EMPLOYEE SAFETY IN THE USE OF MEN AND
EQUIPMENT ON HIGHWAY MAINTENANCE

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In presenting this paper on “Safety In The Use Of Men And Equipment On Highway Maintenance” it is assumed that organizational procedure has been effected and functional duties clearly defined and assigned.

Accident Prevention, synonymous with Safety, is a combination of science and art. Primarily it represents control. Control of the performances of men and machines and of physical environments. The word “control” has a dual meaning in safety because it indicates both prevention and correction of circumstances and conditions. Thus defined, Accident Prevention is vitally important in every enterprise and, if ignored or hap-hazardly practiced, leads unerringly to needless suffering and outright waste of time, equipment and materials. From the past history of accidents, with their resulting injuries to human beings and damages to property, it has become increasingly apparent that man-failure is the heart of the problem, and it is equally clear that methods of control must be directed toward this man-failure. Danger itself is not necessarily dangerous if a full and comprehensive knowledge of that danger is possessed. Control of personal performance in the presence of potential danger can in practically all cases sufficiently minimize the hazard to such nominal proportions that effective work and accomplishments can be carried on without unnecessary loss of life or property. Combining the art of controlling performance with the science of engineering has resulted in making commonplace many things formerly though impossible. The long range approach of training and education to the task of accident prevention is as necessary as the immediate approach to existing hazards because it is a continuing task impossible of separation from activities. Accident Prevention may be defined as a continuous series of coordinated and integrated activities looking to the control of personal performances and physical conditions based on available and controllable knowledges, abilities and attitudes. Safety, or Accident Prevention, involves three basic requirements, without which effective results can not be expected. The degree of effectiveness will be in direct ratio to the completeness with which they are established and made to function. They are:

1. Attitudes
2. Facts and Fact Finding
3. Selection and Application of Remedy
Attitude

Attitude covers an extremely wide range in Highway Maintenance, just as it does in all other activities. It covers not only our considerations for fellow workers and our efforts to produce with the least amount of suffering and loss of equipment and material, but it entails the additional consideration of the traveling public and the attitudes developed by them as a result of their fleeting contacts with us. We must not forget that the public forms its opinion of us largely by what they see as they drive along where men and equipment are engaged in repair and maintenance work. Attitude is a basic human make-up complex which must be influenced and channeled into patterned effort. It includes contentment, cooperation, pride, loyalty, responsibility, desire to accomplish and hope for security. It embraces the struggle for advancement and the dominating need of recognition. Attitude is the foundation on which all subsequent actions depend for success.

Over the whole range of supervision it is perhaps impossible to single out the level at which attitude is most vital to success or failure. In fact, there can be no high or low points in cooperation or responsibility; no shrugging off of duties at any level.

It is universally conceded that actual accomplishment in Safety, or Accident Prevention, begins with the superintendents, county foremen, and special crew foremen. The foreman occupies an important and strategic position. He explains, interprets, instructs, and enforces orders. He is the man who actually gives orders and instructions. As far as the maintenance crews are concerned, his work is authoritative and final. He knows his men personally and his influence and example, as well as his authority, gives him a degree of control greater than can be exercised by any other person.

With the foreman in an admittedly favorable position, how then do we gain and fully exploit his intelligent and sympathetic support? It is certain that we do not gain it by dilatory and disinterested attitudes on the part of supervision above him, or if he suspicions that the safety of his men and the conservation of his equipment is of minor and negligible importance. We cannot gain it if we fail to educate and instruct him in the importance of this phase of his duties and responsibilities. To whom does he look for this education and instruction? To properly impress him with its necessity and importance it must come from or through those to whom he looks for all other supervisory instruction. Thus it is of equal importance that the attitude of supervisors above him reflect the same interest he is expected to show. So it goes through all supervisory levels right up to the top. It is characteristic of human behavior that the interest of a person may be aroused by
proper appeal to one or more of his stronger senses or desires, and the amount of interest thus created varies according to the kind of appeal made.

Thus the conclusion is reached that all accomplishments in accident prevention produced by the science of engineering and the art of supervision must depend upon and receive its motivating force from attitude.

**Fact And Fact Finding**

Assuming that a sufficient degree of executive and supervisory attitude has been developed and enough interest created to support an attack upon the accident problem, the next step is the development and assembling of facts from which the formulation of practical prevention procedures can be effected. Without facts from which to draw assumptions no specific measures can be instituted leading to performance control. Many definitions have been given for the word accident. Most dictionaries tersely define it as “an unforeseen event”. However, it is much more than that. It is but one of several factors in a chain of events that may terminate in personal injury and/or damage to property. It is never planned. On the other hand, it is not always unforeseen. An example can be cited of fast and reckless driving on the highways. We can not definitely state under what circumstance an accident will occur but we can without much doubt foresee that accident is sure to result. This brings us then to the causes of accidents and the methods used in finding them. In accepting the common definition of cause as “that which occasions or effects a result”, it must not be overlooked that there may be several causes of any one accident. While the direct cause of an accident may be a specific unsafe act which results directly in the accident, there is also an underlying cause or causes, which may be tied directly or indirectly to attitude, education or training.

While continuous and unflagging attention must be given to such things as inadequate guarding, defective conditions, hazardous arrangement, methods, processes, planning, etc. which are correctible by engineering revision, we must also know the direct personal causes such as “making safety devices inoperative”, “working on moving or dangerous equipment”, taking unsafe positions or postures”, or “lack of alertness to surroundings”, before we begin to look for those underlying causes which allowed the condition to exist or occasioned the unsafe act.

In classifying the reasons that permit or occasion the unsafe acts of persons, we believe they fall into four categories: Namely; (1) Improper Attitude, (2) Lack of Knowledge or Skill, (3) Physically un-
suited, (4) Improper Mechanical or Physical Environment. Both “im-
proper attitude” and “lack of knowledge or skill” are subject to cor-
rection and improvement through the proper appeal by means of ed-
ucation and training. The physically unsuited will require intelligent
and careful placement; while mechanical or physical environments de-
depend for correction on the professional engineer’s skill in design, lay-
out, and planning.

It is believed that the person most logically qualified to inquire
into and learn the facts of accident occurrences is the supervisor who is
in charge of the operation. Not only is he logically best qualified but
he has the best opportunity as well. Without doubt, he is or should be
personally interested in knowing about those events that cause injury
and damage to men and equipment placed under his control. In ad-
dition he is the man upon whom the district engineer must rely to in-
terpret and enforce all corrective measures devised to prevent the re-
currence of similar accidents. Since district engineers must neces-
sarily charge supervisory personnel with various responsibilities which,
combined, account for the over-all accomplishments of his district, it
is believed that he can best keep himself informed by requiring each
supervisor to answer for his failures as well as for his accomplishments.
It seems fair to assume that when a supervisor is given charge of
specific personnel and equipment, that he should be called upon for
the answers as to why personnel was injured or why equipment was
damaged, and what he expects to do about preventing other injuries
and other damages. It is at this point that the work of a qualified
safety supervisor can be most effective. It is here that supervisory
personnel, and the safety man, should begin to study and analyze con-
ditions and causes and, with both in full agreement, devise specific
measures for control.

Since under our set-up safety supervisors have no command author-
ity, it is believed incumbent upon the district engineer to clearly
establish among all members of his staff the exact relationship desired
between his supervisory force and the safety supervisor’s work of recom-
manding, suggesting, and planning for education and training
of employees, as well as corrective measures needful or desirable for
the control of physical and mechanical conditions. With this relation-
ship clearly established, the line of authority from district engineer to
the foreman maintains its unbroken chain. It prevents the division of
authority and thus eliminates any possible confusion on the part of the
foreman. The safety supervisor should, it is believed, be given the
status of personal representative of the district engineer in all ques-
tions of accident prevention so far as his qualifications justify, and his

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work of instructing, training, suggesting, etc. should be carried out with the full knowledge and cooperation of all supervisors, and in accordance with accepted methods of procedure. The safety engineer's function should be one of fact finding, analysing, advising, organizing, and he should be a salesman and a builder of enthusiasm.

It might be asked why it is necessary or of any advantage to thoroughly investigate accidents which are admittedly past history, the results of which can not be changed. While it is true that no changes can be made after an injury or after the destruction of a piece of equipment, it will be found that the main use to which facts leading to the accident are put is the determination, by groups, of the various causes. It will also be found that in given situations the causes and underlying causes will repeat with remarkable frequency and it is by grouping these similar unsafe acts or conditions that we are able to pin-point the predominating accident producers and devise methods for control or elimination. The breaking down of all the facts, conditions, and causes which led to an accident is the analysis picture required to inform responsible executives, and is the means by which the safety engineer can produce evidence in support of his often disputed contentions that improvements of safety conditions carries with it corresponding improvements in production efficiency.

Selection And Application Of Remedy

The building of attitudes and the collection and assembling of facts will be of no value in accident prevention, if no remedy is selected or, if selected, not fully applied. The correlation of facts is the basis from which conclusions must be drawn as to the things in greatest need of attention, and for the selection of common sense or practical methods to overcome or eliminate the causes. It would not be of any advantage to begin a program of driver training for all highway employees, when it is known that only a small percentage are actually engaged in the job of driving trucks and automobiles. It would also be inconsistent to assemble all vehicle and equipment operators and give them an intense training course in proper methods of backing a vehicle if it is known before-hand that only a few drivers have need of this particular type training. However after proper grouping of facts which has in the past been responsible for injuries and accidents, it can be determined whether attention should be given to the development of attitude, or education and training be provided to give knowledge and skill in particular phases of performance. Remedies produce results only when they are applied to specifically known causes of accidents, and it holds equally true that knowing the cause without applying a remedy
is as useless or insufficient as applying a remedy without knowing the cause. It is true also that the selection of a single remedy is often applicable to several types of causes. I believe that it is safe to conclude that if we are to accomplish our aim of reducing the number and severity of personal injuries and the number and extent of vehicle and equipment accidents it is essential that we give our immediate and intense attention to these three things: we must by example, by training and by instruction, channel the attitudes of all employees, of whatever rank, toward a desirable state of cooperative effort; we must make sufficient detailed investigation into the occurrences of accidents that we can readily assemble the facts and know the causes which led to their occurrences; and that we must select and fully apply the remedy, whether it be one of engineering, planning, training, education, placement or discipline. I believe that this is the only method by which we can assure ourselves that we have brought this phase of our highway program to such a level that we can justifiably state that we are accomplishing our objectives with a minimum amount of human suffering and loss or waste of equipment and materials. I most certainly am of the belief that this is not the case at present, as I am equally certain that remarkable improvement can be made by a whole hearted application of these principles. To me it is clear that success in the protection of men and equipment in Highway Maintenance operations depends upon the development of a proper mixture of the three basic requirements.

In my search for facts and theories, and as a result of the work performed in preparation of this paper, my entire concept of the necessity and desire for improvement in our Accident Prevention Program, and the possibilities of accomplishing it has been decidedly altered. I believe that as a district engineer, I am now able to give a fuller degree of attention to the important job of accident prevention. I believe that it can be integrated into our everyday operations to the extent that it becomes a natural, wholly acceptable part thereof.