotheses.

Such measurements may require the use of a number of instruments in the field and in the laboratory.

When a number of observations have been made, the investigator develops one or more hypotheses that explain the observations. A hypothesis may explain only a few of the observations or it may attempt to explain all of them. At this stage, the hypothesis is merely a preliminary idea that must be tested. Even if it is rejected later, the investigator has a goal toward which to proceed.

The hypothesis is then tested against the original observations. A series of controlled experiments is often useful in performing this evaluation. If the hypothesis explains all of the observations, testing may be a simple process. If not, either additional observations are made, the hypothesis is modified or additional hypotheses are developed.

As with scientific research, the most difficult part of any investigation is the formulation of meaningful hypotheses. The following three principles may be used to simplify this step:

The principle of agreement. An investigator uses this principle in an attempt to find one factor that can be associated with each observation.

The principle of differences. This principle is based on the idea that variations in observations are due only to differences in one or more factors.

(3) **The principle of concomitant variation.** This principle is the most important because it combines the ideas of both of the preceding principles. In using this principle, the investigator is interested in the factors that are common and those that are different in the observations.

In using the scientific method, the investigator must be careful to eliminate personal bias and must be willing to consider a range of alternatives. Finally, the investigator must recognize that accidents often result from the chance occurrence of factors that are too numerous to evaluate fully.

Change Analysis

As its name implies, this technique emphasizes change. To solve a problem, an investigator must look for deviations from the norm. As with the scientific method, change analysis also follows a logical sequence. It

is based on the principle of differences described in the discussion of the scientific method. All problems are first considered to result from some unanticipated change. An analysis of the change is then made to determine its causes. The following steps are taken in using this method:

(1) Define the problem (what happened?).

(2) Establish the norm (what should have happened?).

(3) Identify, locate and describe the change (what, where, when, to what extent?).

(4) Specify what was and what was not affected

(5) Identify the distinctive features of the change

(6) List all the possible causes.

(7) Select the most likely causes.

7.e REPORT OF INVESTIGATION

As noted earlier, an accident investigation is not complete until a report is prepared and submitted to the proper authorities. Standard report forms are available in many cases. In other instances, a more extended report may be required.

The following outline has been found useful in developing the information to be included in the formal report:

(1) Background Information:
   a. Where and when the accident occurred
   b. Who and what were involved
   c. Operating personnel and other witnesse

(2) Account of the Accident (What happened?):
   a. Sequence of events
   b. Extent of damage
   c. Accident type
   d. Agency or source (of energy or hazardous materials)

(3) Discussion (Analysis of the Accident - **HOW; WHY**):
   a. Direct causes (energy sources; hazardous materials)

b. Indirect causes (unsafe acts and conditions)
c. Basic causes (management policies; personal or environmental factors)

(4) Recommendations (to prevent a recurrence) for immediate and long range action to remedy:
a. Basic causes
b. Indirect causes
c. Direct causes (such as reduced quantities, protective equipment or structures)

INSTRUCTIONS FOR COMPLETING JOB HAZARD ANALYSIS FORM

Job Hazard Analysis (JHA) is an important accident prevention tool that works by finding hazards and eliminating or minimizing them before the job is performed, and before they have a chance to become accidents. Use your JHA for job clarification and hazard awareness, as a guide in new employee training, for periodic contacts and for retraining of senior employees, as a refresher on jobs which run infrequently, as an accident investigation tool, and for informing employees of specific job hazards and protective measures.

Set priorities for doing JHAs jobs that 'have a history of many accidents, jobs that have produced disabling injuries, jobs with high potential for disabling injury or death, and new jobs with no accident history. Here's how to do each of the three parts of a Job Hazard Analysis.

SEQUENCE OF BASIC JOB STEPS

Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements. Look at the first set of movements. Look at the first set of movements used to perform a task, and then determine the next logical set of movements. For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the conveyor and putting it on a handtruck is one logical set of movements, so it is one job step. Everything related to that one logical set of movements is part of that job step.

The next logical set of movements might be pushing the loaded handtruck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. And finally, returning the handtruck to the receiving area might be the final step in this type of job.

Be sure to list all the steps in a job. Some steps might not be done each time--checking the casters on a handtruck, for example. However, that task is a part of the job as a whole, and should be listed and analyzed.

POTENTIAL HAZARDS

Identify the hazards associated with each step. Examine each step to find and identify hazards--actions, conditions and possibilities that could lead to an accident.

It's not enough to look at the obvious hazards. It's also important to look at the entire environment and discover every conceivable hazard that might exist.

Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time.

It's important to list all hazards. Hazards contribute to accidents, injuries and occupational illnesses.

In order to do part three of a JHA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning:

HAZARD--A potential danger. Oil on the floor is a hazard.

ACCIDENT--An unintended happening that may result in injury, loss or damage. Slipping on the oil is an accident.

INJURY--The result of an accident. A sprained wrist from the fall would be an injury.

Some people find it easier to identify possible accidents and illnesses and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. But be sure you focus on the hazard for developing recommended actions

RECOMMENDED ACTION OR PROCEDURE

Using the first two columns as a guide, decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident injury, or occupational illness.

Among the actions that can be taken are 1) engineering the hazard out, 2) providing personal protective equipment, 3) job instruction training, 4) good housekeeping and 5) good ergonomics (positioning the person in relation to the machine or other elements in the environment in such a way as to eliminate stresses and strains).

List recommended safe operating procedures on the form, and also list required or recommended personal protective equipment for each step of the job.

Be specific. Say exactly what needs to be done to correct the hazard, such as, "lift using your leg muscles". Avoid general statements like "be careful".

Give a recommended action or procedure for every hazard.

If the hazard is a serious one, it should be corrected immediately. The JHA should then be changed to reflect the new conditions.

OB HAZARD ANALYSIS	JOB TITLE: (and number if applicable) PAGE __ OF __ JHA NO __		DATE: / /	___ NEW ___ REVISED
EE JHA INSTRUCTIONS	TITLE OF PERSON WHO DOES JOB:	SUPERVISOR:	ANALYSI S BY:	
	LOCATION: (Address)	DIVISION/SECTION:	REVIEWED BY:	
EQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT: ample: (Gloves - Eye Protection- Long Sleeves - Safety Shoes)			APPROVED BY:	

SEQUENCE OF BASIC JOB STEPS	POTENTIAL HAZARDS	RECOMMENDED ACTION OR PROCEDURE