AN INQUIRY INTO

SIGNIFICANT FACTORS FOR ACCIDENT PREVENTION

EMBODIED IN THE FACTORIES ACT

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I, JEROME HORNE, submit this thesis for the degree of Master in Industrial Administration. I claim that this is my original work and that it has not been submitted in this or in a similar form for a degree at any University.

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ABSTRACT

The Factories, Machinery and Building Work Act of 1941 has embodied in it certain factors which are apparently intended to promote the prevention of accidents in industry. These factors have been lifted out of the Act and Regulations and their significance is discussed in this thesis. The results of a questionaire posed to firms are presented and analysed. These results indicate a limited degree of effective accident prevention which can be ascribed to the existence of the Factories Act.

The thesis is divided into three parts:

Part I ... What the Factories Act provides for.
Part II ... The significant factors for accident prevention embodied in the Act.
Part III ... Conclusions and Recommendations.

The history of the Factories Act is briefly traced and the Act in its present form is discussed in considerable detail. The following factors are revealed:

Registration for the purposes of control
Approvals for the purpose of quality
The creation of a safe and healthy environment
The utilisation of competent persons
The legal obligations of various classes of persons

Case histories of accidents are worked into the text to illustrate aspects under discussion. These are accidents which have been investigated by the Division of Occupational Safety of the Department of Manpower. Identifying features have been omitted.

A limited comparison is made between the Factories Act and the British and American occupational safety acts.

The proposed Machinery and Occupational Safety Draft Bill is discussed.

It is concluded that there are factors for accident prevention enbodied in the Act. These are: legal registration, approvals, specific

regulations, written appointments of competent persons, appointment of inspectors and accident enquiries. How effective these factors are, requires further statistical work.

Certain recommendations are made which are intended to make the application of the Act more effective. A particular short-coming of the Act is the small emphasis on training of persons in safety awareness. Greater provision should be made for such training and definite guide-lines should be laid down in the Act for safety training of the worker.

The Government has published a Machinery and Occupational Safety Draft Bill which retains many of the features of the present Act. If the positive factors discussed in this thesis are retained and added to during the passage of the new Bill through Parliament, industry and its workers should feel the benefits in the years ahead.

CHAPTER ONE

INTRODUCTION

1.1 PURPOSE OF THE THESIS

The Factories, Machinery and Building Work Act 1941, as Amended, (Act No. 22 of 1941), hereinafter referred to as the Factories Act or the Act, establishes a set of rules binding certain classes of employers and certain classes of workers. Employers and workers are required to abide by certain hours of work, to observe certain holidays and to maintain certain conditions of employment. Employers are obliged to provide a healthy and safe environment, provide protective clothing and equipment, and to train persons to work safely. Workers are obliged to co-operate by using the facilities provided and to respond to training and instructions.

The classes of employer are: occupiers of factories, users of machinery, builders of structures and excavators of earthworks. The classes of workers are those employees who work in factories, operate machinery whether in a factory or not, or perform building work (including diving work), or excavation work.

The purpose of the thesis is to consider in what ways and to what extent the Act contributes to industrial safety. The content of the Act and the Regulations will be considered and the response by industry in applying the provisions of the Act will be discussed in relation to accidents which have occurred and the results of a questionaire sent out in the Western Cape. Some suggestions are made with a view to improving the effectiveness of the State's efforts to promote the prevention of accidents.

The underlying model threading the thesis follows the following pattern:

1. What is the problem?

   The Problem is: Does the Act contribute to accident prevention in industry and if it does, in what ways and to what extent does it do so?

2. What is the solution to the problem?

   The many ways (or factors) embodied in the Act are highlighted and the extent of the contribution to accident prevention is discussed.

3. Has the solution solved the problem?

   The solution is tested in the following ways:

   a. A questionaire was sent out.
   b. Reportable accidents are graphed.
   c. Workmen's Compensation figures are considered.
   d. Wiehahn Commission report is studied.

The fact that a new Draft Bill has been published for discussion in Parliament next year shows that the authorities are not satisfied with the effectiveness of the present Act.

1.2 STRUCTURE OF THE THESIS

The thesis is divided into three parts:

Part I:	...	What the Factories Act provides for.
Part II:	...	Factors for Accident Prevention embodied in the Act.
Part III:	...	Conclusions and Recommendations.

1.3 RESEARCH TECHNIQUE

During 1981 a questionaire was sent to 163 firms mainly in the Western Cape to obtain some indication of the effect and value of the Factories Act on industry. The outcome is discussed at the end of Part II.

Other techniques are the use of graphs and statistics.

1.4 PRINCIPLES FOR SAFE WORKING THAT APPEAR TO BE BASIC TO THE LEGISLATION

The Factories Act is comprised of the Act itself and the Regulations framed under the Act in terms of Section 51 by the State President. The Act itself sets legal obligations as well as enabling binding regulations to be promulgated as the need arises.

1.4.1 Principles in the Act itself

The principles embodied in the Act itself are the common law principles of Master and Servant, Landlord and Tenant and Principal and Agent. The first requires that the employee be loyal to his employer, obeys orders and cares for his master's property. The second type of law sees the employee as letting his services to the employer and receiving wages (rent) in return. In the third category, the employee may be seen to act as the agent of the employer. These principles will be illustrated in this thesis and their effectiveness for safe working will be considered.

1.4.2 Principles in the Regulations

The Regulations places obligations upon the various classes of employers to build sound structures suitable for the activities; to provide ablution and rest-room amenities; to provide a clean and comfortable atmosphere, adequate lighting, suitable protective clothing and equipment, well-guarded machinery and to train workers to work safely. These aspects will be dealt with in detail.

An important principle embodied in the Regulations is that the Chief Inspector of Factories approves codes of construction for certain classes of equipment to ensure their sound construction and fitness for purpose.

Great emphasis is placed on persons being qualified to do certain tasks which require specialist attention, e.g. servicing elevators, examining refrigeration machinery, inspecting scaffolding, testing pressure vessels, etc.

Another important principle applied in the Regulations is that all machinery must be brought under the charge of a competent person; all

building work must be supervised by a competent person; all demolition work by an experienced person; all excavation work by a competent person and all diving work by a registered and qualified person.

1.5 ILLUSTRATIVE CASE HISTORIES

To illustrate aspects of the thesis subject, a few case histories taken from departmental records (with permission) have been included. These cases are accidents which have been enquired into by inspectors of the Department of Manpower which administers the Factories Act. The anonymity of persons has been preserved.

1.6 COMPARISON WITH OTHER COUNTRIES

A limited comparison is made with the corresponding British and American safety acts. The British act is the Health and Safety at Work Act 1974, and the American is the Occupational Safety and Health Act 1970.

1.7 RECOMMENDATIONS

The Department of Manpower is in the process of bringing the safety and health aspects of the present Factories Act under a separate Act, but conclusions and recommendations arising out of this thesis are applied to the existing Act. As the Regulations are not likely to be radically affected by the new Act, criticism and recommendations relating to the Regulations will remain valid.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER TWO

EVOLUTION OF THE ACT

2.1 BRIEF HISTORY OF THE FACTORIES ACT

Ordinance No. 10 of 1912 conferred upon municipalities wide powers of control over factories and their erection. Then the Union Parliament passed Act No. 28 of 1918 which vested in the Minister of Mines and Industries extensive powers of control over factories. This control was exercised through factory inspectors co-operating with municipalities. Factory plans were first to be approved by the factory inspector before being passed by the municipality.

The date of commencement of Act No.28 of 1918 was 1 May 1919 and its purpose was "to provide for the regulation of factories and for other purposes incidental thereto". This Act was mainly concerned with the health and welfare of the factory workers rather than the safe installation and use of machinery, as shown by these subsequent Regulations:

Regulations promulgated in Government Notice No.559 of 1919 were for health and welfare;

Regulations under Government Notice No.2088 of 1920 were for handling of hides and sorting of wool;

Regulations under Government Notice No.2247 of 1920 concerned the manufacture of foodstuffs;

Regulations under Government Notice No.273 of 1921 dealt with guarding of machinery;

Regulations under Government Notice No.2286 of 1925 were concerned with first aid in factories;

Regulations under Government Notice No.268 of 1930 dealt with

cellulose solutions.

A second Act was passed by Parliament, the Factories Amendment Act 1931 (Act No.26 of 1931). This Act provided for the supervision of machinery by a chief inspector to be known as the Chief Inspector of Factories, assisted by inspectors holding certificates of competency issued under the provisions of the Mines and Works Act 1911 (Act No.12 of 1911). The Act made provision for regulations governing the installation and use of machinery, the holding of enquiries, the health and safety of persons in connection with machinery, the reporting of accidents and the classes of persons employed in connection with machinery, who should be in possession of certificates of competency issued under the Mines and Works Act, 1911.

This Act also empowered an inspector to inquire into accidents and occurrences and required him to transmit a report in the case of an accident causing loss of life or serious bodily injury to the Attorney-General in whose area of jurisdiction such accident occurred.

The penalty laid down in this Act for offences under the regulations was £100 or 12 months, but for offences involving injury to persons, penalties were laid down as follows:

> "If any person be guilty of any act or omission constituting an offence under this Act or any regulation made thereunder, whereby
>
> (a) the safety of any person is endangered or likely to be endangered, the guilty person shall be liable on conviction, to a fine not exceeding two hundred and fifty pounds or in default of payment to imprisonment for a period not exceeding twelve months;
> (b) serious bodily injury is caused to any person, the guilty person shall be liable on conviction to a fine not exceeding five hundred pounds or in default of payment to imprisonment for a period not exceeding twelve months;
> (c) the death of any person is concerned, the guilty person shall be liable on conviction to a fine not exceeding one thousand pounds or in default of payment to imprisonment for a period not exceeding two years or to such imprisonment without the option of a fine."

These penalties clearly reveal the seriousness with which the State viewed the health and safety of persons at work fifty years ago.

Regulations for the guarding of machinery in factories were first introduced by Government Notice No.273 of 1921. These were rescinded by Government Notice No.1246 of 1931 when Government Notice No.1247 of 1931 dealing with the supervision and control of certain machinery was promulgated. There were numerous regulations governing machinery, and for the first time a responsible engineer was required to be appointed in charge of machinery.

Regulation 5(1) of the latter notice required the appointment of a Certificated Engineer where there were prime movers with a total capacity of more than 250 h.p. (187 kW) or a single unit of more than 75 h.p. (56 kW).

Regulation 5(10) stated: "The engineer in charge shall be responsible for the compliance with the regulations affecting the safety of persons, but the appointment of such a person shall not relieve the user or manager of any personal responsibility."

Thus the principle was firmly established fifty years ago that the person at the top of the management hierarchy remained personally responsible for the safety of the workers. The penalty for contraventions of the regulations was £100 or 12 months imprisonment, unless otherwise provided for in the Act as previously detailed.

Ten years later these two Acts (of 1918 and 1931) were repealed by the Factories, Machinery and Building Work Act 1941 (Act No.22 of 1941) which was signed on 10 April 1941. Sections 34 to 39 dealt with "Precautions against accidents to Building Workers". Numerous regulations were also published under this Act. On 1 July 1963 the regulations were re-grouped into A, B, and C divisions. Act No.34 of 1963 came into force on 13 December 1963 to make provision for the supervision by inspectors of building and excavation work, and included the D Regulations governing building, demolition and excavation work.

In the E Regulations provision was made for Engineers' Certificates of Competency, which were formerly only obtainable under the Mines and Works Act.

In October 1971, the Diving Work F Regulations came into force to regulate the training and registration of divers. These regulations were subsequently amended on 30 May 1980 to tighten up control over divers.

Recent amendments have also been made to the elevator and boiler regulations.

2.2 PURPOSE OF THE ACT

The Act states that its purpose is "to provide for the registration and control of factories, regulation of hours and conditions of work in factories, supervision of the use of machinery, precautions against accident to persons employed on building or excavation work, and for matters incidental thereto".

It is important to recognise that this is a three-in-one Act covering three distinct areas of activity, viz:

Factories
Machinery and
Building Work (which includes Excavation Work and Diving Work).

The distinctions are necessary because it is possible for a firm to have a registered factory with no machinery in it, e.g. when goods are made with simple hand tools and are manually assembled and packed.

It is also possible for an employer to be a user of machinery without having a factory, such as a farmer using a machine to harvest his wheat.

And finally, a builder need not have a factory and need not use machinery but nevertheless he may come under the ambit of the Act.

From the chapters which follow, it will be seen how the Act is directed to the health, welfare and safety of employees, employers and members of the public, who work with or in the proximity of, or use factory buildings, machinery (such as elevators) or builders' equipment (such as scaffolds). A heavy duty is placed upon the shoulders of the employer to create and maintain a safe environment for the workman, and to train the workman,

who works not only for his own benefit but also for the benefit of his employer.

2.3 NECESSITY FOR LEGAL SANCTIONS

A brief look at the social necessity for legal sanctions is appropriate. Society seems to have required laws from earliest times. The Ten Commandments which Moses conveyed to the Hebrew people brought order in their society so long as they kept those laws. The second, third and fifth commandments carried penalties.(1) The other seven may not have carried threats because of their obviously adverse consequences. Team games have always had rules and penalties. The rules bring order and fairness to the game and the penalties reinforce the rules. To the present day laws are enforced by legal sanctions. However not all legal sanctions in history have been considered fair and the concept of fairness is an important factor in formulating laws.

The elements of an offence would appear to be that:

a law is formulated
it is published
a penalty is prescribed
the law is contravened.

During the Industrial Revolution the bosses cracked the whip and workers were unfairly used. Consequently laws were promulgated to protect workers from e.g. working excessive hours,
inadequate wages,
unhealthy working conditions,
unsafe machinery.

There were, however, many industrialists who were philanthropists and who were more concerned with the well-being of their workers than making huge profits. These did not need laws to regulate their conduct towards their employees. Their provision took into account the physical and social needs of their workers and their contribution was far in excess of the requirements of the law. Laws, however, are still necessary to deter potential offenders, and to punish the guilty. (See Chapter Eleven.)

2.4 TWO TYPES OF LAW EMBODIED IN THE FACTORIES ACT

2.4.1 Master and Servant

The servant is regarded as letting his services to the master in exactly the same sense as a landlord lets a house to a tenant.(2) The wages correspond to the rent. Contracts of service fall into two categories: master and servant, and common law. Statute law such as the Factories Act in addition to being a civil contract also introduces a penal consequence. A servant specially engaged to perform service in any trade or handicraft is in a worse situation than other statutory servants in the event of accident or illness, because he is not entitled to wages during his incapacity but only to food and lodging.(3)

"It is a clear law that a master is liable for any delict or wrongful act committed by his servant, provided the servant acts in the course of and within the scope of his employment and for the master's benefit."(4)

An employer is not liable for the negligence of an independent person who contracts to do work for him, except where the work to be done is in itself dangerous in the sense of requiring special precautions for the safety of others.(5)

2.4.2. Agency

Wille and Millin in their work on Mercantile Law of South Africa state: "The complexities of life are such that it is impossible for any man personally to attend to all matters in which it is necessary for him to be brought into legal relations with other people."(6) He will employ someone to act as his agent. Such employment is called contract of mandate or agency. The employee is the agent and the employer is the principal.

The contract of agency demands the utmost good faith between agent and principal, and the agent has a duty to act in the interest of the principal and not for his own benefit.(7)

There should be a clear understanding of the subject-matter entrusted to the agent and the limits of his authority should be recognised. He should also be competent to perform his function. As a result of a

transaction by the agent certain rights and duties will be imposed on the principal. Not only does the agent bind the principal, but the principal effectively delegates certain of his authority to the agent.

2.5 DELEGATION OF AUTHORITY

In a small company there may have been a time when one man carried out all the management functions, but as the company grows this becomes physically impossible. The work load must be shared with others and specialised functions must be performed by specialists. The partial or full authority of management must be allowed to accompany the shared functions, and thus the delegation of authority arises. Authority must accompany the responsibility, otherwise the delegatee cannot be expected to be held accountable for his actions.

The question that arises is: can the person who has delegated certain duties to another be held responsible for the negligence of the other party in the performance of those duties? This aspect will be discussed in the light of Section 40 of the Factories Act, which deals with managers, agents and employees in relation to their principals.

2.6 SUMMARY

The Factories Act as it stands today evolved from Acts of Parliament passed in 1918 and 1931. It has become an omnibus act covering factories, machinery, building work, excavation work and diving work. Extensive provision has been made for the safety of workers and the penalties in the 1931 Act were heavy. These penalties were lightened in the 1941 Act. The necessity for penalties is discussed and the types of law embodied in the present Act are considered. Delegation of authority is mentioned, because it will be shown in a later chapter that an employer can be held legally responsible for certain offences committed by an employee.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER THREE: REGISTRATION

3.1 THE NECESSITY FOR REGISTRATION

Registration is the means whereby the State can gain legal control of an operation. By this means the State grants permission for a device to be used or a process to be performed. If the operation is not conducted in accordance with certain conditions and requirements, the permission can be withdrawn and the continued operation becomes an offence. Lack of control can bring about unsafe working conditions.

Provision is made in the Act for the registration of factories, and in the Regulations for the registration of elevators and escalators, transportation plant, boilers and certain classes of divers.

3.2 REGISTRATION OF A FACTORY

Chapter II of the Act itself (as distinct from the Regulations) provides for the registration and control of factories. If the activity to be conducted is a factory activity as defined in Section 3, then the premises must be suitable for the performing of that activity. To this end, plans of the buildings must be submitted to the Factory Inspector for scrutiny and approval. Sufficient working space and amenities for the number of workers must be provided, taking into account sex and race. A hygenic and healthy environment must be provided for the continued health and welfare of the workers. This aspect takes into account comfortable atmospheric conditions and proper lighting suited to the type of work to be performed.

The plans are then submitted to the local authority to ensure that the structure will be sound (and therefore safe for the person using it) and the building will not offend the environment aesthetically or by

polluting it.

When the buildings are completed to the satisfaction of the Factory Inspector, a certificate of registration is issued, and the activity is thus granted permission by the State to proceed.

3.3 REGISTRATION OF ELEVATORS AND ESCALATORS

Life in a modern city would be very irksome without elevators or lifts and escalators to convey people up and down high buildings. Vertical transport is an essential feature of modern living.

An elevator is essentially a box in which people stand while being raised or lowered in a shaft enclosure by means of ropes driven by an electric motor. Entrances to the shaft or hatchway must be securely closed when the car has left that landing, otherwise persons would be in danger of falling down the shaft. While the car is travelling the car door must be kept closed or persons might be injured by contact with the walls of the shaft. The ropes holding the car might fracture and the car must be prevented from hurtling down the shaft. The power might fail and the boxed-in persons will have to be released as speedily as possible. All these possibilities need to be safeguarded, and this is done to a large extent by the regulations embodied in the Factories Act.

The owner of an elevator or escalator is defined as the user. He is required by regulation first to apply to the State for permission to erect the elevator, submitting plans and technical details of the installation. After completion of the installation, it is examined by an inspector to ensure that all the safety regulations have been met and that the load tests are satisfactory. A certificate of registration is then issued to the user who is further required to depute a competent person or firm to conduct regular inspections on the installation and maintain it in a safe condition.

3.4 REGISTRATION OF TRANSPORTATION PLANT

Cableways such as the Cape Town Aerial Cableway and Blondin cableways

used on bridge construction sites such as the Bloukrans Gorge beyond Plettenberg Bay have also to be registered before they can be used to carry material or people. The Chief Inspector of Factories will only give permission to erect a cableway after certificates have been received from professional engineers that the foundations and steelwork design are suitable for the specified work load and that the rope factors of safety are in accordance with the appropriate Code of Practice of the South African Bureau of Standards.

3.5 REGISTRATION OF BOILERS

Before a boiler may be used, the owner whom the Act defines as the user, must apply for permission to erect it and submit construction details of the boiler and proof that it was constructed in accordance with an approved code of construction. This proof is in the form of a certificate of manufacture issued under the hand of the approved inspection authority. After inspection of the installation and a satisfactory test, the inspector of machinery issues a certificate of registration which authorises the user to steam the boiler at a maximum safe working pressure. The user has the legal duty to maintain the plant in a safe condition and to prepare the boiler for periodical examination and test by an inspector or other competent person or firm.

3.6 REGISTRATION OF DIVERS

Since 1971, provision has been made in the Regulations for the registration of commercial divers in the following categories:

learner divers
divers
diving supervisors and
diving instructors.

Diving work is a highly specialised activity with its own peculiar dangers, because the diver works in an environment which is naturally hostile to man. The diver has to understand the nature of the environment and must be thoroughly familiar with the equipment he is required to use and its limitations. He must also understand the

techniques of rescue so as to be better able to save himself and his fellow divers during an emergency.

Diving work is more often part of a building operation such as the construction of a quay wall or a bridge over a river. It is therefore, included in the definition of building work.

Diving work is also undertaken by scientists on research projects, and provision has therefore, also been made for the registration of diver scientists in the same categories as commercial divers.

3.6.1 Learner Divers

A person of at least 20 years of age, of good character and conduct and who has been certified fit to perform diving work by a medical practitioner appointed by the Chief Inspector of Factories, may apply to be registered as a learner diver. After registration he may commence to receive training at an approved diving school.

3.6.2 Divers

A learner diver who has had 100 hours of training at an approved diving school, after which he has passed the prescribed examination set by the Board of Examiners for Divers, and is certified fit to dive, will be registered by the Chief Inspector as a diver.

3.6.3 Diving Supervisors

A diver who is at least 21 years of age and has had at least two years' experience in diving work and has passed the diving supervisor's examination will be registered as a diving supervisor.

3.6.4 Diving Instructors

A diver who is at least 21 years of age and has been an in-date diver for at least three years and has passed the diving instructor's examination will be registered as a diving instructor.

3.7 SUMMARY

Various registrations for the purposes of control by the State are listed. This control by registration obviously enables the State to regulate the health, welfare and safety of persons in industry, including the potentially dangerous activity of underwater diving where it is done for financial gain.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER FOUR: APPROVALS

4.1 APPROVED CODES OF CONSTRUCTION

An important task of the Chief Inspector of Factories is to grant approvals of codes of construction for the construction of boilers, pressure vessels, portable gas containers and electrical equipment for hazardous locations. Before granting approval these codes must be studied and the Chief Inspector must be satisfied that if the equipment is manufactured in accordance with the particular code it will function safely. To ensure that the manufacture is in accordance with the code, the work must be supervised by an inspection authority who must also be approved by the Chief Inspector.

In spite of codes of construction being approved, the Factories Act overrides the codes, e.g. if a boiler code requires one safety valve and the Regulation requires two, two will have to be fitted. Also the Chief Inspector may approve a code but add a rider, e.g. a code might not require a pressure vessel to be heat-treated, but the Chief Inspector requires an ammonia vessel to be heat-treated to relieve welding stresses. The necessity for this requirement arose after an accident had occurred wherein an ammonia vessel disrupted and seventeen people died. The occurrence is described in paragraph 4.3.1.

4.2 BOILERS

Codes of construction of boilers, from all parts of the world are approved by the Chief Inspector if he is satisfied with the design features and quality of material and welding preparation and final testing. These boilers may be of riveted or welded construction. The chemical and physical properties of the metal plate, rivets and welding electrodes are specified in the codes to close limits and the certificate of manufacture issued by the inspecting authority who supervised the construction work

must confirm that the materials and preparation (such as drilling and welding) were in accordance with the code. The work of persons who do the welding must also be periodically tested to ensure the correct quality of workmanship.

The need for close control is required by the severe thermal cycles through which the metal passes during use when the stored pressure energy will detect a weakness in its confinement and damage not only the vessel but also its immediate surroundings.

4.3 - PRESSURE VESSELS

In almost exactly the same way as boilers, pressure vessels are required by regulation to be constructed according to an approved code of construction. The construction differs mainly in this respect that most vessels do not need to be stress relieved by heat treatment. A vessel such as a compressed air receiver is not subjected to extreme thermal variations and so does not need heat treatment, but the following occurrence calls for a different approach.

4.3.1 Pressure Vessel Explosion

The dome at one end of a large ammonia vessel had been repaired under the supervision of an inspection authority. The material of the vessel was carbon steel of boiler plate quality. Repair was by means of electric arc welding. Heat treatment was not applied because not required by the code. The vessel was put back into service but after a considerable time in service, an accident occurred.

A road tanker was coupled up to the vessel to decant the ammonia. Ammonia being a refrigerant, the temperature of the vessel dropped during the decanting because the liquid was boiling off. A violent explosion occurred. Eleven people in the immediate vicinity were killed by the blast or the immediate effects of being enveloped in ammonia. The vapour spread to the adjoining housing estate and a number of people were overcome by ammonia fumes and were taken to hospital. Six of these died later.

At the official enquiry it was established that a large area of plate

from the end dome measuring about 250 by 250 mm had been blown out as a result of a brittle failure. This was the dome which had been previously repaired. The reason for the brittle failure was considered to be the ommission of stress relieving by heat treatment after welding repairs in conjunction with the low temperature during decanting. No one could be held to blame as the code of construction did not make stress relieving for a pressure vessel obligatory.

As a result of this accident, the Chief Inspector requires that all cryogenic (low temperature) vessels must be heat treated after manufacture.

4.4 PORTABLE ELECTRIC TOOLS

There are four systems by means of which portable electric tools of a voltage higher than 42 volts may be used and each of these systems has to be approved by the Chief Inspector:

(a) an earth leakage protection device which will isolate the source of supply in the event of a fault to earth

(b) a double wound isolating transformer between the source and the tool

(c) a high frequency generator with corresponding tool

(d) the tool itself is of double insulation construction.

4.5 PORTABLE GAS CONTAINERS

These cylinders of capacity up to 1 200 litre and which contain gases or vapours under pressure, may fail in use with catastrophic results. As with boilers and pressure vessels these containers must be constructed according to an approved code and manufactured under the supervision of an approved inspection authority.

4.5.1 Testing Stations for Portable Gas Containers

Firms which test and fill these cylinders are approved by the Chief Inspector only if they are fully equipped with instruments for testing

the quality of gas (such as air) and for hydraulic testing of the cylinders.

4.6 DIVING SCHOOLS

These schools may only function if approved by the Chief Inspector. To gain approval a school must be fully equipped with diving equipment and an approved master decompression chamber. In addition a qualified diving instructor must acompany the learner divers during the first 35 hours of their training, after which a registered diving supervisor can supervise the operations.

4.7 ELECTRICAL EQUIPMENT IN HAZARDOUS LOCATIONS

In areas where electrical equipment may cause fire or explosions the apparatus must be certified by an inspection authority on an approved certificate which testifies the code of construction of the apparatus and the hazardous conditions which it can withstand.

4.8 INSPECTION AUTHORITIES

The Chief Inspector of Factories also has the task of approving firms which are equipped with the necessary instruments and qualified staff as inspection authorities for the purpose of supervising the manufacture of boilers, pressure vessels and portable gas containers (cylinders containing gases) or electrical equipment in dangerous atmospheres i.e. flameproof, explosion-proof or intrinsically safe equipment.

After examining the credentials of the firm, the Chief Inspector will decide whether or not to approve them. It is the duty of the firm to ensure that fully qualified engineering surveyors do the actual inspection work. This inspection is carried out on the premises of the manufacturer and may require the continuous presence of the surveyor. His duty is to ensure that the preparation for welding, the plate used, the heat treatment if necessary, the X-rays and physical tests on prepared specimens are in accordance with the code of construction. He then

certifies on a legal document that he is satisfied with the work.

The Chief Inspector has the right to withdraw his approval in the event of unsatisfactory work being passed by the inspection authority. Such work may be brought to light as a result of failure of a vessel in service or during an inspection by an official.

4.9 SUMMARY

The Chief Inspector of Factories has the responsible duty of approving codes of construction of various pieces of equipment, training centres for divers, testing stations and inspection authorities.

The purpose of these approvals is to assure the quality of the machinery and the competence of persons performing training, testing and inspecting.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER FIVE: HEALTHY AND SAFE ENVIRONMENT AND WORKING CONDITIONS

5.1 HEALTH

Chapter III Sections 19 to 28 of the Act prescribe hours of work, holidays and conditions of employment in factories. Ordinary and overtime hours of work are prescribed for both sexes separately, also shift work, night work and meal hours. Proportions of pay for overtime, holidays, vacation leave and sick leave are also prescribed. Limitation of employment of women nearing confinement and maternity benefits are prescribed. Under the Industrial Conciliation Act, actual remuneration is specified for various industries in industrial agreements. Persons under the age of fifteen years are prohibited from working in a factory. An employee suffering a physical defect or illness may be prohibited from working in a factory or engaging in a specified activity for his or her own health or safety or that of their fellow workers.

It is thus seen that the Act aims to protect the health and safety of workers by prescribing reasonable working hours and reasonable activities.

Chapter VA (Sections 38 to 39D) enables the health and safety of employees to be further protected by enabling the Minister to prescribe the use of substances which may be injurious to health or certain harmful processes. Provision is also made for medical examinations before or while certain activities are being carried out. Even medical supervision of a preventive character may have to be provided. Notifiable industrial diseases may also be prescribed, and these may be subject to investigation by an inspector.

Chapter III of the Regulations specifies in greater detail the requirements for health and welfare in respect of: floor space and ventilation, lighting and heating, ablution and rest facilities, cleanliness, protective clothing and appliances, eating and drinking facilities, first aid and

fire and flood precautions, safe handling of dangerous substances. The employer may be required to make special provision for the physical, moral or social welfare of both sexes and different races in his factory.

As from 1 April 1974 the hearing of workers was required to be protected by the provision of ear muffs or ear plugs in areas where the noise level was 85 dB(A) or more.

Thus it is evident that the Act and Regulations require the employer to provide a safe environment and protective equipment for the benefit of the worker and indirectly for the benefit of the employer, unless the cost of such provision becomes exorbitant enough to put the firm out of business.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER SIX: SUPERVISION AND SAFETY TRAINING

6.1 SAFE ACTIONS ON THE PART OF THE WORKER

The onus up to this point has been upon everyone but the worker himself, to provide for the safety of the worker. Inspectors have had to ensure the suitability of the factory, the safety of boilers, pressure vessels, portable gas containers, electrical equipment and wiring, elevators, etc. But now the worker himself comes into the picture. He is required to act safely so as not to injure himself or others.

Section 40(2) places a legal duty upon the employee not to do or omit to do any act which it would be an offence for his employer to do or omit to do under the Act, or he will be liable to be convicted and sentenced as though he were the employer.

Section 47(3) forbids an employee to "wilfully and without reasonable cause do anything likely to endanger the health, safety or welfare of himself or others".

Furthermore in terms of Section 47(1) and (2) the employee must use and not misuse safety appliances provided under the Act.

6.2 INEXPERIENCED PERSONS

We now return to the user of machinery and we notice that Regulation C7(1)(c) requires him to "cause every inexperienced person who is required or permitted to operate a machine which may cause injury, to be fully conversant with the dangers attached to the operation thereof and the precautionary measures to be taken and to be observed".

There are very few machines in industry which do not require the strict application of this regulation. The operation of a machine does not usually require an artisan or machinist, and except for such work as precision turning, milling and specialised welding, most machines can be tended by skilled operators. These workmen often have to be trained from scratch and it is towards these inexperienced persons that the user has a legal duty.

Take, for example, a forklift truck as used in a factory. The controls are easily and quickly learned, but the skill to operate the truck safely only comes from training and experience. It would be criminal for the employer to hand the keys to a workman who can drive a car and allow him to drive the forklift say in the absence of the regular driver. There are a number of accidents on record caused by inexperienced drivers of forklift trucks. See Appendix 1.

Some machines are inherently dangerous and therefore require thorough experience in handling. Machines with rolls fall into this category. These may be printing machines, papermaking machines or plastic laminating machines. The initial feeding of the material through the rolls while they are rotating, usually at much reduced speed, requires skill and the utmost care. It is not always practicable to guard the nip of the rolls. In addition to using only trained and experienced persons on these machines, the user must provide emergency stopping facilities such as trip bars or stop buttons in handy places, or trip wires along the length of a machine. Persons working on such a machine must know the location and use of these safety devices. An assistant to an operator suffered the amputation of a hand in a rolls machine because he did not use the trip bar at hand level or the one at foot level while he was feeding the end of a styrofoam sheet into the rolls and his glove was caught in the nip of the rolls. The injury might have been even worse had the operator not been sufficiently experienced to switch the machine off promptly.

6.3 COMPETENT PERSONS

The Regulations place great stress on the necessity for competent persons to carry out certain specified tasks or types of work.

The definition of competence places emphasis on experience in the particular field of competence e.g. an electrician who wishes to service elevators must obtain at least one year's experience in that field.

The periodic examination and/or testing of the following equipment requires a competent person:

refrigeration machinery
lifting machines
flameproof equipment
live electrical equipment
pressure vessels
boilers
elevators
goods hoists
builders' hoists
machinery used for diving work

The examinations and tests by these persons have to be recorded in log-books which then become legal documents which can be utilised as proof that the users of machinery took reasonable steps to maintain their equipment in a safe condition.

6.4 RESPONSIBLE PERSONS

The provision for the appointment of responsible persons in writing, in general charge of machinery or to supervise building work is an important facet of the Regulations which is intended to place a legal duty upon an individual who is competent to exercise that legal duty. There are four categories of activity over which responsible persons must be appointed, viz., machinery, building work, demolition work and excavation work.

6.4.1. Machinery

Regulation C1 requires the user of machinery to appoint a responsible person in general charge of all machinery on a premises. This person must have a level of competence which is related to the size of the installation and this size is the measure of the power output of the machinery. There are four categories of machinery to be considered:

Prime movers such as oil or gas engines
Distribution transformers and switchgear
Electrically operated machines such as motors, heaters and electrolytic equipment
Boilers

The combined kilowatt rating of this machinery decides the class of person to be appointed.

Up to 800 kW, the person must be a competent person.

Above 800 kW and not above 1 200 kW, the person must be a certificated engineer, unless the chief inspector grants an exemption.

Above 1 200 kW, the person must be a certificated engineer. (See Appendix 2)

These competent persons are competent in the operation and maintenance of machinery such as fitters and electricians.

6.4.2 Building Work

Building work is required to be carried out under the general supervision of a person who has had five years experience in building work or is a civil engineer. The appointment must be in writing but the department does not have to be notified of the appointment as in the case of machinery.

The responsible person has three legal duties:

(i) to ensure that the provisions of the regulations are complied with
(ii) to ensure that all plant and machinery are maintained in good condition and properly usd
(iii) to ensure that the work is carried out safely
(iv) to ensure that the work is carried out in accordance with the designs and specifications as approved by the appropriate authority.

6.4.2.1. Diving Work

"Diving work" means any building work performed underwater by a diver for

for personal financial gain. It is, therefore, part of building work and is often associated directly with building work as in the building of quay walls for harbours or bridges over rivers.

Diving Supervisor

A diving supervisor is required to be appointed in writing by the builder to "exercise control over all diving operations". Only a diver who has had at least two years' experience as an in-date diver and who has passed a qualifying examination may be appointed to this position. He needs to by well experienced in the use of diving equipment including the operation of a master compression chamber. He has to keep a diving register of the work done by the divers under his control, the weather conditions and the depths to which they dive.

6.4.3 Demolition Work

Demolition work must be performed by or supervised by a responsible type of person who has had at least two years' practical experience in that field. There is ever a danger of walls collapsing during demolition, an experienced supervisor is the main ingredient for safe working and the absence of such supervision has been the cause of many tragedies.

An apprentice carpenter was placed in charge of a gang of prisoners who were demolishing a building. A wall abutting a corner of the building was removed and the adjoining wall was not propped up. It collapsed on two convicts while they were cutting holes in it for the cables which would be used together with a tractor to pull the wall down.

The necessity for constant supervision is also important as illustrated in the following case:

The foreman of a firm which specialised in demolition work left the site of a building under demolition for a short while to make a telephone call. During his absence the operator of the end loader was killed when a steel column fell on him. The column formed part of a portal steel frame which the demolishers had tried to pull down a few days earlier by means of steel wire ropes and a traxcavator, but without success.

6.4.4 Excavation Work

Because of the dangerous nature of this work, the regulations require that a responsible person be appointed in writing to supervise the work. This person must be competent to exercise such supervision, which implies experience and awareness of the dangers involved. The main danger is the unpredictability of the soil. A wide excavation can be sloped to a safe angle. A narrow excavation can be shored and braced, but an excavator may be tempted to put in the minimum of shoring because it hampers the work. Cutting the sides of a narrow excavation to a safe slope may not be possible because of restricted space around the excavation. The ground may appear to be well compacted but may become fizzured by underground water.

A construction company which specialised in pipe laying had excavated a trench 2,4 metre deep to lay a 150mm sewage pipe. The sides had been sloped to what was considered a safe slope. The bottom of the trench was 1,5 metre wide and the top 2,5 metre wide.
The progress of the work was superintended by an experienced and qualified site agent. The ground was so hard in that area that a heavier traxcavator had to be used to dig the trench. In spite of this one wall broke away and buried three workmen. Only one survived.

6.5 OPERATING PROCEDURES

Not only is a user of machinery required to provide a safe environment and maintain that environment safe, but he must also see that persons work safely. To this end Regulation C7(2)(a) requires the user to appoint in writing a person who is thoroughly familiar with the work processes to report to the responsible person, amongst other things, the proper use of safety appliances and unsafe practices. There is thus a legal duty placed on production personnel to see that persons who operate machines do so safely and without accident.

Under the building work regulations too, the responsible person is required to ensure that the work is carried out in a safe manner and in accordance with the approved plans and specifications. This latter is

a most important aspect as e.g. the correct placing of reinforcing steel or the correct period for curing of concrete before removing support frames. Regulation D3(4)(c) deals with this aspect.

In diving work the diving supervisor is required by Regulation F11(2)(g) to explain the diving schedule of the diving operation to the diver and the stand-by diver and to see that the schedule is strictly adhered to.

6.6 SUMMARY

Machinery and building work (including excavation, demolition and diving work) is required by the regulations to be placed under the supervision of competent persons. Inexperienced persons are required to be trained to operate machines which could cause injury.

Special types of machinery such as boilers, elevators, hoists, refrigeration equipment, are required by the regulations to be inspected and tested by competent persons with special experience in those particular fields.

Production personnel are also required to watch out for unsafe actions and faulty safety appliances and report such conditions to the person in general charge of machinery.

PART I: WHAT THE ACT PROVIDES FOR

CHAPTER SEVEN: LEGAL OBLIGATIONS

7.1 INTRODUCTION

The Factories Act comes in the category of Administrative Law, which is a branch of Public Law, which is in turn a branch of Substantive Law. Certain legal obligations are placed on certain classes of persons and these persons are therefore accountable to the State for their decisions and actions. These classes of persons will be dealt with in turn.

7.2 CHIEF INSPECTOR OF FACTORIES

The Chief Inspector heads the Division of Occupational Safety which is a division of the Department of Manpower. He is one of the officers to whom the Minister of Manpower has delegated powers of exemption from provisions of the Act in terms of Section 54(3) and 54(5).

The Chief Inspector has the duty of approving various matters as follows:

- Responsible persons in charge of machinery in marginal cases.
- Transportation plant such as aerial cableways.
- Codes of construction and inspection authorities for:
  - Electrical Installations in Hazardous Locations
  - Pressure vessels
  - Portable gas containers
  - Boilers
- Portable electric tools which are double insulated
- Earth leakage protection devices
- Double wound isolating transformers
- High frequency generators for portable electric tools
- Engineers' Certificates of Competency
- Diving schools for diver training
- Medical practitioners for divers
- Registration certificates for various classes of divers.

7.3 INSPECTORS

Inspectors of Factories are appointed to scrutinise plans for prescribed activities in factories, to do feasibility studies as to the suitability of premises for a particular activity, to register factories and to enforce the health and welfare regulations framed under the Act.

Inspectors of Machinery are appointed to supervise machinery, building and excavation work, to issue certificates of registration, to investigate industrial accidents and to enforce the safety regulations. More specifically, the inspector of machinery has the following duties:

Hold accident enquiries
Question witnesses at an enquiry
Stop dangerous building work
Grant permission to erect: Boilers
Elevators
Escalators
Issue certificates of registration for: Boilers
Elevators
Escalators
Inspect and test: Boilers
Elevators
Escalators
Transportation Plant such as cableways.

7.4 VARIOUS CLASSES OF EMPLOYERS

7.4.1 Employers

Employer, as defined in the Act means "a person who employs or provides work for anyone in or in connection with a factory, or permits anyone to assist him, in any manner whatsoever, in the carrying on of his business in or about a factory, and 'employ' and 'employment' have corresponding meanings".

Employer and correspondingly the employee are persons associated with a factory. Their legal duties are therefore confined to the activities occurring in a factory, such as hours of work, holidays, health, welfare and the safety of workmen. A heavy duty is placed upon the shoulders of the employer to create and maintain a safe environment for his employees, who work not only for their own benefit but also for the benefit of the employer.

The Act requires employers to keep records of employees' hours and wages and attendance. He must also keep an accident register in which are recorded accidents which are required to be reported to the inspectors.

If an employee does or omits to do any act which it would be an offence for the employer to do or omit to do, an employer may be convicted for the offence unless he can prove:

that he did not connive with the employee
that he took reasonable steps to prevent the offence
that the employee had no authority to commit the offence.
(Section 40 (1)).

It is a very serious offence for an employer to victimise an employee by reducing his rate of pay or his conditions of employment if he suspects that the employee has given information to an inspector or given evidence in court in connection with the Act.

The employer must also keep a copy of the Act and Regulations on the premises.

The Regulations framed under the Act require the employer to provide:

Adequate floor space, heating, ventilation and lighting
Sanitary conveniences and washing facilities
Cleanliness and absence of smelly leakage
Protective clothing and appliances, including ear protectors
Rest and dining rooms
Drinking water
Seats where necessary, particularly for females
First aid equipment and facilities
Fire escape facilities and appliances
Facilities and precautions for safe use and storage of volatile flammable substances

Precautions against flooding.

All these provisions are financed by the employer, including personal protective clothing and equipment. The protective clothing is intended to remain on the premises unless the employer authorises otherwise.

7.4.2 Occupiers

Occupier is defined in relation to premises as "the person having the management or control of any business conducted on such premises...." and may include more than one person.

A factory is registered in the name of the Occupier, by whom or on whose behalf plans are submitted for approval for the erection or use of a factory, for the conduct of a factory activity. The condition of the premises and its continued suitability for the particular activity is the legal duty of the occupier, and notices will be served on him in the event of a default. The occupier is also required to abate any nuisance or remedy any sanitary defect which may injure the health of employees on the premises.

A person shall not occupy any factory unless it is fully or provisionally registered. "Occupy" here means to manage or control a business on the factory premises. Only the activity specified on the registration certificate may be carried out on the premises.

The occupier also has the duty to report accidents which occur on the premises.

The other legal duties of the occupier are spelt out in the Regulations and are exactly the same as that of the employer as specified under paragraph 6.4.1.

7.4.3 Users

User is defined in the Act in relation to machinery as "the owner of or person benefiting from the use of machinery or any structure or plant on the premises on which such machinery is installed..... and includes the person charged with the supervision of such machinery, structure or plant".

In terms of the Act the user must notify the inspector of certain categories of accidents which have occurred on premises where machinery is used. These premises may be a factory, a building or excavation site, a farm or dwelling house.

In terms of the Regulations, a user whose premises is not a factory, must notify the inspector the name and address of the business and the situation of the machinery.

The user of machinery has numerous legal duties which include the following:

Appoint a responsible person in charge of the machinery

Appoint competent persons for the following purposes:

- supervise the operation of machinery
- examine refrigeration plant every three months
- examine goods hoists every three months
- examine lifting tackle every three months
- keep passageways unobstructed
- guard all edges from which people might fall
- examine and test lifting gear every twelve months
- work on or near live electrical apparatus
- examine electrical apparatus in hazardous locations every twelve months
- inspect pressure vessels
- inspect elevators and escalators
- inspect scaffolds
- inspect diving equipment

Train inexperienced persons to operate machinery

Report non-casualty accidents in which machinery has failed

Provide safe ladders

Stack materials safely

Guard revolving and moving parts of machinery

Register transportation plant such as cableways

Ensure earthing of electrical installations

Maintain the boiler installation in a safe condition.

Machinery is very widely defined and includes almost any form of energy

whether stored, transmitted or converted.

7.4.4 Builders

Builder as defined in the Act means "a person who employs anyone on building work".
Building work includes any work on a building or other structure, diving work and work in compressed air.

The builder is required to appoint a responsible person to supervise the building work and in the case of diving work, a diving supervisor must be appointed in writing in charge of the diving operations.

If any excavation work is to be done in connection with building work, the builder must appoint in writing a responsible person who is competent to supervise the work. Similarly, any demolition work must be supervised by a responsible person with at least two years' practical experience and he must be specifically appointed by the builder.

The other legal duties of the builder include:

- Lighting dark areas
- Keeping passageways unobstructed
- Guarding all edges from which people might fall
- Safe disposal of debris
- Providing safe scaffolding including suspended scaffolds
- Providing crawling boards on fragile roofs
- Ensuring that a builder's hoist complies with the regulations, that persons do not travel on it and that it is inspected weekly by a competent person
- Excavations to be shored or cut back
- Providing protective clothing such as safety helmets
- All machinery used must comply with the machinery regulations.

If the builder is a firm which employs divers, then further legal duties are imposed which include:

- Learner divers to be registered annually
- Divers, diving supervisors and diving instructors to be registered

Provide compression chambers, medical attention and first aid equipment

Provide proper machinery and maintain it in sound condition

Ensure that portable gas cylinders are of sound construction and periodically tested

Ensure that the air used is medically pure.

7.4.5 Excavators

Excavator means "a person who employs anyone on excavation work".

Excavation work includes "loosening, taking out and removing stone, soil and other material in connection with the making, repairing, re-opening or closing of any trench, tunnel or similar excavations". It will be seen that because quarrying is a mining activity, it is not excavation work and similarly if tunnelling is for the purpose of mining a mineral.

The legal duties of an excavator include:

Appoint a responsible person in writing to supervise the work

Fence off the excavation and provide warning lights at night

Shore and brace or slope the sides of the excavation

Provide safe means of access

Ensure the stability of adjacent structures

7.4.6 Responsible Persons

The regulations makes provision for the appointment in writing of responsible persons in general charge of machinery and to supervise building work. These appointments carry specific legal obligations.

7.4.6.1 Machinery

The duties of the responsible person in general charge of machinery are:

1. responsible for the safe installation and proper maintenance, repair and operation of such machinery;
2. ensure that safety appliances, devices and guards are maintained in good condition and properly used;
3. ensure that the provisions of the regulations are fully

complied with;

4. stop the working of any apparatus or machine the using of which is, or may, in any way be dangerous to persons due to any defect.

In addition to these clearly spelt-out duties, the responsible person is defined as the user, which implies that he has exactly the same legal obligations as the user of machinery.

7.4.6.2 Building Work

The duties of the responsible person appointed to supervise building work are:

1. ensure that the provisions of the regulations are complied with;
2. ensure that all plant and machinery are maintained in good condition and properly used;
3. ensure that the work is carried out in a safe manner and in accordance with the designs and specifications as approved by the appropriate authority.

7.4.6.3 Diving Work

The diving supervisor appointed by the builder to control diving operations is required to ensure that:

1. good discipline is continuously maintained;
2. diving operations are carried out in the manner planned by him;
3. the requirements of the regulations are complied with;
4. he keeps a diving register.

7.4.6.4. Demolition Work

This responsible person shall ensure that:

1. all electric, water, gas or other supply lines have been effectively disconnected from the source of supply before demolition work is commenced;
2. no floor, roof or other part of the structure is so overloaded with debris or material as to render it unsafe;
3. all practicable precautions are taken to avoid danger from

collapse of the structure when any part of the framing of a framed or partly framed building is removed or when cutting reinforced concrete;

4. precautions are taken by adequate shoring or by such other means as may be necessary to prevent the accidental collapse of any part of the structure or adjoining structure.

7.4.6.5 Excavation Work

The duties of this responsible person are:

1. to supervise the excavation work;
2. to be competent to supervise the work;
3. to inspect the excavation including all bracing and shoring at least once in every shift and before commencement of work after rain.

7.4.7 Employees

Employees in a factory or place where machinery is used or building work performed have legal duties imposed on them which require them to;

Use the safety devices provided under the Act
Obey instructions
An employee may not wilfully interfere with or misuse safety devices
He may not wilfully and without reasonable cause do anything likely to endanger the health, safety or welfare of himself or others.

7.5 ACTS OR OMISSIONS BY MANAGERS, AGENTS OR EMPLOYEES

Section 40 of the Act deals with the circumstances under which a manager, agent or employee may commit an offence for which the employer can be held liable.

The offence must essentially be one which could be committed by an occupier of a factory or an employer or a user of machinery or a builder or an excavator. If a manager, agent or employee commits that offence then his employer could be charged for that offence, unless the employer can prove three things:

1. that he did not connive with the employee
2. that he took reasonable steps to prevent the offence in addition to any prohibiting instructions
3. that the employee had no authority to do or omit to do that type of act or omission.

In addition to the employer being liable for the offence, the employee could also be held liable for the offence.

It will be seen that the types of law mentioned in section 2.4 of Chapter Two are applicable here.

The master is responsible for the actions of the servant while the servant is obeying the master's commands. If the obedient actions of the servant lead to an offence on the part of the servant, then the master has committed that offence. The Act also wisely stipulates that the offence must be one which the master is capable of committing. If the servant committed an offence in disobedience to his master's commands, then the master may be exonerated, but the servant could be charged for the offence whatever it may be, i.e. even if it was an offence which the master was incapable of committing.

Consider the law of agency. Because of the mutual trust between the agent and the principal, an offence on the part of the agent will mean that the principal has committed that offence, unless the principal was misrepresented. In the latter circumstance only the agent should be held liable.

The above principles have been spelt out in Section 40 of the Act. Both the employer and the employee may be held liable for the offence unless the employer can prove that the relationships described did not pertain at the time of the offence.

7.6 SUMMARY

The Act places legal obligations upon a large number of classes of persons. These include Government Inspectors, various classes of employer and corresponding classes of employee and various classes of competent persons. These persons are accountable to the State for their acts or omissions which are directed to the use of safe equipment by safety conscious persons working in a safe environment.

Part I has shown in considerable detail what the Factories Act provides for in respect of health and safety.

In Part II consideration is given to those aspects of the provisions of the Act which appear to be intended to contribute to the prevention of accidents in industry. The results of a questionaire to test the effect of the Act on local industry are analysed and discussed.

PART II: FACTORS FOR ACCIDENT PREVENTION EMBODIED IN THE ACT AND THEIR EFFECTIVENESS

CHAPTER EIGHT

FACTORS FOR ACCIDENT PREVENTION EMBODIED IN THE ACT

8.1 INTRODUCTION

As revealed in the previous chapters provision has been made in the Factories Act for the health, welfare and safety of persons working in factories, on premises where machinery is used, on building and excavation sites, on diving operations and even in the use of electricity in the home. If all employers, occupiers, users, builders, excavators, employees and inspectors carried out their obligations diligently, accidents would be minimised and the local world would be a happier place to live in.

The actual picture tells a different story. The Workmen's Compensation Commissioner reported that in 1979 the accidents carried by the Accident Fund amounted to 193 983 cases and the compensation paid was R21 702 010 giving an average cost of R112 per accident case. The cost to industry is usually considered to be four times this amount.

Industry generally is geared to the profit motive. Accident prevention appears to be directed to the health, welfare and safety of persons. Are these two concepts in conflict? They will certainly be in conflict if accident prevention is costly enough to reduce reasonable profit-making or nullify profits. Every employer will need to quantify his own profit-safety balance sheet to establish the distance he can go in the direction of accident prevention.(8)

But what about his legal obligations? The State has set a minimum level of health, welfare and safety in the Factories Act and if the employer fails to attain this level, he is liable to prosecution. If he can

endure the stigma of appearing in court on a criminal charge, the employer may be prepared to pay the present penalty of R200 per offence, which is very unlikely to cripple the firm financially.

What about his moral obligations? This will depend upon the style of management. A paternal management is more likely to be concerned with the welfare of its workers than an autocratic one and may be willing to provide much more than the legal requirements.

On the one hand, therefore, we have the provisions for safety embodied in the Act and on the other hand we have the worker who may be injured at his place of work. What motivation is required on the part of the employer to comply with the Act and Regulations to create a safe environment for trained workers and thus to minimise the likelihood of accident?

The factors for accident prevention have been listed in previous chapters. Their significance will be discussed in this chapter, as well as their value for an enlightened management. In the final chapter suggestions will be made for improvement of certain areas of the Act.

8.2 HEALTHY AND SAFE ENVIRONMENT

As seen in chapter four, the Act and Regulations require the employer to provide an environment which is comfortable and healthy for the worker and suitable for the activity in which he will be engaged. The factory must therefore be designed with this in view. It is for this reason that factory plans must first be approved before being scrutinised by the local authority who are concerned mainly with the soundness of the structure and the necessary services, as well as anti-pollution.

To obtain registration as a factory, the occupier is compelled to provide the basic legal facilities. To retain registration, he must maintain the facilities clean and functional. The threat of cancellation of his registration hangs over him. Should he carry on the activity in defiance of the law after his certificate is cancelled, he may be charged with numerous offences in addition to the major one of conducting a factory without being registered which carries a penalty of R600 or two years or both. So as far as health and welfare is concerned, the occupier is

likely to comply with the provisions of the Act.

It is therefore to be expected that workers will not contract illnesses or diseases whilst at work: the atmosphere breathed will be reasonably clean and fresh, temperature and humidity will be comfortable, the body will be protected from damp, the skin from irritation and the eyes from strain, rest periods and eating facilities will be conducive to good health and minor injuries and indispositions will receive medical treatment. This aspect is therefore a significant contribution to accident prevention embodied in the Factories Act.

An important part of the safe environment is the guarding of moving machinery. There are detailed regulations clearly indicating which parts of machines must be guarded. These preventive measures are obviously based upon accidents which have occurred in the past. Not only must a square shaft be guarded, but also a round shaft, because there are many accidents on record of clothing being caught up by a revolving shaft and a person being swung around the shaft with serious or fatal consequences. In similar vein, the cutter block of a planing machine in the timber industry may not be of square cross-section, but may only be cylindrical, to reduce the severity of a possible injury.

Modern machinery is usually well guarded perhaps even totally enclosed. But many factories are old and have had to have their guarding custom made. Guards are removed for maintenance purposes and sometimes not replaced. Either due to deterioration or forgetfulness, moving parts are needlessly exposed and a potentially dangerous situation arises. It does not, however, follow that an accident will occur because the environment has become dangerous. It usually also requires an unsafe act to bring about the accident. A factory may have numerous unsafe locations, but because everyone is careful and alert, an accident does not occur. An inspector may point out the absence of a guard on a machine and be told, "But we've never had an accident in ten years".

Many employers attribute most of their accidents to carelessness on the part of the injured person. Such employers do not feel motivated to create a safe environment by guarding machinery. They consider that if a worker acts carefully, an accident should not occur. Lippert[9] on page 3 says, "To label an accident as caused by carelessness is to throw a

blanket alibi over the entire occurrence, thereby preventing any objective study of the causes of the accident or the fixing of any responsibility for action to prevent recurrence".

By guarding a machine an obvious source of injury will be eliminated. It therefore makes good sense to guard machinery in accordance with the Regulations as a first step. Although it may be costly, it results in many advantages; it is tangible evidence of management's concern for the safety of its workers:

it is proof that the firm is abiding by the law;
the worker can attend to his job without having to be careful about his environment;
there is one less possible cause of accident.

A safe environment will include safe and sound equipment such as ladders, tools, lifting machines and lifting gear, vehicles, forktrucks and personal protective clothing. While equipment is maintained in a sound condition they contribute to a safe environment, but as soon as they become defective, they may either be the direct cause of an accident or a contributory cause. This too is cost effective and management will have to be convinced that it is worth the expense. If not, is management willing to carry the risk of un-estimated costs in the event of an accident?

Every provision is made in the Regulations for the creation of a safe environment, but the onus is placed upon the employer to implement the requirements. The prevention of accidents from this cause is embodied in the Act but can only become significant as the employer co-operates to apply them.

8.3 CONSTRUCTION OF MACHINERY

As related in Chapter Three, certain items of machinery may not be used unless manufactured according to a code of construction approved by the Chief Inspector of Factories.

8.3.1 Boilers

The regulations require a boiler to be registered before it is used. It

will not, however, be registered by an inspector unless it can be proved by documentation that it has been manufactured according to an approved code such as British Standard or American Standard under the supervision of an approved inspection authority such as Lloyds or British Engine or German T.U.V.

What this means is that the correct boiler plate material is used and that the plate thicknesses have been calculated according to prescribed formula for a particular design pressure, and that the welding procedure has been supervised and the work done by coded welders and the heat treatment has been applied and the quality of the welds assured by non-destructive testing and sampling.

The final testing of the installation by the inspector ensures that all safety regulations have been complied with before the boiler is allowed to be put into commission.

These provisions of the Regulations are a most significant contribution to accident prevention. A boiler explosion is likely to be a catastrophic event with probable loss of life, serious injury and great damage to buildings and equipment.

The regulations also make provision for periodic inspections of boilers by inspectors. Heat and water are a source of corrosion and unless the water is conditioned, the boiler may be weakened by corrosion. Only expert opinion can estimate the degree of danger and recommend scrapping or reduced operating conditions.

The user of the boiler is also required by regulation to maintain the plant in a safe condition by regular servicing. Defective safety devices can lead to boiler failure with serious damage to the plant and possible injury to persons. During the late 1960's a boiler explosion at the Stilfontein mine took six lives and a boiler explosion at a factory in Potgietersrus resulted in four fatalities. In both these disasters the boilers were fired without safety valves in commission.

Accident prevention in relation to boilers is therefore, well provided for in the Act. The main weakness in the system is likely to lie with the end user who may not treat the apparatus with the respect which is its due.

8.3.2 Pressure Vessels

These vessels, like boilers, must be strictly manufactured and the user must have in his possession a certificate of manufacture signed by an approved inspection authority and which certifies the codes of construction. The main difference as far as legislation is concerned is that the vessel may be used without being registered by an inspector. The onus is fully on the user to maintain the vessel in a safe condition and ensure that it is inspected periodically by a competent person.

Although the principle for accident prevention is embodied in the Act, the effectiveness and therefore the significance of this factor depends upon the end user and his motivation for complying with the regulations.

The question may be asked 'why should the user comply with these regulations?' If he understands the dangers of compressed vapours and gases, he will realise the value of the safety rules and will comply with them. He will be aware that if the vessel is weakened by corrosion it is likely to explode with catastrophic results.

If the person does not understand the dangers of compressed gases in containers, he may accept his ignorance and comply with the regulations, or he may foolishly ignore the safety rules and be prepared to accept the consequences, perhaps hoping that they will not be serious. There are cases on record of 200 litre oil drums being used as a reservoir for compressed air until excess pressure caused the drums to explode.

The best remedy for such ignorance is education: by relating actual occurrences and explaining in simple terms that a vessel containing any compressible fluid is storing energy which may be violently released, a user can be persuaded that it is in his own interest and in the interest of his workers to comply with the letter of the law with regard to these vessels.

8.4 PROTECTIVE EQUIPMENT

Industry spends large sums of money on protective clothing and safety equipment such as overalls, gloves, eye protection, safety shoes, safety

helmets, ear muffs and ear plugs, dust masks, gas masks, fire fighting equipment, etc. These are required to be supplied free of charge to the worker. The equipment is not a raw material for production, and management may, therefore, query its necessity. On the one hand the law requires protective equipment but on the other hand the worker may refuse or be disinclined to use it. Some building workers stubbornly refuse to wear safety helmets on the grounds that they cause headaches.

> The author investigated an accident some years ago in which an elderly plumber was struck on the head by a load of bricks which was being delivered to him in a metal crate by crane on a building site, when the bottom of the crate separated from the crate. The bottom was either not properly secured or the crate had struck a column which the unsighted crane driver was unable to see. The plumber had consistently refused to wear the safety helmet provided for him by the general foreman preferring the soft type of hat he had been wearing all his life, without mishap. He died of head injuries.

The management is burdened with the task of persuading the worker to use the equipment provided. It is a management problem and its successful implementation depends upon two aspects:

(i) the value for accident prevention which management attaches to its use;
(ii) the style of management under which the work is proceeding.

If management is convinced that the equipment is necessary and assists or does not interfere with productivity, it is likely to find a way to get the equipment used. If not, the onus will be on the worker to use it. Many workers are sensible enough to use the equipment as they realise that it is for their own protection.

A co-operative style of management will again place the onus on the worker. Some form of motivation may have to be provided for the worker, such as a safety bonus or safety competition. What makes a person remember to put on safety goggles when he goes to the grindstone? An authoritative style may bring the management into conflict with the worker and result in a good worker leaving the firm.

A law enforcement officer may remind the worker that he has a duty to the State to comply with the law. But is the State likely to proceed against him when it is only his own welfare which he is endangering? This is very unlikely. If, however, he endangers another worker, he may be charged for the contravention of a regulation under the Act.

8.5 TRAINING

A survey conducted in 1979 amongst 60 firms in the Western Cape showed that the firms which applied formal induction training to new workers had a low median average accident frequency rate, while those who did not apply formal induction training had a high median average accident rate. (See Appendix 3 and 3A and 3B) Gardiner[10] states: "We cannot allow new employees to learn safety by experience. Experiences that will teach them may also maim or kill them". This point is tragically illustrated by the following incident:

> A teenage labourer on night shift was called by an operator of a machine used to press styrofoam sheet to correct thickness to assist him to feed two start ends of the material into the machine. The machine had to be kept running on very slow speed. The operator would feed one end in while the labourer would feed the twin end in, the operator at the rear outfeed end of the machine and the labourer at the in-feed front. Although the labourer had assisted on previous occasions on a similar machine he had not worked on that machine before and was not familiar with the operation of the safety trip bar or the foot pedal stop. In the tricky process of feeding his end in, his hand was caught in the nip of the roller. The operator immediately stopped the machine and released the hand by opening the rolls, but the hand had later to be amputated. Had the injured person been more familiar with the safety devices, the injury would have been minimised.

Training of workers who are placed on a different job than that which they normally do is also required because every practical job has its particular features and quirks. If workers are left to their own devices, they may develope habits which pre-dispose to an accident, setting the scene, as it

were, for a future accident. This is not to suggest that people should not be allowed to use their own initiative. In an environment which is under safety control, there is certainly room for original ideas and experimentation and workers may be so well trained and experienced that they have a high standard of awareness of safety needs.

In addition to formal training in a lecture room, good use should be made of the supervisor in immediate charge of the workers. These persons are close to the job where the accident is likely to occur. They are the front line of defence in the accident prevention programme. They can inspect, instruct and correct, and should, therefore, be able to control unsafe acts. Gardener[10] has much to say on this point:

> "The acts of human beings are caused. This statement applies to all kinds of acts, including the unsafe acts of employees. Causation does not imply reason and logic; these may be entirely or largely missing in an unsafe act, which can be, as it is so often described, a 'stupid' act. By 'causation' we simply mean that the act has an underlying source in the employee's needs, concerns and perceptions. With an understanding of such factors, supervisors are in a better position to understand the act and, if it is unsafe, to correct or control it. Without such understanding, they are forced to rely on disciplinary action or admonishments in their efforts to 'make people more careful'".

A supervisor with such insight of underlying causes of unsafe acts is a valuable ally for management and is in effect continually training the workers.

Fourie[11] has another valuable comment to add to the importance of the supervisor. In discussing the need for candidates to be selected before they are sent to be trained in a specific skill or career, he says:

> "Although there has been a tremendous development in the field of psychological assessment, a report from the supervisor or foreman, should also be considered as part of the relevant information regarding the candidate".

On the subject of safety training, a report in "Safety Management"[11]

January 1981 relates the findings by Dr. McKenna of the United Kingdom, which among other things found evidence that first aid trainees at a factory, actually adopted safer behaviour as a result of the first aid training and there was a statistically significant decrease in the injury accident rate of the trained group. This suggests a very practical way in which workers can become more safety conscious at their place of work.

The Regulations framed under the Act require the user of machinery to "cause every inexperienced person who is required or permitted to operate a machine which may cause injury, to be fully conversant with the dangers attached to the operation thereof and the precautionary measures to be taken and to be observed." This implies that no training need be given if the machine is not likely to cause injury. There is much room for improvement at this point in the regulations. The training of workers and not just inexperienced ones, is in the author's opinion as the result of sixteen years of work in accident investigation, the major element in the prevention of accidents in industry. Statistics of the Division of Occupational Safety over ten years show that the personal cause of accidents investigated by the division's inspectors and covering the whole of the Republic was to a greater extent that of the injured person than the management. On average over the ten years the fault of the injured person was 2,4 times that of management. (See Appendix 4)

As far as the Act is concerned, the training of workers is not a significant factor embodied in the Act. A clear directive has not been given to the employer on the type of training required by the State and no incentives have been provided apart from the rebates obtainable from the Workmen's Compensation Commissioner. (See Appendix 5)

8.6 RESPONSIBLE PERSONS AND COMPETENT PERSONS

As distinct from persons being trained to avoid accidents, the regulations place great emphasis on machinery and building work being supervised by competent persons who are experienced in the operation and maintenance of machinery or in building or excavation work. This means in effect that the onus is on management to ensure that the work is carried out efficiently and safely.

This aspect is indeed a very significant factor in the Act and will contribute greatly to the prevention of accidents for the following reasons:

A legally appointed responsible person is likely to take his responsibility seriously because he knows he might have to give an account of his actions before a magistrate;
Persons experienced with machinery or building work (which may include diving work) will be aware of hazards and be able to warn of pending danger;
Certain dangers may be of a highly technical nature and only those who specialise in that field will know the dangers, e.g. only an elevator mechanic would know when a lift was becoming potentially dangerous and only a diver would know what to do when he ran out of air.

When an installation becomes so large and complex that the hazards are proportionately larger, the regulations require that a certificated engineer must be appointed in charge of the plant. The engineers certificate of competence is a unique certificate in that it requires the engineer to write an examination on the Factories Act, i.e. he must know thoroughly the Act and Regulations which he will be held legally responsible to abide by. If the certificated engineer has been guilty of gross negligence or misconduct or non-compliance with regulations, the Chief Inspector may suspend or cancel his certificate and thus rob the engineer of his livelihood, apart from the disgrace that must be endured. No engineer worth his salt would risk such an eventuality.

Smaller installations require competent persons to be appointed in charge, but they do not have to pass an examination in the Factories Act. Although they have to comply with the regulations, there is no way in which it can be proved that the incumbent knows the regulations other than by the absence of contraventions of the regulations and this would only be revealed by an accident or as a result of an official inspection.

8.7 MACHINERY AND BUILDING WORK INSPECTIONS

These inspections are carried out by inspectors of the Division of

Occupational Safety as a routine for the purpose of ascertaining if users and builders are complying with the regulations. The Republic is served by ten inspectorates with a total of about fifty inspectors. An average of about 5 000 machinery inspections are carried out annually at about 32 000 factories and about 1 200 inspections of building work. This means that on average a machinery inspection takes place once in six years. These figures refer to routine inspections and do not include visits to enquire into accidents, which average nearly 7 000 per annum and means that the factory sees the inspector on average once in three years. Whether or not more inspectors should be employed is a matter for debate. As the Act now stands it is the duty of the employer to comply with the regulations and the inspector's visit serves to remind him of that duty.

Is the provision for the appointment of inspectors in the Act a significant factor in the prevention of accidents? If it could be shown that there was a significant correlation between the number of inspections and the number of reportable accidents, some tangible evidence would be available. Unfortunately, no such correlation exists.

Another problem that exists is that about 200 000 accident claims are presented to the Workmen's Compensation Commissioner each year, but only about 20 000 accidents are reported to the Division of Occupational Safety, i.e. only 10% of accidents are reported to the division whose function is to prevent accidents!

8.8 ACCIDENT INVESTIGATION

This is a subject which has been well aired in the literature and has almost been developed into a fine art.[12] There can be no doubt that a thorough investigation into the cause of an accident is a pragmatic means of preventing a recurrence of a similar accident and is, therefore, an important contribution to accident prevention.

The Act makes provision not only for the reporting of accidents but also for them to be enquired into by an inspector. Section 32(1) states:

> "Whenever in or about a factory, or in connection with the activities of a factory, or in connection with machinery or building or excavation work:-

(a) any person is killed or injured as a result of an accident; or

(b) any other occurrence takes place which in the opinion of the inspector might have led to any person being killed or injured; an inspector may, if he deems it expedient, hold an enquiry into such accident or occurrence."

It is seen that the decision to hold an enquiry rests with the inspector. Not only serious accidents must be reported but also minor ones if they incapacitate a worker for more than three days. In practice, one third of accidents reported are enquired into.

The purpose of the enquiry is to establish the cause of the injury and the cause of the accident as well as to whether any contravention of the Act was a contributory cause of the accident and whether any persons can be held criminally responsible there for.

There is no requirement or directive in the Act for the employer to enquire into an accident. He merely has to complete a form giving a brief account of the accident and apart from the usual particulars to answer the question: "What condition caused the accident?", which often gets the answer: "Carelessness". The Act therefore provides no motivation for the employer to make a thorough investigation. This is an area where the Act can be improved. If the employer is forced by legislation to make a full investigation of all accidents causing lost-time and to submit a report to the department, the pressure on the inspectors will be relieved to encourage them to do more routine inspections which could lead to accident prevention. An additional pay-back will accrue to the employer in that he will obtain a better understanding of the causes of accidents and therefore be in a better position to deal with those causes.

8.9 SUMMARY

The significant factors for accident prevention embodied in the Act are discussed and their merits and demerits are weighed. The lack of direction for the training of persons who operate machines is criticised, as well as the absence of provision for the employer to investigate accidents.

PART II: FACTORS FOR ACCIDENT PREVENTION EMBODIED IN THE ACT AND THEIR EFFECTIVENESS

CHAPTER NINE: TESTING THE EFFECT OF THE ACT ON LOCAL INDUSTRY

9.1 QUESTIONAIRE

A questionaire was drawn up by the author (see Appendix 6). A covering letter addressed to the managing directors of 163 firms was sent out with the questionaire. The nearest practical approach to a random choice available to the author with the facilities at his disposal was to use the 1979-1980 directory of the Cape Chamber of Industries. Of the approximately 1 000 members arranged in alphabetical order every fifth firm was selected, except for the few which were obviously not manufacturing companies. The first 163 were so selected.

Three envelopes were returned address unknown and one firm advised that it was a wholesaler. Of the remaining 159, 86 completed questionaires were received making a 54,1% return. These 86 firms are therefore under discussion.

9.2 ANALYSIS OF RETURNS

The Yes/No questions produced the following percentages of 'Yes' answers:

Question 1	: Does your firm possess a Factories Act?	100%
2	: Have you appointed a Responsible Person in writing?	81,4%
3	: Does your firm report accidents under the Act?	73,4
4	: Do you send disabling accident figures to Nosa?	30,2
8	: Are you aware of statutory inspections on P.V.'s?	84,9
Question 5	: Your latest Accident Frequency Rate?	43,0
6	: Last official visit by Inspector of Machinery?	69,8
7	: To what extent does your machine guarding comply?	

very little	1,2%
little	4,7
average	18,8
much	43,5
very much	28,2

Question 9 : How many employees exposed to risk? Correctly answered 74,4% In these firms a total of 10 750 persons were exposed to risk of accident with an average of 168,0 persons per firm and a standard deviation of 295,3 about the mean. The number of such persons varied from 3 to 1 500 per firm.

Question 10 : How long has your firm been in operation? 96,5% of the firms furnished figures totalling 1 980 years with an average of 23,9 years per firm and standard deviation of 15,5 years. The years varied from one to seventy.

The two opinion questions produced the following results:

	Question 11 : Value of Responsible Person	Quest.12 : Value of Act
very little	4,7%	9,3%
little	3,5	14,0
average	32,6	39,5
much	22,1	19,8
very much	17,4	15,1
no response	19,8	2,3

Question 13 : Rank of person completing questionaire?

Managing Director	41,9%
Manager	34,9
Secretary	12,8
Responsible Person	8,1
Other	2,3

9.3 COMMENT

Of the persons who answered the questionaire 76% were in top management. The questionaire was addressed to the managing director and obviously found its way to him. The result reflects a genuine interest in safety right at the top of the management structure.

The method of selection was random in nature and there was no means of identifying the firms who submitted returns. The 54,1% return is a strong indication of the desire to co-operate in promoting safety in industry.

The firms selected fell mostly in the Western Cape which is a dense industrial area. The 168 workers per factory is about three times the average for the more than 5 000 factories in the Cape Western inspectorate. The opinions of managements representing more than 10 000 workers may be considered a significant contribution to this thesis.

Management's response to Questions 1,2,3,6 and 8 reveals a more than 70% awareness of the requirements of the Factories Act. This is a very encouraging result and may be partly due to the official visits conducted by Inspectors of Machinery and of these, all but five had been visited within the last two years, as at the end of June 1981.

The 30% contact with Nosa is a disappointing result and it is, therefore, not surprising that only 43% of the firms had some idea of their accident rate. Nosa encourages firms to supply monthly figures of man-hours and lost-time injuries and in turn Nosa furnishes the Accident Frequency Rates.

Question 7 on guarding of machinery produced a very positive result. A mere 5,9% admitted that their guarding did not comply with the regulations.

The important questions on the value of the Responsible Person and the Factories Act in accident prevention scored well on the positive side. Combining "much" and "very much" to obtain the positive response, Responsible Person scored 39,5% and Factories Act scored 34,9%. Although this is encouraging, it indicates considerable room for improvement, especially in the light of the 14% of firms which considered that the Factories Act contributed "little" to the prevention of accidents.

9.4 SUMMARY

The 54% response to the questionaire indicates an attitude of co-operation with the Inspectorate which is very encouraging. The answers show only a mild effect of the Act upon industry and more work will have to be done by the Inspectorate to achieve a stronger impact for accident prevention.

In Part II, a number of factors embodied in the Act and their effectiveness are considered in relation to accident prevention, and in Part III, their implementation in the field of accident prevention is discussed in depth. As the result of the conclusions drawn, certain recommendations are made with a view to remedying the apparent defects revealed.

PART III: CONCLUSIONS AND RECOMMENDATIONS

CHAPTER TEN

CONCLUSIONS

10.1 THE ACT AS A STANDARD

The Act with its enabling clauses and detailed regulations may be seen as a set of standards drawn up by the State against which industry can measure its performance. It is clear from the previous chapters that standards have been set for well lighted, well ventilated and comfortable surroundings in a factory; standards have been set for soundly constructed and well designed machines with adequate guarding of moving parts; standards have been set for persons to be protected from falling off buildings under construction and to be protected from the collapse of the excavations.

The standards set in the Act to achieve safe and healthy surroundings and safe machinery are not unreasonable and follow the normal engineering practice of sound construction and suitability for purpose. A poorly constructed or badly welded air receiver may not last long in service due to corrosion or deformation causing failure requiring repair or replacement, with the added risk that the failure may be catastrophic and cause damage to surrounding structures or injury to persons.

10.2 LEGAL DUTIES IMPOSED BY THE STATE TO IMPLEMENT THE STANDARDS

The Act endeavours to force compliance with the standards by placing legal obligations on various classes of employer.

It may have been a simple matter fifty years ago to pin-point the person at the head of the organisation and call him to account through the due

processes of the law. Today the picture is different. Companies are so intertwined that it is wellnigh impossible to establish who is the head of the organisation who should give account to the State for contraventions of the Act. In a public company it is the corporate company of shareholders who own the company and the executives are merely managing the affairs of the shareholders. Consider, e.g. the definition of "user".

> "User" in relation to machinery, means the owner of or a person benefiting from the use of such machinery... ....., and includes the person charged with the supervision of such machinery, structure or plant."

In a large company, who owns the machinery? And if the machinery is not guarded in accordance with the regulations, who has committed the offence, and who should be charged? -
The managing director, or the secretary, or the departmental manager in whose department the offence occurred, or perhaps the chairman of the board of directors? Would this be the board of the subsidiary company or the parent company, or would it be the holding company?

The only persons actually named are the occupier whose name appears on the factory registration certificate and the responsible person appointed in writing. These persons are usually employees.

A further complication can arise when machinery is hired out, e.g.

> A crane hire firm hired out a mobile crane and operator to a management service company which was installing machinery in a new factory. While lifting a crate of machinery from a trailer outside the factory under the supervision of the service company, with the load well within the capacity of the crane, the jib collapsed, dropping the load, damaging the roof of the factory and injuring the operator as he tried to jump clear. The turntable of the jib was found to have 16 of its 30 bolts missing and thus could not hold the load.

In terms of the definition in the Act, the user includes three entities:

> the hiring firm who owned the crane,
> the servicing company who benefited (?) from the use of it,
> and the responsible person appointed to supervise the work.

The wording of the definition is very ambiguous. It is an over-simplification to make the person at the top of the hierarchy responsible for the implementation of the Factories Act. He may be persuaded to issue a statement of policy on safety, but could he be expected to implement it personally amongst his other duties? If not, a person who is directly concerned with the implementation of the requirements of the Act should be appointed in writing to supervise the application of the Act. Does this mean that this person may be charged for every infringement of the Act? Not if the regulations are properly worded to state clearly who must comply with it.

If the wording of a regulation stated: "The appointed safety officer shall ensure that a chain and sprocket within normal reach shall be effectively guarded", then the safety officer will be implicated. But if the statement was: "No person shall operate a machine without a guard over its rotating parts within normal reach", then some other person may be implicated. If the regulation states: "No person shall be permitted to operate a machine without an effective guard over its rotating parts", then the supervisor may be implicated.

The Act as it stands at present has weaknesses because of the vagueness of the terms: employer, user, builder and excavator. "Occupier" has definite meaning because the person who has control over the business is named on the factory registration certificate. In the case of the registration of an elevator or boiler, the company is named and so the difficulty of knowing who to deal with arises.

A better way of convincing management that a programme of safety is desirable, is to remind them that safety is a management function in the same way as the management of the business of the company is a management function. The business cannot be operated on unplanned events, i.e. on accidental occurrences, so neither should accidents be allowed to happen. The prevention of accidents should, therefore, be approached in the same way that the running of a business should be approached, by planning, leading, organising and controlling. The requirements of the Factories Act may then be seen as a guide to the manager to direct his attention to the areas of special need and where the applied effort will bring the best result. Used in this way, the Act can make a significant contribution to accident prevention.

10.3 INSPECTORS APPOINTED TO ENFORCE THE STANDARD

The Minister appoints inspectors to enforce the legislation. Since 1931 inspectors of machinery have been required to be qualified as Certificated Engineers and this is still the requirement today.

The Factories Amendment Act of 1931 also provided for regulations governing the installation and use of machinery and under these regulations, factories which generated their own power of more than 187 kW were to have Certificated Engineers appointed in charge of the machinery. Although these sources of power may seem small today, fifty years ago the machinery was massive and unwieldy and operating and maintaining them required engineering skill of a very practical nature.

The inspectors who were also engineers were, therefore, well aware of the dangers of the machinery and were able to carry out a thorough investigation into an accident involving machinery. This is still the case today.

A very significant way in which the Act contributes to accident prevention is the provision for accident investigations by inspectors. When a serious accident occurs at a factory or on a building site, an inspector will set up an accident enquiry. It may take on a formal character with sworn statements by the persons involved, or be of an informal nature whereby information is gathered and the circumstances discussed with the management. Whatever the form, the thoroughness of the investigation should reveal the true cause of the accident. Once the true cause has been established, the correct remedies for the prevention of a recurrence of a similar accident can be applied.

In addition to accident investigations, routine inspections are required to be carried out by inspectors to ensure that the machinery complies with approved codes of construction and is effectively guarded in accordance with the regulations. Logbooks as specified by the regulations are required to be examined to ensure that the user is engaging competent persons to perform periodic inspections and tests on pressure vessels, elevators, lifting machines, etc, and all the methods of directing attention to the maintenance of the standards (in the Act) are obviously valuable.

10.4 WHAT FACTORS EMBODIED IN THE ACT ARE EFFECTIVE IN ACCIDENT PREVENTION?

The Factories Act has been in force since 1918 for 63 years. The original Act provided mainly for the health and welfare of the workers as industry returned to the manufacture of goods for peaceful living after the hectic production needs of World War 1. Guarding of machinery became a legal requirement in 1921, but it was only in 1931 that a responsible engineer was required to be in charge of machinery at large factories. It was also since this time that inspectors were designated to supervise machinery and hold accident enquiries.

Consideration will now be given to the provisions of the 1941 Act, as amended, for accident prevention as detailed in Chapters 3 to 8 of this thesis. The effectiveness of the following provisions of the Act will be considered:

Legal registration and approvals
Guarding of machinery
Protective equipment
Responsible Persons and Competent Persons
Official Accident Investigation
Official Inspections

10.4.1 Legal Registration and Approvals

The registration requirement of the Act is in effect the issue of a licence to operate a factory or to use certain items of machinery, or to earn a living as a diver, or to practice as a factory engineer. If the regulations pertaining to that activity are not complied with, the licence can be revoked and further practice becomes illegal. The licence is an actual certificate which can be presented upon demand and you indisputably have it or you do not have it.

Approvals fall into the same category as registrations, but take the form of a letter of authority as in the case of inspection authorities and diving schools. Codes of construction are merely listed within the Government Department, but refer to published matter. These approvals can be withdrawn and the continued operation under them then becomes an offence.

This form of licensing has great value in motivating people to comply with the necessary requirements to retain the validity of the licence. The intention to comply may not be very enthusiastic, but minimal compliance can at least be expected.

Some ignorant or careless agencies import air compressors with their associated air receivers (which are pressure vessels) from the Far East to sell at competitive prices. In many cases the quality of material and workmanship falls far below the standards of the approved codes. The user is then exposed to the risk that the machinery will fail in service with possible destructive results. The Act as it stands does not bind the seller, but places the onus on the purchaser who will use the equipment to ensure that it complies with the regulations. This is a defect in the Act which needs to be rectified.

The appointment of a Certificated Engineer with legally prescribed duties of a very wide nature has a very salutory effect upon the individual's motivation to maintain standards, as he is in danger of losing his registration as a Certificated Engineer if the Chief Inspector is satisfied that he "has been guilty of gross negligence or misconduct or non-compliance with any of these regulations which is binding on him." Although this regulation has been rarely, if ever, invoked, it nevertheless hangs as a threat, because nobody wants his professional standing to be brought into question.

Earlier this year a Certificated Engineer was charged in a Magistrate's Court in a Transvaal town for the contravention of Regulation C 18 for not providing handrails on both sides (not one side only) of bridges over sewage plant channels. The charge failed, however, because the charge sheet was defective in that only the engineer and not the owner of the plant was charged.

It is interesting to note that before the charge sheet was found defective, the defence had brought witnesses who stated that they considered that the bridges over the 1,5 metre sludge channels with their 1 metre high handrails on one side only was absolutely safe. Here was a case of minimal standards being adopted by the management and being accepted by the workers.

It is, therefore, evident that the registration and approval of equipment, working conditions and persons is a very significant factor which contributes greatly to accident prevention.

10.4.2 Guarding of Machinery

The guarding of machinery obviously leads to safer standards but adds cost to the manufactured article. The risk of accidents should be balanced against the cost of safety, but the Act does not make provision for this aspect.

The guarding and safe use of machinery is described in considerable detail in Chapter IV of the regulations which is divided into parts:

Part II General Safety Measures.
This section deals with the guarding of a wide variety of machinery such as transmission machinery, circular saws, band-saws, planing machines, moulding machines, sanding machines, grinding wheels, guillotines and presses, slitting machines, mixing machines, rolls, washing machines, etc.

Part III Generation, Transformation, Distribution and Use of Electrical Energy.
This section deals with all aspects of electrical equipment up to 400 000 volts. Statutory clearances are given for heights of power lines above roads and railways and over communication and other power lines. The enclosure of switchgear and transformers is described and the earthing of metal work associated with current-carrying conductors is prescribed.

Part IV Vessels Under Pressure.
The requirements of the fittings needed on pressure vessels are detailed, such as pressure gauges and safety valves.

Part V Boilers.
Here too great detail is given of the requirements of the fittings which will ensure the safe operation of boilers.

Part VI & VII Elevators and Escalators.
In even greater detail the safety interlocks on elevators and

escalators are described amongst other important requirements to safeguard the public.

Chapter V deals with building and excavation work and gives the safety requirements among other things for builders' hoists and excavations of more that 1,5 metres deep.

All these measures are prescribed to cover the vulnerable areas where persons may injure themselves when they come into close proximity to moving machinery, dangerously near to charged electrical conductors, near the edges of high buildings or under mounds or stacks which could collapse on them. That these provisions are significant factors for accident prevention goes without saying. The measures form a boundary line between the safe area and the unsafe, across which the unwary should not trespass. Provision is, however, made for competent persons to work in hazardous areas, as in the case of live electrical equipment. In this connection, the Electricity Supply Commission has trained special teams to replace insulators on overhead power lines of voltages up to 400 000 volts!

10.4.3 Protective Equipment.

Protective clothing and equipment will prevent or reduce the severity of an injury but should be intelligently applied. The employer is required to provide free of charge equipment to be worn by the worker who is exposed to "wet or dusty processes, to heat or to any poisonous, corrosive or other injurious substances which is liable to cause injury or disease to the person or which unduly damages clothing". Regulation B6(1)(a).

This provision is very laudable and would certainly prevent most accidents. There have, however, been cases where an unsuitable glove has actually drawn the fingers of a worker into the nip of the rollers of a machine and caused a bad injury.

If, however, a worker is attired in all the safety gear he may need, one wonders whether any work would be performed or how efficiently! Similarly, a fully guarded machine may not produce articles at the economic rate which would justify its use.

Sensibly provided and correctly used, protective clothing and equipment is likely to contribute significantly to the prevention of accidents or at least to a lessening of the degree of injury. A safety helmet used on a building site may save a man's life when a brick falls from up aloft, but may not protect him from a shoulder injury.

10.4.4 Responsible Persons and Competent Persons.

There are many cases on record where the cause of an accident can be traced to incompetence, e.g.

> The manager of a crane hire firm assisted the operator of the crane to dismantle the tower of a crane. After lowering the tower to the ground and in the process of separating the sections which made up the tower, a section collapsed on the operator fatally injuring him as he was knocking out the last pin. It was established that both men were inexperienced and should never have attempted the operation.

Thus regulations demanding the appointment of competent people are valuable in preventing accidents. Even competent persons have overlooked important details with unpleasant results, as the following case illustrates:

As the highly experienced technician working in a high voltage substation walked past an insulator mounted on a metal tower, he stumbled and the aluminium ladder he was carrying came sufficiently near the overhead high voltage jumper wire to cause a flashover to the ladder. The technician was badly burnt but his life was saved when the ladder touched the metal tower and caused the protection to switch out the power source.

The importance of the employer providing highly trained persons to operate and maintain his equipment, cannot be over emphasized. Making this a legal requirement for certain types of equipment is a significant factor for accident prevention embodied in the Act.

10.4.5 Official Accident Investigation.

This provision of the Act is a significant factor for accident prevention as it establishes legal accountability and pinpoints causes which can be removed or avoided for future prevention.

Sections 32 and 33 of the Act empower an inspector to enquire into an accident in which a person is killed or injured or into any occurrence which may have led to death or injury, if he deems it expedient. The Webster dictionary defines expedient as "useful for effecting a desired result" and this is the state of mind in which the inspector will approach a particular accident. He will consider what is to be gained by the enquiry.

If compliance with the regulations would have prevented the accident, then grounds for prosecution will be sought. If negligence on the part of persons whether employer or employee is apparent, then the matter should be enquired into. If the cause was lack of or ineffective training then this aspect should be investigated with a view to convincing management of the importance of this aspect.

If, however, the cause of an accident is obvious and there were no apparent contraventions of regulations or negligence on the part of persons (other than the deceased), then there would be no need to hold an enquiry. The inspector is empowered to make such a decision.

10.4.6 Official Inspections

Routine inspections by Government inspectors help to bring industry into line with the standards of the Act.

Factory Inspectors were appointed under the 1918 Act to enforce the health and welfare regulations. These inspections are still being conducted today to maintain a healthy environment in a factory.

Inspectors of Machinery were introduced under the 1931 Act to enforce the machinery regulations. The main activities of these inspectors were the inspection of boilers and elevators and the conducting of enquiries into accidents.

In recent years more attention has been paid by inspectors of machinery into routine machinery inspections and inspection of building construction sites with a view to bringing these areas of industrial activity into fuller compliance with the regulations in the hope that by so doing accidents will be prevented. This objective can and to a large extent

is being achieved in the measure that industry co-operates with the inspectors. The results of this new pattern cannot be quantified because of the lack of proper statistics either from the Workmen's Compensation Commissioner, the Division of Occupational Safety or the National Occupational Safety Association, which are the three bodies concerned with industrial safety. A statistical analysis needs to be done to enable conclusions to be drawn as to the effectiveness of the joint and separate efforts of managers, safety officers, Nosa and Government inspectors.

10.5 WHICH FACTORS EMBODIED IN THE ACT ARE INEFFECTIVE IN PREVENTING ACCIDENTS?

Having considered the positive factors, we now consider the negative aspects. These are:

(a) the cost of effective equipment
(b) insufficient provision for the training of persons
(c) low court fines

10.5.1 Cost of Protective Equipment

Some of the positive factors have drawbacks which detract from the full implementation thereof, e.g. protective clothing is provided at considerable expense to the employer and the equipment is either not used by the employee or it is abused or it is sold for personal gain. One finds earmuffs allocated to each worker in a noise zone hanging neatly in its place on the wall because the worker complains of discomfort when he wears it. Now that ear plugs are also approved workers have been more willing to use these.

The wearing of safety boots where there is danger of heavy objects falling on feet creates another problem. The boots are not cheap and will be worn to and from work because of the inconvenience of removing them when going home. A worker may be tempted to sell them if he is short of money. He then wears his normal shoes at work and is in danger of foot injury.

It often happens that the employer will supply the boots at cost to the employee who then makes his own decision about when he will wear them.

If he is a labourer it might be his best "stepping-out" pair! The employer then has the disciplinary problem of coercing the worker to wear them at work.

Protective equipment supplied at the employer's expense is often not treated with the respect it deserves. The top guard of a circular saw or the adjustable guard over the knives of a surface planer is removed and thrown into a cupboard and when an inspector enquires after it, it is found after a search, with parts missing.

10.5.2 Training of Persons.

The training of persons who are required to operate machines is very inadequately provided for in the regulations. Regulation C 7(1)(c) requires the nebulous "user" to "cause every inexperienced person who is required or permitted to operate a machine which may cause injury, to be fully conversant with the dangers attached to the operation thereof and the precautionary measures to be taken and to be observed".

Does this mean that the owner of the machine must instruct the new operator in the finer points of the machine which he might have purchased at an overseas industrial fair after witnessing a demonstration of what the machine could produce? Not even the production supervisor under whose control the operator falls, is likely to be "fully conversant with the dangers attached to the operation" of the machine. The maintenance foreman or fitter will certainly know where the dangers of the machine lie, or an experienced safety officer.

Inexperienced persons should not be permitted to operate a machine, but should be trained under controlled conditions and tested before he is placed on his own at a machine. The regulation should specify the qualification of the person doing the training. Records should be kept of the training received by the new worker for official scrutiny.

A legal obligation is placed upon the employee on a premises where machinery is used, to obey instructions which are issued by or on behalf of the user and which are in accordance with objectives of the regulations. As it stands, this requirement leaves no room for negotiation. The person who is at the greatest risk has little or no say in the

measures which should be adopted for his own safety. Very often the operator is the very person who can suggest a safer way of performing the operation or of safeguarding a machine.

10.5.3 Court Penalties.

A very poor factor for accident prevention is the penalty for non-compliance with safety regulations, viz, R200 or one year or both fine and imprisonment. The regulations under the 1931 Act carried a penalty of £100 or one year with or without hard labour. This means that the penalty for a breach of the regulations has remained R200 for fifty years! This is today the fine for a traffic offence for speeding.

Recently a demolition company in Natal which attempted to demolish an 11 000 volt substation while it was still energised, thus endangering the safety of their workers was found guilty on two contraventions of the regulations and fined R100 on each count!

Unless penalties are realistic they will not achieve the desired effect which is to punish the guilty and deter others who might have a mind to offend. Provision should also be made to link the fines to the cost of living index so that they will remain realistic automatically without having to be amended from time to time. The option of a gaol sentence should also not be applicable to a company whose owner or whose shareholders would be highly inconvenienced if they were gaoled for the offence of a manager!

If accidents are to be prevented then the penalties should reflect the seriousness of an offence for not providing safety appliances or interfering with safety appliances and the greater seriousness of causing bodily injury to workers.

10.6 HOW IS THE FACTORIES ACT RECEIVED BY THE INDUSTRIALIST?

The direct question in the questionaire: "To what extent do the Factories Act regulations contribute to accident prevention in your factory?" received a valuable outcome.

Of the 34 Managing Directors who answered it, 35% replied 'much' or 'very much' while only 18% answered 'very little' or 'little' and 47% answered 'average'. This is a very interesting result showing that twice as many M.D.'s thought the Act made a positive contribution to accident prevention as those who had a negative opinion,

- but -

of the 31 managers who answered the same question, 12% answered 'much' and 'very much', while 35% answered 'very little' or 'little' with 26% stating 'average', i.e. as many were in favour as those who were against.

It might be that managers were more pragmatic than M.D.'s as they were more directly in contact with the daily happenings in the firm. Perhaps the M.D.'s view was tempered with hope that the Act was actually contributing to accident prevention. Whatever the reasons for these opinions, the fact remains that the man at the head of affairs whose opinion creates the policy of the firm had a positive view on the value of the Act in preventing accidents.

One M.D. who answered 'much', added a note reflecting the normal behavioural reaction: "We only do what the Act forces us to do". Here is an industrialist who reluctantly complies with the Act, yet he believes that his compliance is helping to prevent accidents. He is tacitly admitting that the Act is a good thing but he needs to be coerced to apply it. How much better it would be if he could be convinced that it was worth while taking preventative measures without the threat of legal penalties. What motivation is required to prompt management to adopt the significant factors for accident prevention embodied in the Act?

A motivation which is likely to appeal to a manager is the rebate which the Workmen's Compensation Commissioner will pay to a firm whose accident claims have reduced over a three year cycle. (See Appendix 5). In addition to the cash rebate, the firm may also be assessed at a lower rate than the general rate for their particular industrial class. These benefits prove that safety literally pays.

Another type of motivation worth considering is the concept of total loss control, whereby the cost of any loss or damage to property or persons is assessed in money terms. Consideration is then given to what manufacturing effort is required to make the profit which would cover this loss.

The exercise may produce such staggering figures that management makes a special effort to control all forms of loss including accident.

Nosa applies the above methods with good results. In addition their star grading and M.B.O. system is well received by industry.

A small business may find genuine difficulty in complying with the requirements of the regulations because of the costs involved in relation to the turnover and profits which the business can make. The minimum requirements to start a factory apply to a firm with three persons up to less than ten persons when a rest room would be required. A firm with three persons could have the same overheads as a firm with nine persons which might have a turnover three times as large and, therefore, more able to afford the basic requirements of the regulations. A small firm may be prepared to risk prosecution by ignoring the requirements of the regulations.

After sixteen years of applying the Act to industry, the author is of the opinion that on average, management does not know the content of the Act nor is inquisitive enough to find it out. To say that management was indifferent to the Act would be unjustified because the matters dealt with in the Act are an integral part of the activities of industry and many requirements are being implemented without management being aware that they are legal requirements. However, if the positive aspects of the Act were better known to management and implemented, then it could be reasonably expected that there should be a steady reduction in industrial accidents. Information should be disseminated by the Department of Manpower as suggested in paragraph 10.8.2.3.

10.7 IS THE ACT EFFECTIVE IN PREVENTING ACCIDENTS?

From the year 1975 to 1979 the accidents reported to the Workmen's Compensation Commissioner have dropped by an average of 5,2% per annum. (See Appendix 7). This is for all carriers of compensation. The corresponding figure for the Accident Fund only is 4,9% per annum. The Accident Fund reflects the manufacturing sector to which the Factories Act is applicable.

This achievement may be considered the combined efforts of management, the National Occupational Safety Association (Nosa) and the Division of Occupational Safety. Any apportioning of proportional contribution would be purely speculative with the present paucity of statistical data.

A large part of the activities of the Occupational Safety Inspectors of Machinery is to conduct inspections of machinery in factories and building work in progress. The graph (Appendix 8) shows the increasing rate of these inspections carried out nationally between 1966 and 1980 and reflects an overall increase of 75%.

The graph further shows the accidents reported by industry to the Department of Manpower (as distinct from Workmen's Compensation). There was a steady increase from 1969 to 1975 amounting to 72%, followed by a sharp reduction in the number reported from 1975 to 1978 of 28%, again followed by an increase in reporting to 1980 of 11%. A correlation calculation showed no correlation between inspections and reportable accidents.

During routine inspections the management is reminded of their duty to report accidents of more than three days and this may account for the sharp increase in accident reporting during the first period. The fall off in the number of reportable accidents during the second period may have been due to an actual reduction in the number of accidents, perhaps related to a reduction in industrial activity or perhaps to better management of an accident prevention programme. The real causes will be difficult to establish.

Nosa is undoubtedly contributing to safety and accident prevention by conducting inspections, surveys, courses and interviews. On a national scale over three years approximate average annual figures are:

Inspections	...	3 000	
Surveys	...	4 200	
Courses	...	800	(Appendix 7)

In 1979 the number of workmen involved in Nosa safety training programmes amounted to 1,4 million. During the same year a new scheme whereby the employer carries out training of employees produced 980 trained persons.

In spite of the favourable trend of accidents reported to the Worknen's Compensation Commissioner, the Wiehahn Commission found that the Factories Act was not being effectively enforced. Part IV paragraph 3.11.8 of the Commission's Report states:

"The regulations relating to safety and health cannot be effectively enforced by the Department of Manpower Utilisation unless the numbers of inspectors are increased and the aid of the Department of Health, Welfare and Pensions and the many local authorities is enlisted, under the control of the Department of Manpower Utilisation, to assist in this task."

As a result of the Commission's findings the Government has decided[13] to repeal the Factories Act and replace it with the Machinery and Occupational Safety Bill for introduction to Parliament during 1982.

In the new Draft Bill discussed in paragraph 11.3, most of the relevant sections of the existing Act have been retained, e.g. reporting of accidents and holding of enquiries, duties of employers towards their employees, duties of employees to work safely, appointment and powers of inspectors, approval of inspection authorities, acts or omissions of managers, agents and employers. These factors are thus considered by the authorities to be of value towards the objective of occupational safety.

The statistics and evidence available to establish the effectiveness of the Act in preventing accidents is inconclusive, but this does not mean that the Act is not playing an important part in making industry a safer place to work in.

10.8 HOW CAN THE ACT BE IMPROVED TO MAKE IT MORE EFFECTIVE?

Is it the Act which needs improvement or the implementation thereof? It has been shown that there are factors embodied in the Act which contribute to accident prevention and some which do not. Would it be sufficient to improve the factors which do not contribute to accident prevention?

Assuming the Act was brought to perfection would it still be effective in preventing accidents? Seen as a standard for safe performance it would

merely act as a signpost pointing the way but unable to accompany the traveller.

What is needed are agencies which will involve the Act in industrial activities until maximum benefit is derived.

Firstly then, improving the Act will be considered and secondly improving and increasing the agencies which implement the Act.

10.8.1 Improving the Act

The negative aspects have been considered in paragraph 10.5; we now consider how they can be modified for gain.

10.8.1.1 Protective Clothing

Instead of the regulations requiring all firms irrespective of their size of personnel to provide protective clothing, provision should be made for the regulations to be applied differentially to companies at the discretion of the inspector in consultation with the management.

10.8.1.2 Training

The Act should place greater emphasis on trained persons to operate machinery which can cause injury such as woodworking machinery, lathes, presses, guillotines, mixers, lifting machinery, boilers, etc.

This training can be done prior to entering the industry or in service. However it is done, the inspector should be empowered by the Act to prohibit untrained or unqualified persons from operating machines or carrying out work which requires special competence (such as electrical wiring). These powers may even take the form of the inspector being empowered to enforce the agreements of the various Industrial Councils.

10.8.1.3 Contraventions and Penalties

Penalties should be realistic in that they reflect the seriousness of the offence, in addition to being modified by the changing value of money. Goal sentences should be dispensed with, as the courts are not likely to

commit the guilty party to gaol for a statutory offence. Offences in connection with administrative regulations should have smaller penalties than offences in connection with safety regulations.

The inspector should have direct access to the courts for early prosecution while witnesses are still available and while the impact of the court proceedings can speedily change the attitude of a tardy management towards the implementation of safety. Provision should be made in the Act for this access to the courts.

10.8.1.4 Participation of the Worker in the Safety Programme

The Act should make provision for the appointment of persons to represent the workers on a safety committee. These persons should have the legal right to appeal to an inspector to arbitrate in the event of a dispute regarding the application of safety regulations.

10.8.2. Improving the Implementation of the Act

10.8.2.1 The Inspectorate

The inspector should play a twofold role: that of advisor as well as law enforcement officer. He should be seen as the person who interprets the provisions of the Act in its practical application to the individual company which will then be without excuse in complying.

To some extent this is being done by the inspectors of the Division of Occupational Safety, but they are seen more in their capacity as law enforcement officers than safety advisors.

There should also be one inspector to advise on both health and safety and not two as at present: a factory inspector and an inspector of machinery.

The qualifications (which should be at a professional level) and training of an inspector should therefore, be directed towards this double role.

10.8.2.2 National Occupational Safety Association (Nosa)

Nosa should become an arm of the Division of Occupational Safety. This

will remove the confusion which may and does arise in the minds of some company managers about the inspection of their premises by a Government inspector and on another occasion by a safety advisor from Nosa.

Nosa is funded by the Workmen's Compensation Commissioner and other accident insurance carriers, which makes it a quasi-Government body. It is only natural, therefore, that the two arms for safety should in practice be joined into the same body viz. the Division of Occupational Safety. In this way the two roles of the inspector could be more effectively carried out.

10.8.2.3 Literature

Official literature should be made available to industry explaining in simple terms the meaning, intention and application of the regulations. Non-compliance with the regulations is often due to ignorance of the requirements of the regulations. Who desires to wade through a mass of legal jargon? The company then relies on its own initiative to apply safety rules, with perhaps limited ideas and dubious expertise.

10.8.2.4 Company Safety Professional

As described in Chapter Six, section 6.4, the employer is required to appoint responsible persons in certain categories of his activities. Only when the person appointed is required to be a Certificated Engineer (who has to pass an examination on the content of the Factories Act) has he any knowledge of the Act. Otherwise the responsible person, whose legal duty is to apply the regulations, is not legally compelled to know the content of the regulations.

The system of responsible persons should, therefore, be deleted from the regulations and replaced by the requirement that a company with a defined exposure risk appoint in writing an accident prevention officer suitably qualified by examination which will include knowledge of the Act.

Smaller companies should be required to have access to such a safety professional on a periodic basis, say once a year, when he audits the company's safety programme and conducts a survey and reports to the Government.

10.9 MOTIVATION OF INDUSTRY

The Factories Act has been in force since 1918 for 63 years. As has been seen there are many factors for accident prevention embodied in the Act. It has not been possible in this short thesis to quantify the level of significance of these factors, but there can be no doubt that these factors have a qualifying effect on industry in that the employer is provided with ample material to qualify him as an exponent and practitioner of safety of a high quality. And one of the motivating factors which can help to spur the employer in the direction of safety is his duty to society as administered by the penal sanctions associated with the Act. Whether or not this is a motivation to be desired or whether other more honourable motivations should be sought and emphasised, is a matter for unending debate.

The factors for accident prevention as dealt with in previous chapters may be listed as follows:

Legal registration (of factories, elevators and escalators, transportation plant, boilers, divers and engineers)
Approvals (of codes of construction, inspection authorities and diving schools)
Specific regulations (for health, welfare, safety of machinery and building equipment and diving equipment)
Written appointments of competent persons (for machinery, building, excavation and demolition work, and diving operations)
Appointment of inspectors
Accident enquiries

These factors all have the force of law, but are they effective in reducing accidents? Are the more than 200 000 injury cases (including over 1 000 fatalities) reported to the Accident Fund annually being drastically reduced? Accident cases compensated by the State Accident Fund were reduced by 5,3% from 1974 to 1976, and the accidents reported to the Accident Fund were reduced by 14,1% from 1976 to 1979 (Appendix 7). But what is the trend? Some statistical work needs to be done on this aspect.

It is very likely that the activities of the National Occupational Safety Association is contributing substantially to reduction in accidents, because of their direct approach to top management. Perhaps the very fact that they are an advisory body to industry and not a law enforcement body is in their favour in persuading management to apply the rules of safety in the industrial establishment. What motivation does industry require?

No management welcomes accidents for the obvious reasons of interruption of production, replacement of staff, damage to equipment, etc. Management, therefore, has an inherent motivation to prevent accidents. The problem seems to lie in how to motivate the worker to avoid accidents.

Heinrich showed that 88% of accidents were caused by people and only 10% by things. To achieve a successful accident prevention programme, management must concentrate their effort on the worker to direct his energies into safe and useful activities.. Here lies the problem. Gardener[10] says: "There are no absolute answers in the matter of dealing with people, as all supervisors learn in quick order". Davis[14] goes further: "People insist on acting like human beings, rather than rational machines. We must accept them as the emotional beings they are and motivate them in their individual ways. We cannot easily change them to fit the motivational patterns we want them to have. Always we motivate people in terms of <u>their</u> needs, not ours".

Management should bear in mind Maslow's need hierarchy, which are, in order of priority:

1. Basic physiological needs
2. Safety and security
3. Belonging and social needs
4. Esteem and status
5. Self-actualization and fulfillment

Better results are likely to be obtained if the workers needs as listed here are recognised and allowed to influence the safety programme. Davis[14] emphasises one of the needs when he states: "Employees primarily are motivated by what they do for themselves. When they handle responsibility or gain recognition through their own behaviour, they are strongly motivated. If these conclusions are correct, then management's proper

role becomes one of providing a proper environment for employee accomplishment. The employee performs the work and management provides the supportive environment".

Davis believes that behaviour modification for organisational use is overrated. He believes that cognitive models dominate present thinking about motivation. He says[14]: "People are considered to have internal needs and managers motivate people by providing a work situation that satisfies their inner needs while at the same time achieving objectives of the organisation".

If managers are not willing to take the time and make the effort to satisfy the inner needs of their workers, then the firm must suffer the consequences of continued accidents. Tongue-lashing and disciplinary action on its own only produces short-term results. But even the above sympathetic approach may require additional firm action. Gardener[10] says: "As a last resort, in order to protect both the employee and fellow workers from the employee's wilfully dangerous acts, the use of disciplinary action is justified. But punitive action alone is not likely to bring about a long-range cure; it prohibits the symptoms but does not deal with the causes".

Gardener lists the causes of unsafe acts:-

"1. Lack of knowledge; inadequate skill
2. Employee needs may be at the bottom of unsafe acts
3. Employee might be preoccupied with other matters
4. Perceptual difficulties; just too much information to take in".

It is clear that the management must get alongside the employee if it is serious about preventing accidents. (See Appendix 12).

10.10 SUMMARY

The Act is seen as providing a set of standards to be attained by industry. The manner and effectiveness of implementation of these standards is discussed. Although there are statistical indications that accidents in the manufacturing sector are reducing, the contribution

of the Factories Act could not be assessed.

It is concluded that there are significant factors in the Act which can prevent accidents, but industry needs to be motivated to implement these factors.

Recommendations are made to improve the negative factors in the Act, and the need to involve employees in the accident prevention programme is emphasized.

In terms of the model formulated in Chapter One, it may be concluded that the problem of the effectiveness of the Act in preventing accidents has not been adequately solved and the present methods of implementation needs to be improved and more avenues of implementation need to be found.

A new Act could provide additional enabling clauses to improve the improve the implementation, but the desired objective can only be achieved when all the parties involved, work towards the same goal.

PART III: CONCLUSIONS AND RECOMMENDATIONS

CHAPTER ELEVEN: RECOMMENDATIONS

LEGISLATION ON INDUSTRIAL SAFETY

The need for legal sanctions to enforce industrial safety is reinforced by the fact that highly civilised and cultured nations like Britain and America have safety legislation.

The limitations of the present South African Act have been recognised and a new Draft Bill has been recently published.

11.1 UNITED KINGDOM: HEALTH AND SAFETY AT WORK etc. ACT 1974 (15)

"Work" is defined as work as an employee or self-employed person, but does not include domestic work.

Duties are imposed upon employers to provide for the safety and health of employees "so far as is reasonably practicable", and also for the safety and health of persons who might be affected by emissions from their premises. Articles manufactured, imported or supplied for use at work must likewise be safe and not endanger the health of persons at work. The onus of proof of what is reasonably practicable is placed upon the accused.

Employees are required to take "reasonable care"for their own health and that of their fellows. They are also to co-operate with the employer to promote health and safety. Provision is made for the appointment of safety representatives from amongst employees and the setting up of employees' safety committees.

Provision is made for accident investigation and law enforcement by inspectors who have designated powers. Inspectors (other than in Scotland) may prosecute offenders before a magistrate.

Codes of practice may be approved by the Health and Safety Commission and

will then be enforcable in criminal proceedings.

Provision is made for the Secretary of State to make regulations under the Act.

11.2 UNITED STATES OF AMERICA: OCCUPATIONAL SAFETY AND HEALTH ACT 1970 (16)

This Act places obligations upon employers to provide a safe and healthful environment for their employees. Provision is also made for employees to participate in safety. Previous acts of states said in effect that safety was the employer's prerogative. The above Act is a Federal Act covering all American States. OSHA also lays down standards which supersede other codes.

The Act affects 4,5 million businesses or 60 million workers.

The Act requires the employer to furnish a place of employment which is "free from recognised hazards that are causing or are likely to cause death or serious physical harm to his employees."

A field staff of 500 safety and health professionals enforces the Act.

Their priorities are:

1. Investigate multiple fatalities or catastrophies
2. Investigate employee complaints
3. Special emphasis programmes
4. Random inspections.

The Act requires the use of the "First instance sanction" i.e. the inspector issues a citation and, if appropriate, proposes a penalty at the time of the first visit as opposed to the practice of first making recommendations to correct the violation and only when not complied with, to penalise the employer. The OSHA Review Commission is a legal body which considers appeals by employers against these citations or proposed penalties and arranges a day in court before a judge in which the employer can represent himself. The Commission reviews the judges decision and decides the penalty.

A National Institute for Occupational Safety and Health was set up to do research in occupational safety and health and recommend criteria for standards to the Department of Labour. They publish annually a list of toxic materials. They are also responsible for the long term training of OSHA professionals and the short-term training of employers and employees as required under the Act.

11.3 MACHINERY AND OCCUPATIONAL SAFETY DRAFT BILL

This Draft Bill was published on 31 July 1981 in Government Gazette No. 7697 and comments were invited (See newspaper report Appendix 9).The Bill arose out of the findings of the Wiehahn Commission, which was signed in Pretoria on 10 May 1980. (17)

The Commission reported that at 31 December 1979 there were 32 126 registered factories and there were 1 627 075 persons employed in factories. During 1979 the following percentages of workers were involved in accidents. (Accidents in mines, explosive factories, railways and on public roads are not included.)

Up to one week	....	43,38%
1 - 2 weeks	....	28,09%
2 - 4 weeks	....	14,22%
4 -13 weeks	....	10,70%
13 weeks to 6 months	....	0,82%
Fatalaties	....	2,35%

1 229 establishments in which Certificated Engineers were required to be appointed had only 924 engineers appointed, i.e. 75%

Recommendations by the Commission:

1. Rename the Factories Act to: Occupational Health and Safety Act.
2. Shops and Offices Act 1964 should be consolidated with this new Act.
3. The Electrical Wiremen and Contractors Act 1939 be repealed and provision be made for the safety aspects of wiring and wiring work in regulations to be made under the Occupational Health and Safety Act.

As a result of the Commission's report the Government issued a White Paper[13] and made the following comments on the above recommendations:

1. The Government is in principle in favour of consolidating the Factories, Machinery and Building Work Act 1941 and the Shops and Offices Act 1969.
2. The Government accepts a directorate of occupational health and safety, which includes Nosa, within the Department of Manpower.
3. The Government accepts the rationalised reporting of accidents and statistics of the Workmen's Compensation Commissioner and Directorate of Occupational Health and Safety.
4. The Government cannot accept that farming activities or domestic service be included under the Occupational Health and Safety Act.
5. The Government feels that only persons charged with the overall supervision of wiring work and those who have to inspect, test and approve electrical installations should be registered. The Electrical Wiremen's Registration Board serves no purpose.

In a subsequent press statement issued from Pretoria on 8 December 1980 the Minister of Manpower, the Honourable S.P. Botha commented on the above White Paper on Parts 3 and 4 of the Commission of Inquiry into Labour Legislation as follows:

The Government has decided after reconsideration:

(a) There will be a separate Act on Industrial Health administered by the Department of Health, Welfare and Pensions;
(b) that the Directorate for Industrial Health be established in the Department of Health, Welfare and Pensions;
(c) the Department of Manpower remains responsible for Industrial hygiene and safety.

The new Bill is intended to "provide for the safe use of machinery; to provide for precautions against accidents to and disease of persons in connection with employment; to regulate the physical conditions under which persons are required or permitted to work and to provide for matters incidental thereto."

There will be only two classes of persons, viz. employer and user,

instead of the five classes in the Factories Act; "occupier, builder and excavator" have been omitted.

The definition of machinery has been widened to include any form of power or energy.

The definition of user has been modified to exclude the person who owns the machinery, to exclude the person who leases out the machinery and to exclude the person charged with the supervision of machinery.

The notification of accidents is hardly altered except that more than 14 day (instead of more than 3 day) accidents will be reportable.

Accident investigation and powers of inspectors are virtually the same.

The acts or omissions by managers, agents or employees section remains virtually the same with the addition that the "reasonable steps" are enumerated.

Penalties are drastically raised to R5 000 or five years or both, for a contravention of the Act. For a contravention of regulations, the penalty will be R2 000 or two years or both and a daily fine of R100 or 50 days or both up to a total of R5 000 or five years or both.

A second Draft Bill also published on 31 July 1981[18] is intended to "regulate the hours of work and conditions of employment of employees and to provide for matters incidental thereto."

Both the Factories, Machinery and Building Work Act, 1941 and the Shops and Offices Act, 1964 will be repealed when the new Bills become law.

11.3.1 Comment on the Draft Bill

From the report of the Wiehahn Commission, the Government White Paper and the Draft Bill, it is clear that health and safety at work is going to be the major activity of the Division of Occupational Safety. Both the inspector of machinery and the inspector of factories will be concentrating on enforcing the Act and Regulations which will require all employers of labour and users of machinery to ensure a healthy and safe environment for their workers.

In the new bill the harsh penalties may be out of proportion to the offences particularly if the offence is of an administrative and not a criminal nature. Paton[19] in his work on Jurisprudence says: "Many modern statutory offences are administrative in character and the object is not financial punishment but rather to police the rules by way of the stigma of conviction".

Firstly the penalty should be related to whether the offence was of an administrative or criminal nature and secondly the ability of the offender to meet the penalty must be considered. Paton notes that "there is, however, a welcome recognition of the need to individualise the penalty - not to let the punishment fit the crime, but the particular criminal". A heavy fine might put a small firm out of business and a light fine might have little punitive effect upon a large and profitable company.

There is one aspect which the new Occupational Safety Bill will need to spell out more definitely; that is the aspect of providing effective induction training for new workers and in-service safety training for the normal personnel. Heinrich has shown that 88% of accidents are caused by people themselves and only 10% by an unsafe environment.

Classification of personal causes of accidents by inspectors of machinery on a national basis shows that the injured person causes his own accident to an extent of about 2,4 times that of management causing the accident. (See Appendix 4)

More provision should, therefore, be made for safety training of persons to work safely at their places of work than to improve the environment. Certainly a hot, dusty and toxic atmosphere will affect the health of a worker quite apart from whether he acts safely or not. It might even contribute to a careless act. The employer will need to take the initiative in this aspect. But where the employer provides protective equipment, it is up to the employee to use that equipment, and if he does not he might impair his own health or safety.

In view of the importance of safety training, provision should be made in the Regulations for an outline course in safety awareness which could be adapted to various grades of persons in various spheres of activities. Records should be kept of each employee who should be progressively

graded on a scale of safety awareness. These records should be monitored by a qualified safety officer or engineer, who may be on the staff or engaged from an outside source on a consultative basis.

In addition, the safety officer should administer the safety programme, investigate accidents and recommend preventive measures. Copies of these programmes and reports should be submitted to the Division of Occupational Safety, perhaps on a monthly basis or as they occur.

In view of the value of past accidents in making people aware of the mistakes which should be avoided in the future, as many accidents as warrant it, should be investigated by a safety committee. As only more than 14 day accidents will be reportable to the Department of Manpower, the minor ones should be summarised in a monthly report to the Department so that inspectors may be able to assess whether or not the management is achieving an effective safety result. An official visit might be necessary to bring the firm back into line.

The new bill should also recognise that the risk of injury arises from the type of activity in which the worker is engaged. The fact that an injury has occurred does not necessarily mean that someone has been criminally negligent. Reasonable precautions may have been taken by employer and employee, but the accident still occurred. On this aspect Paton[19] says:"It (the law) does not demand the highest degree of care of which human nature is capable..... The law demands not that which is possible, but that which is reasonable in view of the magnitude of the risk".

It is very illuminating to quote Paton at length on the matter of risk, as the employer and the employee have to settle in their own minds what degree of risk is acceptable to them in the course of their activities and the State too must decide what level of risk is reasonable.

> "The law, therefore, allows every man to expose his fellows to a certain measure of risk and to do so even with full knowledge. If an explosion occurs in my powder mill, I am not necessarily liable to those injured inside the mill, even though I established and carried on the industry with full knowledge of its dangerous character. This is a degree of indifference to the safety of other men's lives and property

which the law deems permissible because not excessive..... It (the law) demands the amount of care which is reasonable in the circumstances of the particular case... 'Reasonable', in short, seems to refer not to the average standard, but to the standard that the jury or judge think ought to have been observed in the particular case. In determining the standard to be required there are two chief matters for consideration. The first is the magnitude of the risk to which other persons are exposed, while the second is the importance of the object to be attained by the dangerous form of activity. The reasonableness of any conduct will depend upon the proportion between these two elements. To expose others to danger for a disproportionate object is unreasonable, whereas an equal risk for a better cause may lawfully be run without negligence."

It is interesting to note that the Government is taking active steps to initiate and promote training of persons in various trades and allied work. (See Appendix 10)

The definition of "user" in the Draft Bill implicitly excludes the owner of machinery and explicitly excludes the lessor of machinery.

Such a definition could exonerate a firm which owns and hires out equipment from an accident which might occur as a result of the equipment being in an unsafe condition, e.g.

> A hiring firm hired out an electric drill which had a faulty cord, as a result of which the workman was electrocuted as he prepared to drill into a metal panel which constituted a good earth.

This gap in legal accountability should be closed by means of an appropriate regulation.

11.4 RECOMMENDATIONS.

The existing Act should be replaced by another, but all its significant factors for accident prevention should be retained. The new act could be called the Occupational Safety and Industrial Hygiene Act, bearing in mind that the Department of Health, Welfare and Pensions is concerned with the health of persons from a medical point of view and which

requires a medically trained official to administer.

Only injuries causing disablement of a worker for more than three weeks should need to be reported for investigation by the Division of Occupational Safety, but all disabling injuries should be recorded by the employer and an accident investigation report kept on the premises for perusal by an inspector. A monthly summary of all accidents should be furnished to the Department of Manpower.

The "user" of machinery and the "employer" should be named by the company and the name notified to the Department of Manpower. This will eliminate the problem which the State often faces of whom to charge.

The appointment of a Responsible Person as in the present Act should not be adopted.

It should be legally required that a professional safety engineer visit the premises where certain defined activities take place, say every six months and furnish a report to the Department of the state of safety of the premises and the progress of safety training of workers in relation to the work being carried out and the risks involved. These safety engineers must have an approved standard of training and experience which includes having passed an examination in the safety regulations. He may be in the employ of the particular firm or may be a consultant or attached to Nosa or similar body.

Instead of all the regulations being issued in one omnibus form, the various classes of machinery and health standards should be issued separately with explanatory notes. Suggested categories are:

Transmission Machinery
Power Presses
Guillotines, Rolls and Mixers
Lifting Machines
Electrical Distribution
Electrical Installations
Elevators, Escalators and Transportation Plant
Boilers and Pressure Vessels
Construction Work

Diving Work
Gas Producer Safety (See Appendix 11)
Health Standards
Accident Reporting and Investigation.

As the objectives of Nosa are the same as that of the Government officials, there should be closer co-operation between the two bodies, with interchangability of staff, i.e. Nosa officers should be empowered to issue requirements on employers as a result of their inspections and to be requested by the inspectorates to hold enquiries into accidents. It might be better to integrate these two bodies completely.

In the inspectorates themselves there should be no distinction between factory inspectors and machinery inspectors as this is very confusing to the public. There will certainly be different levels of inspectors with various specialities. Inspectors should progress in grades and will operate in their achieved levels of competence, which should be attained by in-service training and examinations.

Every inspectorate should have access to or on its staff an industrial psychologist for the purpose of advising inspectors on the causes of accidents and prevention as well as advising industry.

Every inspectorate should have access to an Industrial Court to handle cases for prosecution, with a public prosecutor who has knowledge of the safety act and industrial conditions being available when necessary. It should not be necessary for an inspector to have any knowledge of criminal procedure, although knowledge of the rules of evidence would be of advantage for the holding of enquiries. In this connection, it should not be necessary for inspectors to take statements under oath, seeing that evidence in court will be given under oath. In the case of a fatality the Police also take sworn statements and there is a possibility of conflicting sworn statements which may be quite unintentional, but could lead to a charge of perjury.

11.5 SUMMARY

The British and American Safety Acts are mentioned briefly for purposes of comparison with the South African Act whose health and safety aspects have been fully described in this thesis.

The Report of the Wiehahn Commission and the Government White Paper are referred to and shown to lead up to the Machinery and Occupational Safety Draft Bill. This Bill is also commented on at some length.

Finally, certain recommendations are made with regard to the present Act in the light of the conclusions which were arrived at in Chapter Ten.

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APPENDIX 1

At 13h00 on a Saturday, the forktruck driver parked his forktruck with the forks facing the wall of a loading platform in the loading shed of the rail siding of a factory. As the work was finished the driver went home, leaving the key in the ignition of the forktruck.

An elderly black man who was a clerk in the office in the shed, decided to drive the forktruck. He was privately preparing to take out a driver's licence and here was his opportunity to practise his driving.

He did not realise that a forktruck has its steering wheels in the rear and not in the front, and also that it has a very small turning circle.

He switched the ignition on and reversed the truck in a wide circle which brought him near the edge of the platform. He was found hours later lying dead on the rails below the platform together with the overturned forktruck.

APPENDIX 2

Regulation C1 of the regulations framed under the Act requires the user of machinery to appoint a responsible person in general charge of the machinery on the premises. Where the total power from various sources exceeds 800 kW the responsible person is required to be a Certificated Engineer unless exempted by the Chief Inspector of Factories. Below this power the responsible person must be one who has had practical experience in the operation and maintenance of machinery.

A Certificated Engineer is a person in one of the following categories:

(1) A qualified artisan who has written an examination in five engineering subjects and the subject: Factories Act and Regulations;

(2) A technician who has written the subjects: Plant Engineering and Factories Act and Regulations;

(3) A graduate engineer who has written the subjects: Plant Engineering and Factories Act and Regulations;

(4) A graduate engineer with suitable additional practical experience who has written the subject: Factories Act and Regulations.

Before being permitted to write the examination a person must satisfy the Commission of Examiners that he has had the proper training and experience in the operation and maintenance of machinery. He then qualifies as a candidate for the examination.

The Wiehahn Commission has reported that out of 1 229 establishments which required Certificated Engineers in 1979 only 924 had been appointed, i.e., 75%. The 800 kW stipulation appears to be a purely arbitrary figure and if it was pegged at a higher figure, the shortage of these engineers could be made to disappear. The figure merely defines a large installation of machinery. Why, however, should a large installation require a more qualified person than a small installation? Certainly the risk exposure is greater because a large installation usually requires more personnel. But the stipulated criterion is usage of power and not size of staff. This criterion was first introduced in 1931 in the Factories Amendment Act and has never been revised.

APPENDIX 3

INDUSTRIAL SURVEY

Appendix 3 shows the results of a survey conducted during 1979 of sixty firms in the Western Cape. The twenty questions were posed, mostly by telephone, to top management viz. to directors, managers or engineers. The Accident Frequency Rates, accidents per year and the number of employees were obtained from the files of the National Occupational Safety Association and covered the calender year 1978.

The selection of firms was arbitrary within the following restraints:

(i) Most of the firms were members of Nosa.
(ii) Most of the local types of industries should be represented.
(iii) Very small and very large firms to be included.
(iv) Ten zero accident firms to be selected in various industries.
(v) Some firms with large AFR's to be selected.

The Yes/No answers were related to the frequency ratings for firms Nos. 11 to 49 in rank order and the median values of Accident Frequency Rate for Yes and No were compared. Where there was a significant differance between these median frequency ratings a tendency could be recorded and some meaning drawn from the answers. Some questions merely required an opinion, but this opinion coming from top management was considered important.

A separate table of median values was drawn up and the median differences ranked. These are shown in Appendix 3A and 3B. The firms which applied formal induction training had low AFR's, while the firms which did not have formal induction training for new employees had much higher AFR's. This aspect tops the list.

The firms which involved the workers in accident prevention also scored well.

The results emphasise the importance of induction training and involvement of workers in the accident prevention programme.

APPENDIX 3A

MEDIAN DIFFERENCE RANKING (Firms 11 to 49 only)

Question No.		Medians		
		Yes	No	Difference
15.	Formal induction training?	5,53	32,06	26,53 -
8.	Workers involved in accident prevention?	5,00	26,09	21,09 -
5.	Nosa award received?	4,85	17,59	12,74 -
16.	W.C.C. rebate received?	4,32	16,48	12,16 -
6.	Use of Nosa facilities?	6,09	16,48	10,39 -
7.	Active safety committee?	4,51	13,86	9,36 -
11.	Investigate lost-time accidents?	7,26	- -	
17.	Guarding of machinery prevents accidents?	6,65	12,04	6,61 -
12.	Full-time safety officer?	4,70	7,85	3,15 -
9.	Top management involved in accident prevention?	5,40	8,50	3,10 -
10.	Investigate non-casualty incidents?	6,65	9,30	2,65 -
14.	Full-time sister or first aider?	5,35	7,69	2,34 -
18.	Human failing a main cause of accidents?	7,33	3,00	4,33 +
19.	General education a factor in prevention?	8,10	4,29	3,81 +
20.	Race a factor in accident prevention?	9,05	5,53	3,52 +
13.	Part-time safety officer?	7,85	4,85	3,00 +

MEDIAN DIFFERENCES IN FREQUENCY RATINGS

Negative AFR above

Positive AFR below

15. Formal induction training

8. Workers involved in accident prevention

5. Nose guard received

16. M.C.C. rebate received

6. Use Nose facilities

7. Active safety committee

17. Guard machinery

12. Full-time safety officer

9. Top management involved

10. Investigate non-causality incidents

14. Full-time sister

18. Human failing

19. General education

20. Base a factor

13. Part-time safety officer

-30 -25 -20 -15 -10 -5 0 +5 +10

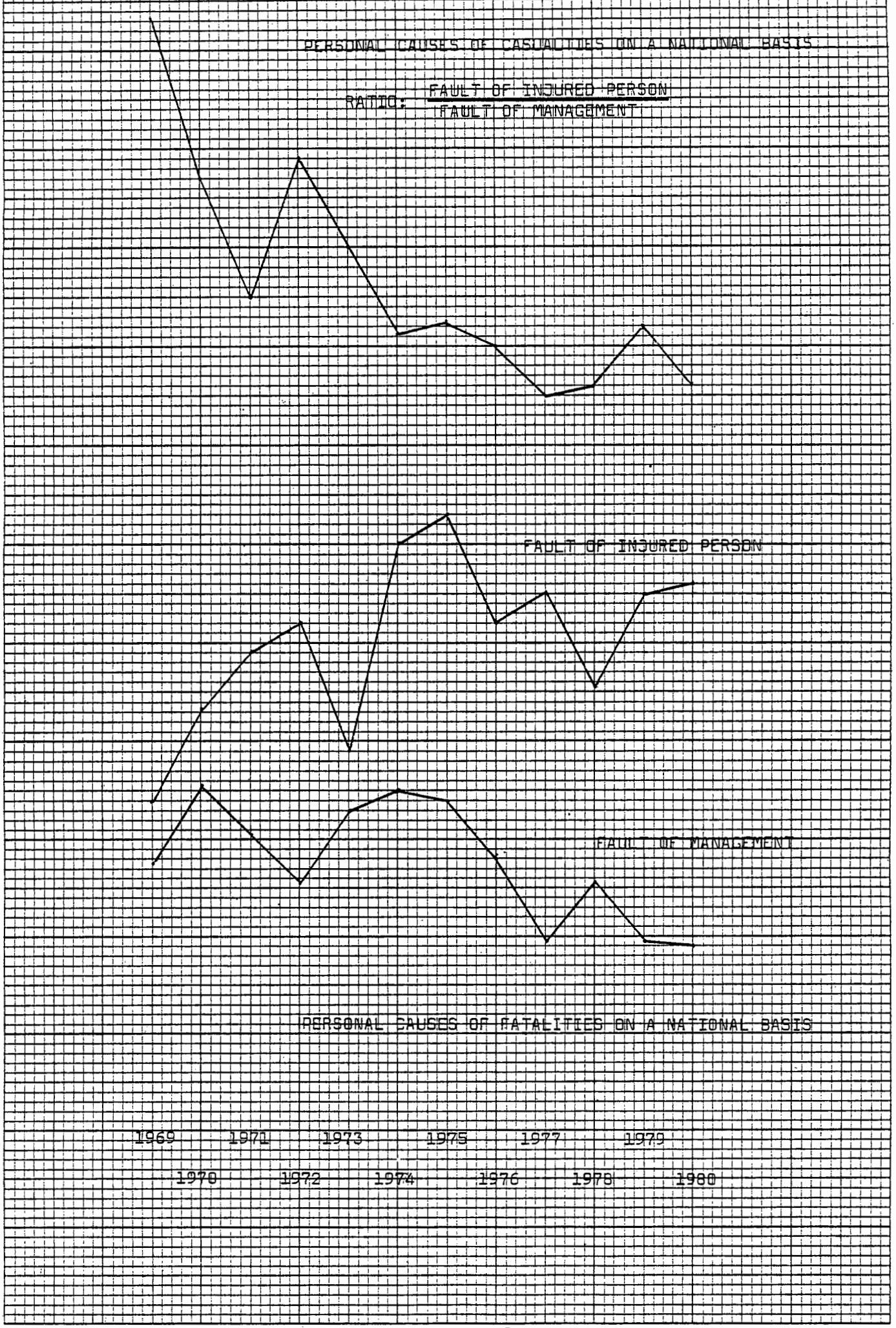
APPENDIX 3C

INDUSTRY REFERENCE NUMBER AND NATIONAL ACCIDENT FREQUENCY RATES 1974

1.	Wood ...	26,1
2.	Mining ...	22,4
3.	Building Construction	17,2
4.	Iron and Steel ...	16,5
5.	Food, Drink and Tobacco	16,5
6.	Glass, Bricks and Tiles	15,2
7.	Printing and Paper ..	13,6
8.	Chemicals ...	10,1
9.	Textiles ...	6,4
10.	Fishing ...	59,5
11.	Diamonds, Asbestos ...	10,8

ACCIDENT FREQUENCY RATE

$$(AFR) = \frac{\text{Number of disabling injuries} \times 10^6}{\text{Number of man-hours worked during the same period}}$$


PERSONAL CAUSES OF CASUALTIES ON A NATIONAL BASIS
RATIO: FAULT OF INJURED PERSON / FAULT OF MANAGEMENT
FAULT OF INJURED PERSON
FAULT OF MANAGEMENT
PERSONAL CAUSES OF FATALITIES ON A NATIONAL BASIS
160
140
120
100
80
60
40
20
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980

APPENDIX 5

Claims as a Percentage of assessments	Percentage Rebate
Over 62%	Nil
62 - 61%	2½%
60 - 59	5
56 - 55	10
52 - 51	15
48 - 47	20
40 - 39	30
32 - 31	40
28 - 27	45
24 - 0	50

APPENDIX 6

QUESTIONAIRE

FACTORIES, MACHINERY AND BUILDING WORK ACT 1941

TITLE OF THESIS: SIGNIFICANT FACTORS FOR ACCIDENT PREVENTION EMBODIED IN THE FACTORIES, MACHINERY AND BUILDING WORK ACT 1941

NOTE: This questionaire is directed to the top executive of the firm. Please don't put it aside but complete it immediately as far as you can and then pass it on to whoever can quickly furnish the remaining information.

Tick

1. Does your firm possess a Factories Act? ... Yes ☐ No ☐
2. Have you appointed in writing a Responsible Person in general charge of all machinery on the premises? Yes ☐ No ☐
3. Does your firm report accidents under the Factories Act in addition to reporting under the Workmens' Compensation Act? ... ... Yes ☐ No ☐
4. Do you send returns to the National Occupational Safety Association (NOSA) of man-hours and lost-time accidents? .... Yes ☐ No ☐
5. What is your latest Accident Frequency Rate? ☐ Don't know ☐
6. When was the last official visit to inspect machinery by an Inspector of Machinery (not Factory Inspector)? ☐
7. On the scale below, to what extent does the guarding of your machinery comply with the Factories Act safety regulations? ... ... ☐
8. Are you aware of the statutory examinations and tests required on a pressure vessel (air receiver, autoclave, cooking pot, tyre mould, refrigeration receiver, etc)? Yes ☐ No ☐ N/A ☐
9. How many employees are exposed to risk of accident? ☐
10. Approximately how many years has your factory been operating? ☐

11./

11. On the scale below, to what extent does your legally appointed Responsible Person contribute to accident prevention? ☐ N/A ☐

12. On the scale below, to what extent do the Factories Act regulations contribute to accident prevention in your factory? ... ... ☐

1 = very little 2 = little 3 = average 4 = much 5 = very much

13. Rank of person completing questionaire:

- Managing Director ☐
- Manager ☐
- Secretary ☐
- Responsible Person ☐
- Other ☐

APPENDIX 7

STATISTICS GLEANED FROM REPORTS OF THE WORKMEN'S

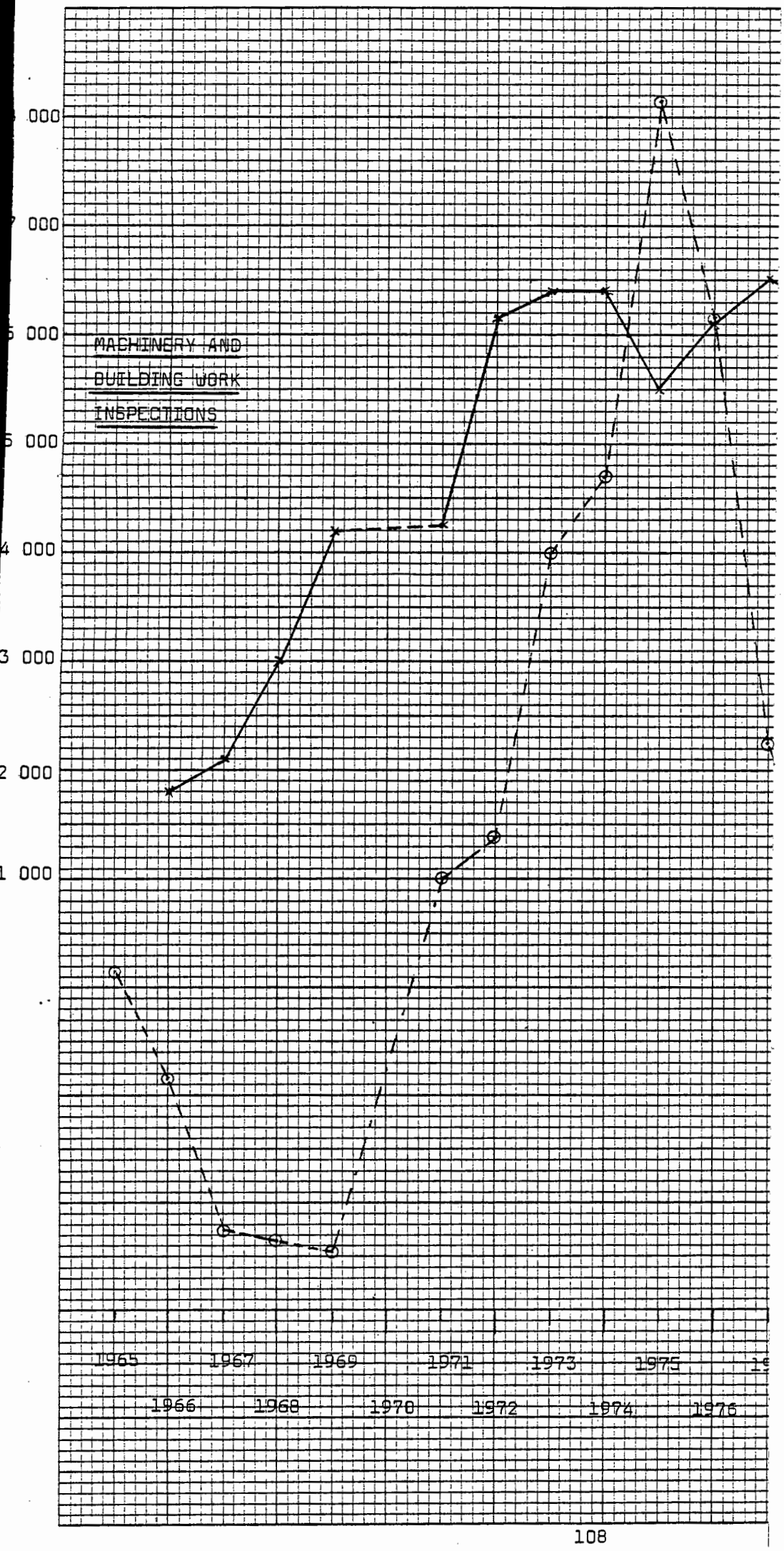
CONPENSATION COMMISSIONER

Compensable Accidents

Year	All Carriers	% Difference	Accident Fund	% Difference	All Carriers Fatals
1972	348 005	+ 2,0	217 383	+ 2,9	2 284
1973	354 823	+ 0,2	223 755	+ 2,0	2 546
1974	355 552	- 1,8	228 320	+ 1,2	2 522
1975	348 989	- 4,1	231 033	- 6,4	2 479
1976	334 552		216 213		2 231
	Accidents Reported				
1975	355 615	- 4,4	237 501	- 4,9	
1976	340 063	- 6,4	225 949	- 9,8	
1977	318 450	- 5,4	203 885	- 1,8	
1978	301 411	- 4,6	200 301	- 3,2	
1979	287 438		193 983		
	Mean:	- 5,2%	Mean:	-4,9%	

National Occupational Safety Association

Year	Surveys	Inspections	Courses
1976	3 326	2 189	624
1977	4 670	3 083	771
1978	-	-	-
1979	4 548	3 541	974


000
7 000
6 000
5 000
4 000
3 000
2 000
1 000
MACHINERY AND
BUILDING WORK
INSPECTIONS
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976

APPENDIX 10

Address Issued by the Department of Foreign Affairs and Information at the request of the Director General: Manpower. Ref 1/15/3/1 dated 23 July 1981.

The Honourable S.P. Botha M.P., Minister of Manpower.

Speech on 22 July 1981 at the opening of the new Training Centre of the Car Distributors Assembly (Pty) Ltd., in East London.

> "The Government's policy in regard to training which has been repeatedly stated in recent times, is that the country's total workforce must be developed to the optimum by means of training and re-training. In practical terms, this means that every member of the workforce, whether he happens to be employed or to be unemployed, should be afforded the opportunity and should be encouraged and assisted to improve his skills in such a way that he will be able to take maximum advantage of the opportunities in the market."

He says further:

> ".....The provision of training and re-training facilities for workers, is primarily the responsibility of each individual employer. This also applies to the Government who is, after all, a major employer of labour."

He went on to state that the Government had introduced very generous tax concessions in an effort to encourage employers to train their employees.

APPENDIX 11

EXPLOSION AT GAS PRODUCER PLANT

One man was killed and five others injured (four critically) as a result of two explosions in the ash plant of a large automatic gas producer.

Gas escaped into the ask plant when a valve was opened to release the fines collecting under the grate. The first explosion killed the task plant operator. Three minutes later during rescue operations, the second explosion occurred causing extensive injuries to the rescuers.

Damage to the gas producer itself was minimal but damage to adjacent buildings and the control room was extensive.

Gas continued to be produced for about seven days after the accident and continued to escape into the ash plant creating an explosive hazard which could not be immediately curbed. It was considered to be too dangerous to enter the ash plant to shut the valve and neither could the gas producer be shut down as there was no means of stopping ignition except by cutting off the coal supply and allowing it to burn itself out.

The plant was shut down while the manufacturer and user consider ways and means to clear the dangerous gas and redesign the system in such a way that a similar situation cannot arise.

APPENDIX 12

THE ARGUS, FRIDAY JULY 10 1981

Industrial health system 'inadequate'

THE SYSTEM of legal regulation of industrial health in South Africa is seriously inadequate, according to speakers in a panel discussion at the conference on Law in South Africa at the University of Cape Town yesterday.

Dr Jonny Myers of the Industrial Health Research Group at UCT said the content and application of the Factory's Act excluded workers and shrouded working conditions in secrecy.

'Neither factory inspectors nor the employers are obliged to inform workers of the result of a factory inspection.'

Penalties laid down for employers contravening the Act were 'totally inadequate' as a deterrent measure, he said.

DEMAND RIGHTS

Mr Halton Cheadle of the Centre for Applied Legal Studies at the University of the Witwatersrand said workers should demand industrial health rights at the shop floor.

These included the right to information, representation, negotiations on new technology, monitoring, medical examination, full compensation and the withdrawal of labour.

Dr Liz Thompson, an adviser to the Industrial Aid Society, said accidents were the most serious industrial problem.

In 1976 there were 350 000 accidents, of which 2 231 were fatal and 32 000 involved permanent disability.

She said the biggest problem concerning accidents was the sacking of injured workers.

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