



ACE Global Engineering Network

# **RISK MANAGEMENT PROGRAMS**

# INTRODUCTION

Management commitment to an aggressive program of loss prevention and control is the foundation of all serious efforts to reduce loss. As a member of management for your facility, you are charged with the responsibility of producing a product or providing a service. If your facility is destroyed by a fire, explosion, or other peril, even the most effective management effort may fail to sustain profitability. Therefore, it is important that management establish a program for the identification, evaluation and control of hazards in order to eliminate or, at least, minimise loss and damage.

The exact form of your Loss Control Program will vary depending on your facility's needs, however, in every case the final program should be a written set of procedures that address the following primary topics :

1. **BASIC FIRE PROTECTION**
2. **SELF INSPECTIONS**
3. **EMERGENCY PLANNING**
4. **PLANT SECURITY**
5. **EMERGENCY RESPONSE TEAM**
6. **SMOKING REGULATIONS**
7. **CUTTING, WELDING & OTHER HOT WORK**
8. **IMPAIRMENT NOTIFICATION**
9. **PREVENTIVE MAINTENANCE**
10. **EMPLOYEE TRAINING**

In addition to a good Loss Control Program, all facilities should have a fire and safety executive. Larger firms should employ a full time safety officer, who should be given full managerial support. Where facilities are too small to justify a full time safety officer, a member of management should be responsible for the creation and operation of a suitable Loss Control Program.

The purpose of this booklet is to stress the need for Loss Control Programs, the importance of written procedures/adequate practice and to explain, in broad terms, the topics listed above.

# 1. BASIC FIRE PROTECTION

"Basic Fire Protection" is a general term that includes many of the items covered by this booklet. In this section however, it is meant to pertain to three primary functions.

## 1.EVALUATION OF THE HAZARDS

## 2.OUTLINE OF POLICY

## 3.THE PROVISION OF SUITABLE FIRE PROTECTION EQUIPMENT

The equipment needed will vary from one company to another as do the risks of fire and explosion, the likely extent of the physical damage and the consequences of business interruption. The best approach is to attempt to foresee the kind of fire expected under the most adverse conditions and then determine the manual and automatic equipment needed to combat such a fire.

Factors to be taken into account include : the nature of your business, combustibility of the contents, combustibility of the buildings, special hazards, extent of the expected fire spread, response time (and capability) of public fire brigade and the probable outcome if swift action is not taken.

The various common forms of fire protection equipment available are listed below. It is, of course, important that a written program exists for the periodic evaluation, location, use, inspection and maintenance of all equipment.

### **FIRE EXTINGUISHERS:**

Needed in sufficient numbers of suitable types at clearly marked and accessible strategic locations.

### **INSIDE HOSE REELS:**

Needed in main production areas and particularly in storage areas where extinguishers are of limited use.

### **PRIVATE HYDRANTS:**

From city main supply or private pumped system where the former is inadequate for use by the public fire brigade or private emergency response team. Need depends on values at risk and code requirements.

### **FIRE DOORS AND WALLS:**

To prevent the spread of fire, limiting the extent of damage. Production, storage areas and areas housing special hazards should be separated in this manner.

### **AUTOMATIC SPRINKLERS:**

To provide automatic **protection** at all times and sound alarms. Need depends on values at risk, occupancy and construction of building.

### **DRY CHEMICAL, CO<sub>2</sub> AND GASEOUS FIRE SUPPRESSION:**

Total flooding or local application, providing protection for special hazard operations, cooking equipment, computers, transformers, switchgear and specialised production machinery.

**AUTOMATIC DETECTION EQUIPMENT:**

To provide automatic **detection** of fire at all times, assuring rapid notification of personnel to perform emergency response functions.

**MANUAL ALARM SYSTEMS:**

To provide manual notification of personnel to perform emergency response functions.

A sufficient number of suitably designed pieces of equipment should be available so that fire protection measures can be taken, pending the arrival of the public fire brigade which may be unavoidably delayed. As previously mentioned, the nature and type of equipment needed should correspond to the risk at your facility and we would be pleased to assist you in the selection process.

## 2. SELF INSPECTIONS

A weekly inspection of the facility by a responsible employee, familiar with the usual conditions on site, should form a primary part of the Loss Control Program.

The inspection should take the form of a brief tour through all parts of the buildings and yards to check for abnormal or unusual conditions. It is important that the same person performs the inspection each week and a report is completed for review by a manager who has the authority to correct deficiencies.

The security patrolman may undertake the weekly self-inspection with the form amended to include his other duties.

An example of a suitable report form is included each Region's forms section on the Portal. You may revise a similar form to meet your own particular circumstances and we would be pleased to assist you in this matter.

### 3. EMERGENCY PLANNING

However good a company's fire prevention system, fire can and does occur and it is important to have an emergency planning procedure for quick response to the situation.

Fire safety planning involves the identification and evaluation of fire and explosion risks, the creation of a formalised fire response system and the maintenance of that system by means of periodic drills and review.

Some of the points to be covered are discussed in more detail in later sections, however, here we are concerned with the basic actions to be taken at the outbreak of fire, during the course of the fire and after the fire has been extinguished.

A written procedure should be established containing clear instructions to suitable personnel regarding the following actions to be taken in case of fire :

1. Activation of manual fire alarm or calling company operator.  
(All Personnel function).
2. Calling the public fire brigade immediately.  
(Company Operator or Plant Security function - Preferably two persons).
3. Calling emergency response team leader and sounding evacuation alarm.  
(Company Operator or Plant Security function).
4. Evacuation of the buildings.  
(All Personnel function).
5. Fighting the incipient stage fire pending arrival of the public fire brigade.  
(Emergency Response Team function).
6. Attendance at sprinkler pump houses and sprinkler valves to ensure correct operation.  
(Emergency Response Team function).
7. Removal of parked vehicles or vehicles being loaded.  
(Emergency Response Team function).
8. Directing the public fire brigade to the fire.  
(Plant Security function).
9. Security of site during the fire.  
(Plant security function).
10. Suitable actions to be taken to minimize smoke and water damage during the fire and after extinguishment has taken place.  
(Emergency Response Team or All Personnel function).

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Appropriate actions under item 10, could include closing fire doors, shutting off gas supply, covering with tarpaulins, removing some goods, shutting down processes, activating smoke venting systems, closing down air conditioning systems, stopping conveyors, turning off flammable liquid pumping systems, turning on drenchers and special spray systems, etc. Such action requires prior consideration, a pre-planned procedure and delegation to suitable personnel.

In most cases after a fire or explosion, there is a period of diminished or ceased production, with a consequent loss of profit. For some companies, this loss can be catastrophic, possibly leading to the cessation of business.

One way in which these consequential losses can be reduced is to pre-plan for them, to prepare a contingency plan designed to quickly return the company to full profitable operation following a loss of any kind.

The loss of each item necessary for production should be considered and recovery measures evaluated. Examples of areas to consider are: power supplies; cooling towers; boilers for process and space heating; research and development areas; manufacturing and quality control machines; buildings; transport; warehouses; skilled labour; raw material supplies; computers and alternate sources of the above items.

During preparation of the plan, essential areas within your facility should be identified and decisions made to reduce the likelihood of loss by installing automatic fire or explosion protection. This could be an extremely important step, however the provision of such protection should not cause the area under consideration to be taken out of the contingency plan. No matter how well protected against loss, all aspects of the business should be considered as being potential loss areas.

The preparation of a contingency plan is a time consuming exercise. There are no short cuts to be taken and senior personnel will be required to contribute. ACE can offer advice to help, however you are the only party capable of producing your plan. Nobody else has the necessary knowledge of your business.

The planning team should be comprised of senior personnel with authority to act on their own initiative. All important areas of the business should be represented. A typical team might comprise: Plant Manager, Financial Director, Chief Engineer, Purchasing Manager, Sales Manager, Personnel Manager, Safety Manager and Insurance Manager. In addition, specialist personnel can be called in as necessary, such as the electrical engineer, private emergency team leader, etc.

## 4. PLANT SECURITY

Suitable security measures should be adopted to safeguard the company's property from loss or damage by fire, theft, civil commotion, etc. The nature and extent of the measures undertaken will vary with the company's experience of intruders, the plant location, the nature of operations, and values at risk (including property values, potential productive capacity and continuing jobs for employees). The security program should ultimately take the form of a written procedure with responsibility for review and supervision delegated to a senior plant official.

Security programs fall into one of two broad categories: **active** programs using guards who limit access and make patrols during idle periods and **passive** programs using fences, lights, barriers, and electronic devices.

### ACTIVE PROGRAMS

An essential part of an active security program is adequate guard service. The service should include procedures for the locking of all buildings after business hours, inspection of the perimeter fence and administering authorised access to the plant after hours. Additionally, the guard service should: be acquainted with the nature of the facility's operations, knowing which areas are important and/or hazardous; be familiar with all of the manual and automatic fire protection equipment at the plant; be taught to notify the Public Fire Brigade before attempting to fight a fire; be taught how to direct the Public Fire Brigade to the location of the fire; and to notify plant management when an emergency occurs or when potential trouble is observed.

All parts of the facility, both inside and out, should be checked immediately after the end of normal hours and at intervals not exceeding every hour during idle nights and every other hour during idle days. Extra attention should be given to hazardous areas where overtime, shift work or cleaning operations have taken place and where repairs or alterations are being undertaken.

For the sake of efficiency, patrols should take no more than 45 minutes leaving a minimum of 15 minutes between rounds for rest and reporting.

Patrols should be supervised through a clocking system and clocking points so located to ensure a complete inspection of the facility is undertaken. Where facilities are very large, it may not be possible to cover all the clocking points on an hourly basis. In these cases, patrols should be divided into areas of importance to ensure thorough inspection within the time allotted.

*For smaller facilities, it may be difficult to justify an in-house security patrol, in such circumstances, consideration should be given to engaging reliable security companies to perform patrols during idle times.*

### PASSIVE PROGRAMS

The second category of security program involves passive programs. These include protective signalling systems (proprietary, remote or central station) covering; intrusion alarms, manual fire alarms, automatic fire alarms (smoke, heat or fire detection), alarms for the discharge of sprinklers or other extinguishing systems, sprinkler control valve tamper alarms, fire pump alarms, etc. Additional physical security equipment would include: fences, lights, barriers, locks and closed circuit television.

Passive programs can be used in place of active programs in locations where values are lower and hazards are limited. In most cases however, facilities must combine both active and passive programs to be adequately safeguarded.

We would be pleased to assist in the formulation of a Security Program to suit your needs.

## 5. EMERGENCY RESPONSE TEAM

The type and size of the emergency response team depends upon the characteristics of the risk. An attempt should be made to foresee the kind of fire to be expected under the most adverse conditions, then determine the equipment and actions necessary to combat such a fire during its "incipient" or small stage, pending the arrival of the public fire brigade. With this information, it is possible to plan the number, organisation and training of personnel to utilise the fire protection equipment selected.

Such a team may be usefully deployed in case of storm, flood, spillage or other emergencies. Consideration should be given to this aspect in the formation of a suitable team and in the purchase of equipment.

Much thought is often given to equipment but less to the skill and availability of the people who will use it. Hydrants, hose reels, and even extinguishers are of little value when the people expected to use them are not trained in their use, are on holiday or working another shift.

Co-ordination and control over the provision and maintenance of fire equipment, training and fire fighting operations are essential. This responsibility should be delegated to the person who has responsibility for Basis Fire Protection, of which this forms a part. A written procedure should be developed, which includes the following items :

1. **Periodic re-evaluation of the risk, equipment needed, size and structure of the emergency response team.** A brief outline of equipment available is given under the Basis Fire Protection section, however circumstances and needs change and both equipment and personnel requirements should be reviewed periodically with personnel rosters/duties kept up to date.
2. **Initial and periodic training.** This should take place in conjunction with the public fire brigade. Members should practice as a team and training should include an understanding of the nature of fire and the capabilities of the various portable and fixed pieces of fire extinguishing equipment present at the facility. In sprinklered facilities, all members should be familiar with the operation of the fire pumps, valves and sprinkler risers. In the event of a fire, personnel should be delegated to attend the pump house and the sprinkler riser control valve. Following the fire, all extinguishing equipment should be restored to service as quickly as possible and clean up duties begun to reduce downtime.
3. **Co-operation with the public fire brigade.** The public fire brigade should be encouraged to familiarise themselves with the facility and assist in training of the emergency response team.
4. **Co-ordination and co-operation with plant management** at all levels, should actively support the Emergency Response Team.
5. **Co-ordination with essential departments.** This would include security management, services management, telephone switchboard, operators of special processes, evacuation marshals, etc. All facilities, large or small, should have sufficient means to fight a small stage "incipient" fire pending the arrival of the public fire brigade. These means should be related to the particular circumstances of the fire risk at your facility and we would be pleased to assist you in the evaluation of the matter.

## 6. SMOKING REGULATIONS

### **POOR SMOKING PRACTICE IS ONE OF THE MOST FREQUENT CAUSES OF LARGE FIRES.**

The temperature of a burning cigarette can exceed 900°C (1652°F). During a puff the surface reaction temperature can reach 1200°C (2192°F). A burning match head has a temperature of 1500°C (2732°F). These temperatures far exceed the ignition temperatures of most combustible materials and gases.

Cigarettes can normally start fires by initiating a "glow" in solid materials capable of supporting progressive flameless combustion (smouldering). Some materials such as cardboard, fibreboard and dust layers have the ability to smoulder slowly for hours, even days, after smouldering is initiated; sawdust, paper and textile fabrics are particularly vulnerable. Most flammable gases, vapours and explosive dusts can be ignited by burning tobacco.

Where should smoking be prohibited? Some locations are obvious from a health or environmental point of view, however, relating to fire risks the following are potentially very dangerous :

1. Where flammable liquids, gases, combustible dusts and fibres are present.
2. In production areas and workshops where readily combustible materials are used or produced, or where the waste product is easily ignitable.
3. In all storage areas, packing & despatch departments and in areas where there may be accumulations of waste, such as loading bays.
4. Areas that are visited infrequently, such as archives stores.

Where possible, rules regulating smoking should be worked out with employee co-operation; reasons must be fully explained by management. These must always be firmly enforced and receive the backing of all senior management personnel. Notices inside the areas concerned and on all approach routes, must be displayed.

Where smoking is allowed, there must be an abundant supply of safely designed non combustible receptacles for cigarette ends and matches. They must be emptied safely (not into plastic bin liners for example) and frequently. Smokers should be reminded not to use waste paper baskets as ashtrays and as a precaution all waste bins should be of metal construction.

Too often, fires are discovered at night having been caused by carelessly discarded smoking materials during the day. It is at this time that your premises are most vulnerable. If your no smoking rule applies only for the last hours of work, a routing check for fire or smoke should be made before the facility is closed for the day.

You may find it practical to prohibit smoking in production or warehousing areas for example and then provide special areas where people can smoke freely and safely, such as smoking rooms or booths. These should be partitioned off with glass and metal partitions, contain non-combustible furniture, be provided with an adequate number of safe ashtrays and be equipped with a 2 gallon water extinguisher. A notice reminding employees to extinguish cigarettes upon leaving, should be displayed near the exit.

We are frequently presented with the argument that to prohibit smoking will encourage hidden smoking. Where companies have a fair and carefully thought out smoking policy, explained to all employees (including new recruits), we find this problem is not experienced.

## 7. CUTTING, WELDING / HOT WORK

There have been a large number of serious fire losses caused by inadequate control of cutting and welding operations. These may be more appropriately titled "Hot Work" operations, as control needs to extend beyond cutting and welding operations, to soldering, paint stripping, roof repair (bitumen boilers), grinding and similar operations. All of which may present a fire hazard due to the use of open flame and/or production of sparks. A good hot work program should be established to reduce the risk to the minimum.

Control of hot work operations is best achieved by means of a "Permit to Work" system. Prior to issuance of a permit, alternative methods of work should be considered such as removal of a component to a safe place for welding and cutting.

Control of hot work should be delegated to a responsible person conversant with the hazards of the operations and the facility. The company fire or safety officer is probably the best choice but failing this, departmental managers may be considered as they will be fully aware of the hazards in their department, and may be conversant with the hazards of hot work operations. It is equally important to ensure that persons proposing to carry out hot work operations are fully aware of the need to obtain a permit before commencement. This applies not only to your own staff but also to contractors, who should be advised, at the quotation stage, of this requirement.

Permits should be issued before commencement of work and should not extend beyond one shift, to ensure that good control is maintained throughout the operation. It is preferable for the permit to take the form of a stiff cardboard card or tag using a wording similar to that shown in the Forms section of the Portal in each Region's section.

Equipment should be in good repair - this applies particularly to contractors' equipment that should be thoroughly checked. It should appear in good condition and be fitted with safety equipment, e.g. flashback arrestors, non-return valves, etc.; in accordance with recognised standards. Gas cylinders should be secured in the **upright** position both in storage and in use.

The need for a fire watch throughout the period of work is self evident. Welders concentrating on the job at hand cannot be expected to see where sparks are going. As sparks can create fires that do not show themselves immediately, the fire watch should continue for **at least** half an hour after the operation has ceased. After this period, the person who issued the permit should satisfy himself that there are no incipient fires before "clearing" the permit, and ending the fire watch.

## 8. IMPAIRMENT NOTIFICATION

It is a condition of most fire insurance policies that fire protection systems are kept operative and in good condition at all times. It is therefore important that ACE be notified in the event that any part of a fire protection/detection system has been shut off or "impaired". Examples include : a sprinkler installation, alarm system, gaseous extinguishing system, hydrant main, etc.

Our experienced engineers are available to discuss the problem with you and can suggest ways to minimise the risk to your business during the impairment.

If the impairment is the result of an emergency, ACE should be notified immediately by telephone or facsimile. When an impairment is planned; for example to extend a sprinkler installation, then at least 2 days notice should be given, together with scheduled commencement/completion dates and a note of special precautions which will be taken while the fire protection system is impaired.

To ensure consistency, one person should be responsible for control and notification of impairments. When contractors are to perform work that requires an impairment to a fire protection system, they should first obtain permission from your representative. Contractors should never be allowed to impair your fire protection systems without your prior permission.

The impairment of even a small part of a fire protection system can leave your business very vulnerable to fire loss. The following precautionary measures should be taken to minimize hazards during impairment:

1. For planned impairments allow only one impairment at a time.
2. Cease hazardous operations in the affected area. These include production hazards, the use of flammable liquids and hot work (cutting, welding, etc.).
3. Remove, whenever possible, combustible materials from the affected area.
4. Inform the public fire brigade, plant emergency response team and all managers in the affected area that the fire protection system is impaired. If relevant, notify your alarm service.
5. Check that fire extinguishers and hose reels in the affected area are available. Connect hose to outside hydrants ready for immediate use by your plant fire team if necessary.
6. Ban smoking throughout the affected area.
7. Take emergency measures to limit the area of impairment as much as possible. For example, make temporary connections into impaired sprinkler systems from hydrants or adjacent sprinkler systems. If only a small part of a sprinkler system is worked on, disconnect the relevant part, plug remainder and restore protection to the rest of the system pending completion of the work.
8. Ensure that the impairment lasts for as short a time as possible. All materials, equipment and labour should be on hand, ready to complete the work quickly. If it is necessary to leave the work, endeavour to re-commission the system during idle periods.
9. Maintain continuous watchman cover during the period of impairment.
10. After completion of work, restore the fire protection system and test it. Ensure that all valves that should be left open are FULLY open. Perform a drain test and an alarm test on sprinkler installations, noting the steady pressure with the drain valve fully open, which should be similar to pressure recorded during previous drain tests.
11. Once the impairment is over and full protection restored, your local ACE office should be notified.

## 9. PREVENTIVE MAINTENANCE

Buildings and machinery should be kept in good condition and working order, safe, free from defect and ready to function when needed. Periodic maintenance is therefore essential. The frequency and extent of preventive maintenance will vary according to company needs, manpower and resources available. The program should be under constant review as new processes and equipment are introduced or removed from the plant.

Periodic checking of the following important areas should be included in every good preventive maintenance program:

1. Buildings cladding and roofing, gutters, downpipes, tanks, pipelines, tank bunds and other stationary structures and equipment should be inspected at least once a year and repaired, cleaned and painted as found necessary.
2. Fire and safety equipment such as extinguishers, hose reels, hydrants, sprinklers, fire alarms, CO<sub>2</sub> and other fixed extinguishing systems, breathing apparatus, stretchers, first aid equipment, etc. Such items are not in frequent use and defects will not become apparent until they are needed in emergency conditions. Similar remarks apply to more specialised safety equipment such as pressure relief venting, rupture discs, flame arrestors, etc.
3. Note: Service frequencies listed in appropriate local codes and National Fire Protection Association codes.
4. Boilers, pressure vessels, and other equipment that must be examined by law at predetermined intervals.
5. Utility services are particularly important as their failure can cause prolonged interruption of production. Switchgear, electrical wiring, cooling towers, compressors, pumps, boilers and other service equipment should be included in the preventive inspection and maintenance program.

## 10. EMPLOYEE TRAINING

Employee error accounts for an appreciable number of losses from fire and explosion in all industries. The key to reducing this type of loss is to train employees in proper work practices.

Most workers will not deliberately jeopardise their safety, the safety of others, or their jobs by using unsafe work practices. When an operator error occurs, it is usually due to a lack of training in proper practices or to an employee's perception that management will tolerate or encourage improper practices.

Developers and administrators of training programs should remember that training methods that may have been effective in the past might not be so today due to changes in employees' attitudes toward their jobs. In addition, the routine of automation can dull employees' reactions during emergencies, and cause them to make slow or improper decisions under unusual circumstances.

Even if an employer has a good training program, it is of no value if management indirectly allows employees to sense that unsafe work practices will be tolerated. Production short cuts which are encouraged by management without due consideration of the loss prevention aspects will negate the effectiveness of the best training program.

### **To develop an effective employee-training program, management should:**

1. Appoint a training director to supervise the development of an overall written program.
2. Inform all employees of the need for proper training.
3. Demonstrate support of the training program by making certain that no management decision relating to job performance and procedures violates those taught in the training program.

### **The training director should be responsible for:**

1. Establishing the scope of the training programs and being certain, they address both fire and explosion hazards as well as job procedures.
2. Having training program segments written.
3. Establishing the degree of participation by line supervisors.
4. Training the instructors.
5. Establishing training schedules.
6. Establishing retraining schedules.
7. Implementing responses and follow-up programs.

Virtually every job requires training. The employee-training program must be all-inclusive. All jobs and all situations that might be faced must be covered in this program.

Well-established training methods are the subject of numerous articles. Many of these training methods are based on the **behaviour** modifications outlined below:

1. People behave in a manner that is sensible and logical to them.
2. Behaviour is influenced by its consequences.
3. People will change their behaviour if they know how to and see a need to change.
4. The training process must provide for the acquisition of knowledge and skills to enable people to change their behaviour.
5. The job environment must allow sufficient practice and reinforcement to enable people to change their performance.

All training programs must have a clearly written format (see below) and each element must be well defined. Training should be broken down into logical parts so that progress through the program may be readily measured. Trainees should be given comments at frequent intervals to reinforce their progress.

Depending upon the number of trainees and the type of training needed, the program may involve formal classroom sessions, process simulators, self-study that employs such aids as videotape or audio cassettes, or a combination of these three methods. On-the-job sessions with line supervisors should reinforce the training program.

To obtain responses on the effectiveness of the program, training directors should simulate problems. Situations should be chosen to allow employees to respond as realistically as possible. Observing their response will give the training director an indication of the effectiveness of the training programs, and additional simulated problems given at carefully chosen intervals will indicate when retraining is needed.

For further responses on the effectiveness of the training program, the training director should review loss reports, near-miss incident reports, production reports and product defect reports.

## **1. Basic Program for All Employees**

- A. Corporate operating policies
- B. General plant safety rules
- C. Overall familiarisation
  1. Facility layout, operations and hazards
  2. Alarm and signalling systems
  3. Emergency procedures

## **2. Specific Job Training**

- A. Process equipment operation
- B. Fire and explosion hazards associated with the operation
- C. Familiarisation with operating manuals for the equipment.