

INDUSTRIAL SAFETY – ERGONOMICS AND THE ACT

by
L. Ring

Mr Chairman, ladies and gentlemen.

During the tea break I stayed behind and was talking to a few people. I mentioned that somewhere amongst all this debris I felt there were some human beings and they said "Who are they?". And I feel that some of this discussion has been directed to insurance people; some of it has been to lawyers; my address is more to the average man.

I think it is always advisable to define ergonomics for this kind of address to most people. It is not a disease and it is not economics pronounced badly - *EEK!* Ergonomics is in fact the study of man's total environmental relationship with work; examining and measuring the effects of fatigue, noise, illumination, vibration, psychological stress, ageing and behavioural changes; on his safety, well being, on his performance.-

Although I will deal with this in a little more depth later, it is essential at the beginning to define "ergonomics". Its A.B.C. is anatomy and physiology and psychology. It utilises other disciplines such as sociology, systems analysis and design and statistics for human sciences. It works with architects, engineers and, of course, safety officers. Its objective is to adapt the man to the job, and we do this by selection and training, and the job to the man by design. The selection element of ergonomics in this country of course doesn't exist; we don't have selection. So emphasis must be placed on training.

In considering the Accident Compensation Act therefore I am concerned with prevention and rehabilitation. I am concerned with how much prevention and rehabilitation; when we are going to get adequate prevention and rehabilitation and who is going to do the prevention and rehabilitation, because for me if I walk on to a construction site and I fall and I am a paraplegic for the rest of my life, or if I walk into a factory and I use a machine and I am totally blind for the rest of my life, I don't care whether I get \$12,000 and 80% and an extra gratia payment of \$250,000 – I want to walk again and I want to see again and I am concerned about the person. I am concerned about – how did the accident happen? Why did it happen?

To me the Accident Compensation Act is the most significant piece of social legislation since the Social Security Act. It removed in one stroke the fear and insecurity of accidental physical incapacity whilst retaining the motivation to be gainfully employed.

But it has added nothing yet to the prevention of accidents nor the rehabilitation of its victims. I used the word "yet" because I accept that the Commission feel that the public wanted the compensation element of the Act functioning first. But in reversing the Act's priorities it has created more difficulties than it needed. It must now either prevent accidents or pay up; rehabilitate or redress; and the cost is likely to be as unpredictable as the Sydney Opera House.

In 1973 after the Act was brought down the Secretary of the Workers' Compensation Board and now its National Director of Safety — Ian Campbell — was speaking at Victoria University. He said; I quote:-

"One cannot stress too much the fact that the Act gives first priority to increasing attention to prevention whilst naming the second target as rehabilitation. For too long have our attention and efforts been focussed on compensation. It is clear that in some direction the Commission itself could take the initiative. There thus exists a great opportunity for the expansion of accident prevention activities, this being only limited by the resources which can be made available."

I quote from the Woodhouse Reports:-

"We recommend Section 310; we recommend that an annual sum of approximately \$600,000 be set aside out of the Compensation fund for the promotion of rehabilitation and safety."

From the Government White Paper which followed in 1969, Section 26:-

"Intensified efforts will be made if the Commission's proposals are implemented to promote safety with a view to minimising injury. An additional sum of \$400,000 set aside for the purpose".

On Rehabilitation — Mr Ian Campbell:-

"In this field I would suggest there is even greater room for improvement in the field of accident prevention."

The Act by ending the indeterminate litigation provided motivation for rehabilitation that was long overdue and was a permanent problem for many of the doctors in this field. But it must now be matched with adequate facilities. At the moment they are fragmented and inadequate. Sophisticated assessment techniques, scientific job analysis and complete occupational rehabilitation are unheard of. And when I talk about sophisticated assessment techniques I mean accurate, but completely accurate, assessing of joint range, muscle power, the things that are essential for rehabilitation. I know the Otago scene very well. I phoned them up and said "What happens when a person is permanently disabled and you have to do this type of assessment to determine what job they will be eligible for", and they said "When we get this we send it to the Disabled Resettlement League in Dominion Road". I phoned up the Disabled Resettlement League and I said "What do you do when you get a person of this kind who needs sophisticated assessment. It will have to be pretty exact. He is only good for two or three jobs maybe" and they said "We send him to Otago".

But let me first define the problem.

For more than half our lives the people in New Zealand and many western countries are more likely to be killed by accidents than any other cause and even in the world as a whole accidents as a cause of death are now outranked only by cancer and cardio vascular disease. If I were to tell you that of all the people here 50 of you would be injured between now and next year and that out of that 50 three of you will be permanently disabled and that one of you might die, I don't think you would like it very much. You may not do a great deal about it but if I were to say that 50 of you are going to have polio or tuberculosis between now and May 15th next year and that three of you are going to be permanently disabled and one might die, you would make a hell of a stink with your Parliament for medical research, preventative treatment, ordinary treat-

ment, and everything possible. There would be a hue and cry from one end of the country to the other. We had a small attack some while ago — 2 or 3 people — and the newspapers were full of it. Of accidents one doesn't hear very much.

But that is the statistical probability of you suffering an accident or an injury.

Accidents remain the only major source of morbidity and mortality viewed in essentially extra rational terms — luck, chance, fate, Act of God, — all are acceptable explanations.

Between now and next May in 1975 there will be over three million accidents in industry. 63,000 of these are going to suffer a compensable injury. 1,000 will be permanently disabled and at least 80 will die. At this very moment up and down the country there may be a young farmer driving a tractor wondering about his TV tonight; there may be a miner or a quarry man thinking about his retirement; there may be — I don't know — a young mother in a supermarket wondering what to cook for supper; and in the next hour they will be seriously injured or will be dead because 22 people are injured every hour, every day, 365 days a year in industry. Whether or not the accident is a cut finger or an amputation; whether or not it is a fall and there is a bruise or a fractured skull; whether they have an electric shock and it ends up as a minor burn or they die, is a question of absolute luck. That is pure chance. And the trouble with all of us is that we believe that accidents are a collection of abstract numbers that isn't going to happen to us. That has come through very evidently I think to-day.

It is always somebody else who has an accident. It is always somebody else's child that is run over. Well I've got news for you. You and I make up these statistics. They are not a collection of abstract numbers. They are human beings, feeling, thinking people, you and me, and it can be your turn tonight as you go out of this room, or my turn on the way home. Somebody is going to make these statistics and they are you and me.

The cost is \$75,000,000 a year; medical expenses and insurances and loss of productivity. Over \$300,000 for every working day and this is infinitesimal compared to the money and suffering in its wake.

Over 3½ million days a year are lost in industrial accidents. This is equal to withdrawing 15,000 people from the labour force, equal to the people who work in the entire city of Wellington minus the Lower Hutt. It is 26 times more than the number of days lost by industrial disputes and I find it incredible the publicity that is devoted to industrial disputes and so little to industrial injuries. Especially when some of the disputes concern safe conditions at work. Absolutely incredible.

The fact that it is difficult to raise public opinion over works accidents is probably due to a feeling that work accidents are primarily between employers and individual workers and if further concern were necessary then the expert Government departments and the trade unions would be dealing with it. How dangerous this apathy is can be seen if you want to have a look at the 1973 report of the Labour Department's factories inspectorate. In recent years the inspectorate has been fielding a front line strength of under 160 inspectors to cope with 21,090 factories. Some of the inspectors have been little more than trainees. They are not only responsible for safety under the Factories and

Machines Acts, and this has 12 sections alone, but 23 other Acts as well and they relate to everything; from the Industrial Relations Act to the Minimum Wage Act.

During 1973 53% of factories were visited. The factories are visited therefore once in two years. In Auckland only 38% were inspected. That means a factory gets seen once in three years. Obviously a 3-yearly interval between general inspections is much too long for many hazardous processes and in fact many of the building sites take less than three years to build.

Of the 21,000 factories, 858 employ over 100 workers, which is a large work force by New Zealand standards, 187 employ over 500 workers. Yet there are not more than 30 full-time safety officers and some 68 or so part-time safety officers employed by management throughout the country.

The preventative arm of the Accident Commission, the New Zealand National Safety Association, is at the moment fielding a strength of 17 safety officers of whom no more than six have had practical factory experience. No single officer of the factory inspectorate and the National Safety Association has a recognised qualification in occupational health, hygiene, ergonomics or safety. And I am talking now of degrees.

In 1973 there were 18,970 breaches of the Factories Act by employers disclosed by inspections. Of the total 15,000 related to safety health and welfare. Yet there were only 20 prosecutions. In the construction industry there were 565 accidents that resulted in serious injury or fatalities. Yet there were only prosecutions against 32 employers. Five of the prosecutions were taken for breaches of the Regulations resulting in fatal accidents and for which the maximum fine in the construction industry is \$1,000 – for other industries \$500. The average fine is about \$300. The maximum penalty is of course rarely imposed and to imagine it is a deterrent to many firms, especially in construction, operating under obvious unsafe conditions because it is cheaper and quicker, is to live in cloud cuckoo land.

Every worker in Auckland as he steps into his factory every day is playing Russian Roulette for one in six Auckland workers is injured annually and the figure varies only marginally throughout the country. One in six. Despite the activities of the Occupational Health Department, of the Factories Inspectorate, of the National Safety Association, industrial accidents are not significantly decreasing. Between 1966 and 1969 accidents increased by 10%. And the severity or days lost increased by 20%. The population only increased by 4.2%.

Although there is a need for caution in drawing conclusions about statistics of this nature, whatever qualifications and reservations are made the orders of magnitude are plain enough. It is unnecessary to dwell on what the bare statistics mean in terms of human tragedy and suffering. The figures, however approximate, speak for themselves. For both humanitarian and economic reasons no society can accept with complacency that such levels of death and injury are the inevitable price for meeting the needs for goods and services.

Now, let me have a word about ergonomics. One of the worst problems with the safety business is that for a number of years, actually since its inception, it has suffered from a disease in that it puts accidents into two categories – unsafe acts and unsafe conditions. It says that unsafe acts account

for 85% of accidents; unsafe conditions account for 15%. Now this is a climate which suggests that no matter what you do the worker is always to blame and this is how it has been and I often hear – “There will always be accidents as long as there are people; as long as there are workers.” Which is a lot of nonsense. There will always be accidents as long as there are employers too. And it is also the reason why among employers in 35 industries investigated in Britain, it was found that between .01% and .5% was being spent on safety. Something like \$1.20 per head per year.

Lets have a look at ergonomics, since that is the main object of this exercise. And we are looking at ergonomics in a particular point of view because ergonomics I think is the very heart of safety and the very heart of accident prevention. Ergonomics looks at accidents with its own disciplines and the disciplines of ergonomics are firstly anatomy. It looks at the worker in terms of his fatigue levels. It looks at the machine design of a worker. As you know the average lathe to operate it you need to be a dwarf; you need to be 4' high and you have to have an arm spread of 12". In England while I was there they built a train to run from London to Scotland and you must know that before you become a train driver in Britain you are at least 55 years old. It is the top of the tree. But when you are 55 years old you are running into what we call the degenerative age group – you are wearing out. They built this train, the train ran, (there were several of them); the train ran from London to Scotland; the journey took six hours. In six months they went through 28 train drivers. Nobody knew what was wrong. They finally found out, because they sent in engineers and economists eventually, and there it was. They had built the train with a console right down to the floor complete with no room for his knees. The driving seat was of course fixed but to operate the train the driver had to sit at right angles to his console and direction of travel. If any of you here had to sit with your spine twisted through a 90° angle for six hours you would also be a chronic back condition in no time at all. A designer merely forgot a driver has knees and it cost \$196,000 for modifications and compensation in about six trains.

So we look at machine design – and we look at seats and the chairs. As you know at the end of each holiday period every office plays musical chairs and it's to find the most comfortable chair; it's not for what you're thinking. And of course we look at tools too. You may feel that when you are screwing a screw to the right, you may think this is perfectly obvious – a nut; why not screw to the left? Has this occurred to you? The reason you screw to the right is anatomical. The muscles that turn your hand that way are very much stronger than the muscles that turn your hand the other way. It is therefore designed so that you screw in a particular way. The Americans did not screw the same as we do and this caused a great deal of annoyance. Up until the last war indeed the Americans screwed the wrong way and we had to put a lot of pressure on them to get them to screw the same as we do. Seriously, this is a fact and these things are designed anatomically. It plays a very important part in work design because all these things lead to fatigue.

I have here a very simple example of machine tool design to eliminate fatigue, and by doing that eliminate accidents. If you made a fist. From this you will see – your wrist goes up slightly, like that, and you get a very good grip. If

you do that with it and lessen the grip your hand is very much weaker. An ordinary pair of pliers for somebody working on a conveyor belt — he must adopt that position all day and, what is more, he must use his hands to open the pliers. At the end of the day he will be very tired and he is liable to have an accident.

If you re-design a pair of pliers like that so that you can hold it and it will point straight ahead and at the same time have a spring loading base so it merely relaxes, you minimise the fatigue levels — in fact you cut the fatigue levels down in this by something like 50%.

We are concerned about minimising fatigue and reducing errors and so stopping accidents.

We look at the physiology of the human being. We look at noise; you may or may not know it but in New Zealand the noise limit is a figure called 90 D.B.A. It's a decibel scale. 90 D.B.A. is the top limit above which irreversible hearing loss occurs. Many many factories in New Zealand are working on the upper limit, the 90 D.B.A. limit, and we still don't know the long term results of this kind of exposure. If I shouted as loud as I could in your ear from 6" I would be recording a noise level of 85 D.B.A. Now see what this means if you are working in a factory and you need to make a person aware of danger and you can only do it audibly, and this has occurred time and again. The noise level in the factory is completely above the audible range, the audible conversation, the audible shouting range, so he must rely entirely on vision for any kind of danger signal. In some of the operations I have done on the waterfront, some of the investigations where people have been killed, the story was always the same — "We shouted, but he didn't hear". Of course he didn't hear. The noise level on the waterfront is at least 90 D.B.A. on a ship.

We look at illumination levels. In most factories the level, the accepted legal level, of illumination is much lower than the subjective comfort level of illumination and this will cause eye fatigue and that will cause accidents. There is a code, an I.E.S. Code, which can be readily looked at and seen, and if the will was there could be implemented, at which the minimum levels could be ascertained.

Ageing is a problem we have to look at very closely in accidents because after the age of 35 for every decade you lose 5% of vision and you lose 10% of hearing. You not only lose that but you lose co-ordination and you lose strength. All this is only equated by increased experience. If you don't get increased experience you are that much poorer off physically. This is why when the elderly get an injury it is very very much more severe. It is very difficult to deal with ageing.

When I was in practice quite often you get patients coming in and you say "Well, what is wrong with you?" and he says "I'm stiff in the mornings" and you say "You're stiff in the mornings? I don't quite understand." At this point you are thinking he ought to see a urologist, and he says "I never used to be as stiff as this in the morning" and you feel or you are wondering if you ought to congratulate him, but of course he is in trouble — he is doing a job where he cannot afford to be stiff in the mornings. But that is what happens when you get older.

We look at vibration. It is only now beginning to be appreciated what vibration will do on a pathological level. There are conditions affecting the blood vessels called "white finger" and contractions of the hand called Dupuytren's Contracture which occur as a result of vibration. And at frequencies which happen to coincide with the natural frequencies of certain organs a constant vibration creates tremendous pain and pathological change.

These are areas which badly need investigation.

We look at vigilance because it is only possible for you to maintain vigilance for a prescribed time. This was proved when radar was introduced. They had a great deal of difficulty learning how to cope with it because the radar operators would fall asleep. After half an hour anybody, no matter who he is, his vigilance decreases. The classic example of this of course was Pearl Harbour. Where they looked at the radar screen and saw a lot of things which looked like snow and turned over and went back to sleep. Half an hour later they wiped out Pearl Harbour. They should have identified it but after a prescribed period it is impossible. Now we put a stimulus into these kinds of vigilance exercises which stops this, but we could learn from this in terms of traffic accidents; when you are travelling at night, it's when lots of road accidents occur because of decreased vigilance. They are a big proportion of them. Travelling at night, and all you have as a stimulus is the oncoming lights of a car you know what happens; you begin to get drowsy, you open the windows, you turn on the radio; you turn it off, you need a constant stimulus to stay awake. It is possible that if they put at every 10 miles some artificial stimulus like a light of varying colours it would help you to stay awake.

These are areas in which ergonomics can be applied.

We look at temperature. Thermal changes. And this is so important I cannot stress it too much. You rarely find on an accident investigation report that it was a hot day; that the man's co-ordination had deteriorated and bang, he had an accident. But this is a very common occurrence.

We need to do a great deal of investigation on temperature changes. We have a cold store, a freezing works, which gives us the greatest amount of industrial problems and here most of the labour force are Polynesians and Maoris. Now the length of time in which workers can work in a freezing chamber and then have to come out is determined by standards which have been set in Britain in Walls Ice Cream factory. There is no question at all that the physiological differences between a Polynesian who has just arrived from Samoa and an Englishman working in the Walls Ice Cream factory is very much different and therefore his work and rest periods must be changed — not in any way increased, but changed, because they lose their sensitivity in their fingers and they have an accident and they cut them off.

We look at the psychology and we look at environmental stress which is terribly important; communications, because all the communications that most people see in factories are by posters; generally hidden behind the Factories Act and so out of date and so irrelevant that nobody sees it any more.

The lectures which people are often given in industry are not given to the workers. They are given to management and supervisors and they don't need them. They are not getting injured. The workers are getting injured. They are the ones who need to be instructed. But the average supervisor has his own

problems. Conveying this kind of technical information is not really his forte and even when supervisors and middle management are given lectures of this nature they are invariably told that you can do what you like in terms of instruction to the workers providing they don't stop work.

We look at small cycle times which is becoming much more prevalent now, and boredom. As jobs become more and more automated the cycle times become less and less and less. And boredom and monotony are one of the biggest factors in producing accidents because workers will take chances under these conditions.

So these are some of the areas in which ergonomics can play a part and this is why I am so concerned with prevention and I am also concerned with rehabilitation because if you wanted rehabilitation at this moment you would have a great deal of difficulty getting it. I can tell you that. Not that it isn't available. It is. And quite good rehabilitation of its kind. But you would have difficulty getting it because the average doctor either doesn't know it exists or is reluctant to send you there or you may not fancy going all the way out to Otahuhu for some kind of rehabilitation. So it wouldn't be easy to get, but if it were, all that Otahuhu can take — Otago — is 400 a year. At the moment the numbers coming through at the Disabled Resettlement League are 193 a year and we have 17,000 accidents in Auckland alone. These are compensable injuries. So if there were a sudden rush for rehabilitation you might have difficulty getting in. I have no doubt that the matter will be solved. I am sure. And I was very pleased to hear Mr Sandford's comments that of course these things will be looked at and they will be given the priority they deserve.

Finally I would like to stress that ergonomics looks at things quantitatively and qualitatively; it looks at approaches to safety by scientific research and methodology. I believe that we should be initiating now a complete job analysis of most of the operations up and down the country so that from this we could arrive at suitable safety standards and also from this we would have a blueprint for rehabilitating the disabled so that you could say "Yes, he has a weakness of this muscle or that muscle; he has a limited joint range eligible for X number of jobs; he will be able to do this". This is very very important. This is a basic blueprint. It needs to be done now because it is a year's exercise to carry this out alone. And there is no reason why it can't be done. It's the work of a small team.

We need to know the contribution to accidents made by mild disorders like colds and flu, by menstruation, by alcohol, by drugs such as aspirin, by ageing, by changes in the weather. They have significance — and by smoking. We need to investigate efficiency costs and techniques of safety propaganda. There is an incredible dearth of scientific research which is particular to New Zealand; particular to New Zealand's ethnic groups. We cannot accept any longer because of the changing pattern of our work population — factories now are being more and more populated by Polynesians and Maoris and they have problems peculiar to themselves. And we cannot accept other people's work, other people's standards.

But even apart from that there is a lot of research being done in other countries that isn't applied here. I searched in vain for one piece of industrial accident prevention research which had been done and there is none. There is none, none that has been done overseas which is significant which has been

implemented here. Many things have been done. New techniques of lifting and communicating accidents in industry which have been done and proven overseas are not used here yet and 30% of our accidents involve back injuries.

These things must be done by the University or responsible agencies like the D.S.I.R.

And so that is about it. I think this kind of approach is the only real approach we can make towards prevention of accidents and rehabilitation. I would like to stress again the importance in prevention. This Act is going to cost us a great deal of money. The only way we can stop the overheads from reaching a fantastic level and the only way in which it can be carried out in a really humane way is to prevent the accidents from happening.

Almost all we have sat here and listened to today is what happens after the accident.

I want to know what is going to happen before the accident occurs.

Thank you very much.