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THE EFFECTS OF OSHA AND THE NEC ON INDUSTRIAL PLANTS

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When Congress passed the Williams-Steiger Occupational Safety and Health Act in 1970, a provision was included which allowed OSHA to unilaterally adopt national consensus codes and standards by reference. By this means the familiar OSHA regulations issued on May 29, 1971, included the 1968 edition of the National Electrical Code. The 1971 edition of the National Electrical Code was adopted by OSHA on February 16, 1972.

Since most responsible industries have for many years maintained comprehensive safety programs and proper working environments, they should not view with undue alarm another program which makes this function mandatory. OSHA's objectives are to assure, so far as is reasonably possible, safe and healthful working conditions for every employee in America and to preserve this country's human resources. These objectives are compatible with the objectives of responsible employers. They are reasonable and can be achieved.

As a means of compliance with safety aspects of electrical systems, OSHA adopted by reference the National Electrical Code (NEC). The National Electrical Code originated in 1897 as a result of the combined efforts of insurance, electrical, and related interests. Since 1911, it has been sponsored by the National Fire Protective Association (NFPA) and since 1920 has been approved as a national standard by national standards organizations, including the American National Standards Institute (ANSI).

The National Electrical Code is the primary electrical standard in the U.S. for the installation of electrical equipment in certain types of electrical installations. Although NFPA prepares the National Electrical Code as an advisory document, it has long been enacted into law by many governmental agencies, especially municipalities, to provide proper controls and to insure safe installation of electrical wiring and equipment, particularly in residential and commercial usage.

Until OSHA made the National Electrical Code enforceable as a federal law, the National Electrical Code was generally not applied to industrial installations by enforcing agencies. However, most major industrial installations used the National Electrical Code as a guide on a selective basis. Most of the contents of the National Electrical Code are of a general nature and are based on sound electrical engineering principles as well as proved experience.

In the past 30 years, we have seen an electrical revolution take place as a result of the tremendous upsurge in the use of electrical energy and the increased complexity and variety of electrical equipment. For example, the average American home uses more electrical energy today than the average industrial plant in 1910.

Since the National Electrical Code has been a minor factor in industrial design considerations, industry has not taken a strong interest in keeping the National Electrical Code up to date. As a result of the technological advances in industrial equipment design and installations, the National Electrical Code is inappropriate in many situations, and its strict application would even create hazardous situations in some cases.

In response to the situation created by OSHA, electrical engineers and safety personnel in industry are making considerable effort to rectify the shortcomings of the present National Electrical Code. Also, there is concern that the safety legislation to which industry is now subject will not only stifle

creative engineering design but will interfere with engineering efforts to achieve maximum overall safety.

National Electrical Code Article 90-1 states that "the purpose of this Code is the practical safe-guarding of persons and of buildings and their contents from hazards arising from the use of electricity for light, heat, power, radio, signaling, and for other purposes." Although this statement sounds simple enough, the industrial electrical design engineer is frequently placed in a dilemma in attempting to apply the specific provisions of the National Electrical Code. For example, the Code places emphasis on interruption of power to overloaded or faulted circuits or equipment. Many cases arise in industry where the loss of the device or circuit is an insignificant danger to persons or buildings compared to the inherent and much greater risk of fire and injury resulting from a crash shutdown of a large machine or an integrated process system.

In other words, the continuation of power to critical equipment will often create a safer environment than would otherwise be accomplished by giving primary consideration to protection of the electrical equipment. With this as a design criterion, it was a natural development that industrial electrical designers have combined safety, economies, operational requirements, and sound engineering to produce electrical installations which sometimes have features which do not strictly conform to the National Electrical Code.

Another facet to the problem of conformance to the National Electrical Code is the specter of needless increases in the cost of plant construction to cover the cost of design features which contribute nothing to industrial safety or reliability. An example of this waste can be found in cable ladder systems, which have achieved wide use in industrial plants in recent years. The National Electrical Code specifically requires that all nonmetallic sheathed cables be of multi-conductor design. This is a reasonable requirement in the case of small sizes of conductors but becomes an impractical, if not impossible, requirement when applied to the large cable sizes often required in a large industrial plant. Industry faces the prospect of being forced to revert to more expensive alternative wiring methods which offer no improvement in reliability or safety. The waste which can be brought on by enforcement of inappropriate Code measures is not only incompatible with our national and corporate goals, but is a disservice to safety and to the objectives of OSHA.

Let us now explore the avenues which can lead to the needed changes in codes and standards.

OSHA has let it be known that requests for changes and interpretations of the National Electrical Code should be directed to the National Electrical Code authorities, and not to OSHA. The National Electrical Code is revised and reissued every three years. Well-defined procedures are detailed by the NFPA for the processing of requests for revisions to the National Electrical Code.

The National Electrical Code is sponsored by a correlating committee and 22 code-making panels which study proposed Code revisions and determine what changes are to be made. Partly because of a lack of interest, industrial-user representation on the panels was sparse until this year.

As a result of the impact of OSHA, The Institute of Electrical and Electronic Engineers (IEEE) became interested in this matter. IEEE includes a large number of electrical engineers from the electrical-user industries. IEEE requested permission to have a delegate on those National Electrical Code panels relating to industry. A seat was also requested on the National Electrical Code Correlating Committee, which is the NEC policy-making committee. In August 1973, IEEE was awarded seats on the 11 requested Code panels, but the request for a seat on the correlating committee is still pending. Several other industrial users have been appointed to certain panels, and other appointments are under consideration.

What can your company or organization do to achieve changes to the National Electric Code which will reflect your engineering needs and safety objectives?

1. Know the Code. The National Electrical Code is a little read and little understood document in most industries. Appropriate persons in your company must have an understanding not only of Code requirements but also of the procedures for its revision.

2. Prepare and promote changes you consider essential. Any interested person or organization can submit proposed changes to the Code. Since changes proposed by an organization or group of companies will carry more weight, you should preferably work through your industrial association to combine proposals concerning problems similarly affecting several companies. Promote your proposals through liaison with appropriate organizations having representation on the Code panels.

3. Make your safety dollars count. Be wary of unreasonable expenses proposed for conformance to Code requirements which do not contribute to safety. OSHA officials, quite properly, have said that they do not wish to have industry undergo unnecessary expenses which do not improve safety. OSHA is a new organization and needs feedback in order to know what problems it has created. There have been several classic cases where plants have spent considerable amounts of money to make modifications to comply with a standard which was unreasonable. A short time later they were embarrassed to learn that someone had brought the matter to OSHA's attention and that OSHA had eased the requirement, making their expenditure unnecessary.

These days everyone works on a budget. Be certain that the safety dollars you have available are spent on worthwhile safety improvements that will actually lead to injury prevention.

Summary

It is intended that these examples and specific criticisms of the National Electrical Code will be accepted as constructive criticism. The safety goals of industry, OSHA, and the NEC are compatible and achievable. In weighing their engineering decisions, the electrical engineers of industry must now reckon with new factors: OSHA and the National Electrical Code. The full impact of OSHA is probably yet to be felt; but it is evident that if the codes being applied to an industry are inappropriate, immediate action should be taken to bring the problems to the attention of the code-making authorities. This takes both time and talent. Everyone must be ready to assist or pay the price for the lack of activity.

In order to accomplish the changes in standards which it needs, industry must be willing to budget the necessary time and expense of its engineers to participate in code-related activities. With the state plans gaining ground, you must be aware of both the NEC developments and any changes or modifications imposed by state law and codes.

The necessary machinery is available to all of us to insure that the electrical codes under which we operate are reasonable. None of us should complain about codes which waste our funds and needlessly restrict our activities without adding to employee safety until we have done our share towards seeing that the codes are attainable, enforceable, and reasonable. It is towards these ends that I urge you to direct your efforts.

A NEW LOOK AT OSHA—OR A NEW OSHA?

By JOHN PICKENS
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One day last Spring a man in the inside trucking department of a New England factory had to move a large box of cleaning materials. Working alone, he pushed the box along the factory floor on a dolly. At the head of a stairway to the floor below, he stopped, bent over and lifted the box in his arms. He was a huge, burly fellow, and the box weighed only about 45 pounds. So his hefting it up for a few moments was not too surprising.

But his next act was. He kicked the dolly, shoving it clattering down the stairs. Halfway down, it cartwheeled, bounced off the bottom step, and landed upright on its wheels on the floor, where it went careening across the concrete, richocheted off a wall, and finally came to a stop on the opposite side of the hallway.

The man watched all this, carried the box down the stairs, placed it back on its dolly, and calmly wheeled it along the floor toward his destination.

The stupidity of his act was matched only by the extent of his good luck. Imagine the injuries which that careening dolly could have caused to a person in the hallway, or the other damage that could have so easily occurred.

The incident sheds some light on a curious paradox about industrial safety—the continued high levels of accident rates despite intense efforts throughout most of business and industry for the past two years to comply with the Occupational Health and Safety Act. When signed into law in December, 1970, OSHA—the most comprehensive health and safety act in the nation's history—was widely hailed as filling a well established need. In that year, according to the National Safety Council, 14,200 workers were killed in industrial accidents, and roughly 2.2 million persons suffered disabling injuries. The Council's 1972 data shows no significant change. Deaths were down about 100, but disabling injuries rose by 200,000. And a disturbing long range trend is still apparent.

Member companies of the National Safety Council generally have better safety programs and lower injury rates than non-members. For manufacturing and mining, where meaningful comparisons are possible, NSC members average 70 per cent lower for frequency rate and 40 per cent lower for severity than the rates prepared by the Bureau of Labor Statistics. Significant evidence on injury rates before and after joining NSC is not available. Nevertheless, it is reasonable to conclude that the same management motivation that produces good results prompts a firm to become a member. NSC tends to attract good performers rather than those who most need help. Ministers have often complained that their congregations are made up of good people, while the sinners stay home.

Let's look at a chart. NSC data on total injury experience of members reveals a steadily decreasing improvement trend from World War II until 1962. Since then the trend is reversed, with steadily increasing injury rates through 1972. Certain adjustments can be made to construct a rate based on the same proportion of experience for each industry group as existed in the 1961-63 membership. If this were done, the 1972 rate would be 8.36 rather than 10.17. Even with this correction, it is apparent that the injury rate is continuing to curve upward, with no apparent influence from OSHA during the last two years.

I do not attempt to prove anything from this data. I simply say, look at it. Let those who gloried in the improving record from World War II until 1962 explain what happened since then. For those who say, "Give OSHA more time," I point only to the steady and obvious trend shown and challenge anyone to show the slightest ripple in the 10

year trend that would indicate some new factor in total experience. OSHA just hasn't proved to have any influence, good or bad. And, of course, we have been "had" on the record-keeping system. The new rules starting in mid-1971 very effectively eliminated any real possibility for statistical comparisons with the past.

Thus, in spite of the comprehensive sweep of OSHA's complex laws and the severe fines for failure to comply with them, must we conclude that industry generally is no safer today than it was before the Act was passed?

The irony of having to ask this question is all the greater because of the origins of most of the Act's provisions. The majority of OSHA required procedures were not new safety ideas for industry. Most of them, in the form of standards and recommendations, had been in existence for many years. They had been developed, tested, proven, and frequently updated by representatives of management, labor, and technical groups, and by federal and state agencies and trade associations. The American National Standards Institute, American Road Builders Association, Army Corps of Engineers, National Fire Protection Association, National Safety Council, Society of Automotive Engineers, and Underwriters Laboratories are examples of the many sources of these well-established safety principles.

What OSHA did was bundle these established guidelines and standards into one big legal package. Safety recommendations that previously relied heavily on voluntary compliance acquired the force of the law, with heavy penalties applicable to violators.

Why, then, the deteriorating loss experience in so many cases and the unchanged or increased rates of job-related injuries and accidents? That inside trucker's actions raise a question and may point toward an answer. Has zealous compliance with the myriad of OSHA rules detracted attention from other equally vital aspects of an effective safety program? The right attitude, for example, which is not covered by an OSHA spec, is what that worker lacked. It almost seems as if people have lost sight of the forest because of the trees. I will get back to attitude later on.

Raising the question of over-zealous compliance is not to say that OSHA does not serve a useful purpose. On the contrary, its objectives are consistent with the objectives of any safety program. However, compliance with rules to make the working environment safe, while an important part of every loss control program, is only one facet. By itself, it will not achieve the long range goals of the program. Here are two illustrations taken from our files that are typical.

One of The Hartford's insureds is a medium sized producer of packaged food products. During the past three years, the firm's rate of disabling injuries has steadily increased, as has the loss frequency rate. Management has given much attention to compliance with OSHA regulations, including OSHA supervisory orientation meetings; noise, toxic materials and dust surveys; simulated OSHA inspections; and so on. But other aspects of the company's safety program are weak. So, while the firm looks great on OSHA compliance, its loss record is poor.

Contrast that situation with the experience of a large firm in the Midwest that is in the transportation equipment business. Management, while integrating OSHA into its system, has not broken stride in carrying out the rest of its safety program. The strategy has been to continue attention to all facets of loss control. Not only has this policy been successful, it offers a good example of OSHA's beneficial effects. In 1972 there was a significant decrease in frequency of injuries, from 930 to 550, with a corresponding drop in dollars paid on compensation claims compared to the year before. Also during the year, across-the-board efforts directed at conditions responsible for accidents have successfully reduced the public liability loss frequency by 46 per cent. The experience would seem to illustrate OSHA's ability to strengthen an already well-established safety program.

Two examples are not intended to prove anything, except that they are typical of the two groups into which the majority of our accounts fall.

Thus it seems that there are two ways of looking at (or utilizing) OSHA: improperly approached, it hurts a safety program; properly used, however, OSHA can enhance it.

Evidence suggests that the loudest complaints about OSHA are most likely to be ade by those with the worst health and fety conditions.

The Hartford's experience insuring hunreds of firms of many types and sizes has ielded no correlation between the size of ompanies and the degree of difficulty expeenced in stepping up to the requirements of ie new law. The companies hit hardest by)SHA were those of all sizes whose houseeeping was habitually sloppy, whose safety ducation programs were weal , and who folowed the rule, "We'll fix it when it stops unning."

One is led to the conclusion that perhaps)SHA's chief problem is that many people ire not being fair to it. On the one hand, the iew law is being asked to take on far too ieavy a share of the accident burden; on the other, the law is the object of criticism much of which has little factual basis. The result is that an inherently valid piece of legislation has become a crutch, expected to prop up a shaky loss control effort that may need program therapy rather than prosthetics.

So what should be done?

While it may seem presumptuous, I would like to share with you my thinking on a different kind of OSHA. My OSHA does not mean Occupational Safety and Health Act. Rather, it stands for four key points that are critical in any successful, effective program of loss control. I perceive these as Ownership, Supervision, Hindrances, and Attitudes.

Ownership is a term that may seem strange to some loss control people, but it is the keystone of property underwriting. The owner must possess the will to preserve and maintain his property. Insurers usually avoid coverage on a risk if there is any reasonable doubt as to ownership, or where a moral hazard exists. Ownership in a very broad sense includes all and more than is implied by the term "management." Ownership is a measurement of the corporate will to preserve and protect its assets. It means understanding risk and the management of risk as an economic imperative.

Ownership also sets objectives for the corporation and measures the contribution of each facet of the operation in terms of how well that facet promotes the overall corporate objectives. Most of these objectives are profit related, so ownership recognizes costs and makes a visible commitment to cost control. Ownership reflects a recognition of hazards and problems inherent in the risk in a completely businesslike manner. This embraces housekeeping and care that display pride in a good operation. It is reflected in building maintenance. It is reflected in the vigilance with which management avoids or protects against physical and fire hazards. As the saying goes, "A clean risk never burns."

Ownership is reflected even more fundamentally in the corporate viewpoint on losses. Many companies recognize that insurance costs are directly related to the corporate loss experience, but they frequently fail to recognize fully the implications and costs associated with these losses. Some fire and explosion potentials are so serious that a company might have difficulty in surviving them financially. They might also have the effect of putting a company out of business because of the loss of critical production line components, taking months to replace in the event of a total loss. With production gone and unable to fill orders for an extended period of time, it may well be that a company could never recover its markets.

It is no longer acceptable to judge the desirability of loss prevention recommendations merely by comparing the capitalized costs of protection with savings in insurance premiums. The cost of a sprinkler system is not just a matter of how fast it will be paid for in reduced insurance premiums, but rather may be an investment in survival as a going business. The cost of creating a safety organization is not a matter of whether safety credits under schedule or merit rating are greater than the cost of the organization itself. Bringing plant conditions up to standard is not a matter of camparing their cost versus possible fines for OSHA violations.

Loss control must be evaluated costwise in terms of risk, which makes it essential that we understand risk. It is fundamental that practitioners of loss control understand this, that they set their sights on and tailor their programs to corporate objectives. They must seek ways to measure their results in the same

framework, not merely to justify their existence, but to secure the blessings and backing of ownership for expanded and broadened programs in the future.

For ownership, through management, will get what it wants and needs, and it will understand the loss control effort best if it is an integral part of the management process. We should have learned long ago that it does no good to complain to each other that "management is not sold."

The "S" stands for *Supervision,* and I need not dwell on its importance in a successful loss control program. It implies a delegation of responsibility for results to, and an acceptance of this responsibility by, supervision, based upon thorough understanding. It requires, therefore, provision for supervisory training:

1. In understanding these responsibilities.
2. In systematic observation and investigation of conditions that are not in conformance with accepted standards.
3. In awareness and recognition of potential trouble spots, based upon observation as well as the record, and establishing of priorities for attention.
4. In initiation of and insistence upon corrective action for hazardous or substandard conditions or substandard performance. For supervision must know and enforce standards, health and safety standards as well as performance standards in every area of the job.
5. In the importance of communication of these attitudes to and education of all levels of personnel.

Supervision must avoid becoming the victim of what has been called "the activity trap." This is the situation that people find themselves in when they start out for what seem like very clear objectives; but very shortly become so involved in the activity of getting there that they forget where they are going. The once clean-cut goal'becomes lost, but the activity remains and becomes an end in itself.

Company policies and procedures must keep the supervisor in the line of action and in no way relieve him of responsiblity for results. Otherwise, reliance on staff functions, such as loss control, will inevitably defeat attempts to achieve effective loss control.

"H" stands for *Hindrance.* A hindrance is anything which interrupts, delays, or interferes with the orderly progress of the job or activity; which slows, obstructs, or causes a harmful delay in completing the job according to schedule or plan.

Hindrance embodies the concept that loss control is an operating problem. Accidents and injuries most definitely interrupt and interfere with getting the job done. They are only one of the many results that become visible when something goes wrong. They are usually blamed on hazards, a term well known to loss control people.

Loss control people tend to attribute some special significance to their particular area of concern for safety, ignoring the fact that the same conditions causing accidents or injuries have either been causing or could cause many other operating problems of far greater concern to management than a minor injury. Accidents and injuries are merely clues to the fact that something has gone wrong in the basic process of management: a breakdown in the planning or utilization of physical plant; a failure to recognize the inherent qualities and hazards of materials; or inadequacies in the instruction and supervision of people.

During the 1940's, The Hartford developed concepts concerning the need for proper attention to equipment, material, and people. These concepts have been adopted by many organizations. After all these years I still consider them the most basic and sound approach to effective loss control. They are based on supervision recognizing and accepting its responsibilities to give proper attention to the 12 items relating to three major production factors, as shown in this chart:

Equipment	*Material*	*People*
Selection	Selection	Selection
Arrangement	Placing	Placing
Use	Handling	Training
Maintenance	Processing	Leading

The ultimate correction of every loss producing condition that I have encountered in over 25 years in this business can be found in one of these 12 items. Responsiblity for the recognition and correction of hindrances leads directly back to supervision, and to ownership which says that this is the job of supervision.

And every injury, fire, damage to property, or other hindrance is a warning signal that something has gone wrong in the system. It cannot be undone, but it can be valuable and useful in terms of future savings, if properly investigated.

"A" stands for *Attitude,* and by attitude I mean the awareness or safety consciousness of every employee. Although instructions and policy originate with ownership, no amount of regulations, bulletins, or instructions will guarantee results unless people have positive attitudes, receptive to these instructions, and know that they are the attitudes of their superiors all the way up the line.

An incident that recently came to our attention in an east coast company may serve as an illustration. An employee had to replace a burned out light bulb in the ceiling. To do so he placed one 55 gallon oil drum on top of two others and climbed up on top. He couldn't be bothered to go for a ladder that was available in another part of the building. The inevitable occured, the top barrel slipped and the employee fell, badly injuring his back.

Now Section 1910.25 of the OSHA regulations includes many detailed specifications, tables, and formulas regarding portable wood ladders. They cover portable stepladders, portable rung ladders, platform stepladders, painters' stepladders, masons' ladders, and trolley or side rolling ladders. The tables include a classification of species of wood acceptable for use in ladders and formulas for computing stresses on a given ladder. But nowhere in the OSHA regulations is there anything that says you should not stack empty oil drums on top of each other as a substitute for a ladder.

This incident is an example of the fact that with a proper attitude and awareness of the potential hazard, the idea of stacking drums on top of each other instead of walking a short distance to get a ladder would have been utterly ridiculous to this man. Attitude was certainly a prime factor that caused the other worker to kick his dolly down the stairs.

I believe that the development of proper attitudes is, to a large extent, dependent on whether a man perceives these same attitudes in his foremen and other levels of supervision. I know this was not the first time that he or other workers had taken shortcuts, or taken chances with make-shift equipment, and had been permitted to do so by the foremen. Permissiveness quickly becomes encouragement, and establishes policy..

Although the employee under federal safety regulations has only minimal responsibilities, we make a mistake by not involving him in the total loss control effort. He should be fully aware, through training, of all the safety regulations and standards that are applicable to his job. I believe that this training should come from management. The fact that he has not received this kind of training from management has led unions to initiate their own training programs and has promoted an unnecessary adversary situation. The employee is entitled to protection, under the law, against unreasonable hazards to his safety and health. Yet we have resisted making him a part of our team in the mistaken belief that doing so would invade the prerogatives of management.

There is an old saying that "to be forewarned is to be forearmed," and nothing could be truer in its application to safe working conditions and safe working practices. Our problem is to develop an awareness of hazards, to learn how to recognize them when they are in front of our nose. We must develop the attitude that we all want to find ways to improve conditions in a mutually constructive and cooperative way, rather than considering that we are somehow adversaries in this process.

This version of OSHA, the acronym I have created, seeks to demonstrate that there is much more to loss control than regulations. The four concepts selected embrace a total loss control program. The first is *ownership,* embracing the concepts of risk management, and demonstrating a dedication to preserving and protecting the corporate assets through the setting of realistic profit-related *objectives.*

The second is *supervision,* trained and practiced in accepting the responsibilities for loss control that have been delegated by ownership, including maintenance of an operation that meets safety and health *standards.*

The third is *hindrances,* a recognition that accidents and injuries are operational problems arising out of *hazards,* to be controlled in the same way as any other hindrances that interrupt or interfere with the orderly progress of the job.

The fourth is *attitude,* a safety *awareness* on the part of all employees, developed through education and participation of all employees.

Such an approach requires a continuous program throughout the organization that fully accepts federal regulations and standards as an integral part of and in no sense conflicting with the overall program. You have all heard the saying about people doing the wrong things for the right reasons, and doing the right things for the wrong reasons. OSHA gives us a chance to do the right things for the right reasons. It is high time that we begin seeking ways to comply with federal regulations, not because they impose penalties, but because they can contribute to the loss control program. It is high time we stop letting compliance with these regulations distort or distract us from our total loss control effort.

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National Safety Council

A Membership Organization Dedicated to Protecting Life and Promoting Health

March 21, 2001

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To Whom It May Concern:

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Respectfully,

Robert J. Marecek

Robert J. Marecek
Manager, Library

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