

# DEPARTMENT OF MAINTENANCE

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## ACCIDENT PREVENTION ACTIVITIES OF A STATE HIGHWAY DEPARTMENT

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### SYNOPSIS

THE REDUCTION and control of accidents within a department actually requires four programs: (1) control of accidents within the daily physical activities of highway personnel in all their hundred or more operations; (2) control of accidents occurring in the contact between these operations and the traveling public; (3) control of accidents in the operation of all department equipment; and (4) control of accidents on contracts awarded to private contractors working under the direction of the highway department.

One hazard accounting for the reduction of personnel efficiency and the incurring of lost time is poison-ivy dermatitis. Eradication of the plant has been effective, but for budgetary reasons the control has been limited. The introduction of preventative inoculations to combat infection have recently been applied on a large scale.

Most traffic control devices, maintenance warning signs in particular, do not meet the modern demand. First, they are too low to parallel the motorists' line of vision; second, they do not state what type of operation is being conducted; and third, they do not give the motorist clear-cut directions for his future line of travel.

After an intensive course in safe operating principles and teaching methods, instructors may take over groups within their own district. The training consists of: (1) explanation and discussion of regulations on equipment operation; (2) briefing on the mechanical structure of equipment; (3) psychophysical test on visual acuity, color recognition, field of vision, depth perception and reaction time; and (4) thorough road instruction course covering all phases of highway equipment operations.

The inclusion of an accident-control provision in each contract makes accident prevention an integral part of each contract job. The contractor is referred to his own publication, the *Manual of Accident Prevention in Construction* compiled and published by the Associated General Contractors of America. This special provision is just as binding as any provision which specified quantity or quality of work performed.

● IN THIS PAPER the authors wish to stress four distinct points: first, the need for accident prevention activities in a highway department; second, the preliminary organizational steps which must be taken to properly cope with the problem; third, the citation of a few typical operational problems and how they were handled; fourth, and last, the results which have been obtained by such a program.

Concerning the need for accident-prevention activities, it might be well to define what constitutes an accident. An accident is an unintentional interruption to any orderly process which causes a turning aside from an

intended procedure. The injury to employees, the damage to vitally needed equipment, the reduction in productive man-hours are results of accidents. They are the impressive outward sign of something having gone wrong inwardly.

Accidents either cost money or produce human suffering. Usually both facts pertain. Using the results of the questionnaire circulated by our committee, requesting statistics for the past year, we note: "Eighty-six highway employees killed during 1950. Over \$10 million of highway funds dissipated in direct and indirect costs as the result of these acci-

dents" These figures are only for the death cases. Figures for cases involving permanent injury, loss-time injury, and minor injuries are many-fold times the costs just stated.

Concerning the second point, the steps which must be taken to properly cope with the problem, there have been many dismal failures in the past in accident-prevention programs. The history of these failures shows that the programs were too altruistic and the delegated officials tried too hard to do the right thing.

The establishment and operation of an accident-prevention program within a highway department should follow a definite pattern. Before setting up or organizing an accident-prevention program, one vital fact must be recognized and accepted: the program will become a permanent part of the activities and those handling the program will have a definite place in the organizational structure of the highway department. A safety drive at periodic intervals will never prove sufficient. New machines, new methods, new surroundings, and new personnel are always entering the picture. Accidents know no off time; therefore, prevention of accidents should have no off time.

Let us now get back to the definite pattern of organization which we feel is so necessary to operate a successful program:

First, and most important, the program must have the wholehearted support of the top official of the department.

Second, the selection of the proper person to organize and carry forward the program of accident reductions is of paramount importance. This person must have three definite qualifications: the proper personality, an analytical mind, and a knowledge of the department activities.

Third, the accident-prevention organization must be so framed that the head of this activity reports directly to the top official of the department. Failure to accept or recognize this fact has produced many abortive attempts. Placing safety research, study, and education as a byproduct under personnel or operational officials will not work. The ultimate result is always a gradual diversion of the duties of the safety director from accident prevention to purely operational work.

We are not attempting in this paper to set up or recommend an organizational structure

for accident-prevention activities applicable to any highway department. We believe this question is a personal problem of each individual highway department. The solution of this problem is an individual case study of each highway department and will vary with the number of employees, geographic extent, operational organization, and other factors. We are attempting to point out a few cardinal principles we believe should be adhered to under all circumstances.

We have progressed to the point where we have selected the proper official to handle our accident prevention activities, and we have also designated to whom he should report. The next step is to state how this person should proceed.

With a little forethought these steps fall into quite an orderly pattern.

(1) Factual records of past experience must be obtained and analyzed. Causes, locations, frequencies, and major import of these accidents must be determined.

(2) Request the top official of the department to call a meeting of his key officials. At this time the head of the department should state that he, as nominal head of the department, not only solicits but expects the cooperation of those present in reducing accidents and forwarding the program established by the division of safety.

(3) Present the factual statistics and the anticipated program to key officials of the department, soliciting their cooperation, and seeking their advice as to the most orderly method of procedure.

(4) Establish district or division committees to consist of employee representation at all levels down to the lowest supervisory level. These committees will actually function as a clearinghouse for the whole accident prevention program in each district and may be used to study and review accidents, receive and recommend steps to prevent accidents, and aid in preparation of a safety handbook.

The assignment of employees to positions where they sit in judgement renders to the individual a source of pride. They are flattered. They become enthusiastic. In their enthusiasm they think and in so thinking devise safe methods, act safely and see that others do likewise.

(5) Prepare a handbook outlining the safety policies of the department. Have this hand-

book officially adopted and place same in the hands of every employee.

This book will serve two purposes. It will be instructional and thereby aid each individual in preventing accidents to himself. It will also be an enforcement guide.

(6) Publish monthly a record of departmental accident statistics segregated by districts or divisions. The record should also show the types of accidents.

This publication also serves two purposes. First, it encourages competitive attempts for improvement. Second, it points out weak spots in the program.

We have now progressed from the need for a program, through the preliminary organizational set up to carry out a program to the third point: the chief categorical activities within the program. These are four in number: (1) the control of accidents to highway-department personnel while engaged in one or more of over a hundred different operations; (2) the control of accidents occurring in the contact between these operations and the traveling public; (3) the control of accidents in the operation of all department equipment; and (4) the control of accidents on contracts awarded to private contractors working under the direction of the department.

Point four of this paper is the citation of a few typical operational problems and how they were handled. Time does not permit a detailed description of all problems. A few of the methods we employed were: operational training for new employees or old employees who had been re-assigned to new activities; physical examination previous to employment; physical examination of accident-prone individuals; first-aid training; and use of training films.

Taking the first activity, the control of accidents within our daily operations, we have picked one cause of high frequency that may surprise you. However, it is one that seems to be a constant source of trouble with all highway departments as shown by their accident frequency reports. It stems from an innocent looking, three-leaved plant prevalent along most of our highway systems: *Rhus toxicodendron*, known as poison ivy.

At one time we were losing as many as 600 days of man-hour production a season. During the past year we have been successful in reducing this loss to a minimum by resorting to the following methods:

All new employees were screened for their past medical history on susceptibility to the weed. If they were found to be susceptible, they were placed on a job which minimized their exposure. In all cases protective liquid was supplied to the field forces, and its application made mandatory. An educational program on secondary infection was held. This program helped reduce the exposure both to our employees as well as to their families. With the cooperation of the state department of health, approximately 475 susceptible employees were inoculated early in the season of 1951 as an additional preventative measure. To our knowledge, with the exception of tests conducted by the Army Medical Corps, this is the first time ivy preventative inoculations have been given on such a large scale. To date, less than 5 percent of all the men inoculated have reacted unfavorably. One of the most important phases of prevention has been the introduction of our eradication program along state highways. As more funds are made available we hope to increase the coverage each year until the exposure to our employees and the public has been reduced to a minimum.

The second phase is the accidental contact between highway operations and the traveling public. During 1950, 41 out of 48 state highway departments reported a total of 86 fatalities. They were not all caused by passing traffic, but a large enough percentage were to make it a problem.

All state highway departments (and the same is true for public works departments, municipal departments, and federal agencies who perform similar services) follow the same general pattern in traffic protection. These agencies utilize warning signs, flagmen, and in some cases, police protection. But a preliminary study has shown that the average application has been far from satisfactory. Warning devices are placed because the foreman says to place the signs. What the foreman does not do is to instruct the men as to how the signs should be placed. As a result they are usually placed so that they confuse the approaching motorist, rather than guide him safely past the work project.

Working on the assumption that the majority of today's drivers will conform to traffic control devices, we conducted a test in sign placement. A typical maintenance operation

was set up, using the same pattern for sign placement that exists nationally.

A speed-reduction check was made on vehicles approaching the work site. This check was made from the time the motorist first observed the sign until he had passed the work zone. The reduction in speed was negligible. We then raised the height of the warning signs to a level which paralleled the approaching motorist's line of vision. Immediately a speed reduction was apparent. Next we advised the motorist what was being done: road oiling, joint pouring, drainage construction, etc. To complete the picture we advised the motorist just where we wanted him to travel: keep right, keep left, single line, etc. With each successive step a definite change was observed in speed reduction and the manner of operation as the motorist proceeded through the work area. As a final preventative measure we supplied each of our field employees with a red cap. We furnish our employees two of these caps a year, one cap being summer and the other winter weight. The small expenditure has paid dividends. Since the adoption of the plan we have outlined, our relations and contact with the traveling public have greatly improved.

The third phase of the overall program deals with the operation of department equipment. An analysis of equipment accidents over a 5-year period pointed out the need for a training program. Not a training program dealing entirely with actual vehicle operation, but one including a clear interpretation of existing regulations issued by our motor vehicle department and our own highway department. It was set up as two programs: the first dealing with new or temporary drivers and the second with older, permanent operators whose record indicated the need for a refresher course. Three driver-instructors were picked from each district and given an intensive 2-day session on the application of the training methods. Then 1-day sessions were conducted with groups of eight to ten trainees. The instruction followed five steps:

- (1) An introduction by the instructor outlining the course to the students.

- (2) An explanation and discussion on the driver's manual issued by the department of motor vehicles and the regulations on equipment operation included in our own handbook.

- (3) A briefing on the mechanical structure

of our equipment with special emphasis being placed on the braking systems, body hoist hazard areas and tire inflation and maintenance.

- (4) Psychophysical tests which included visual acuity, color recognition, field of vision, depth perception and reaction time were given each student. The results of these tests were utilized to reveal to the operator physical shortcomings of which he may have been unaware and advise him how to compensate for these shortcomings in his driving.

- (5) Each trainee was taken on a road-instruction course by the driver-trainer from his section of the district. This instruction included all the contingencies of highway operations, stressing in particular such items as backing of vehicles and the attaching and detaching of all types of mobile equipment. At the conclusion of the road-instruction period the driver-trainer completed a form reporting on the performance of the trainee and indicated if the employee needed further instruction.

As a further step in driver control we have a central accident analysis committee composed of a representative of our insurance carriers, our chief equipment engineer and a member of the safety division. Each equipment accident is reviewed by this committee and judged chargeable or non-chargeable. In chargeable cases the employee involved appears before his district committee to explain his side of the story. If disciplinary action is necessary such recommendations are forwarded to the district engineer by the committee.

The fourth phase of the overall program is the control of accidents on contracts awarded by the department and performed by outside contractors. We have a dual purpose in the exercise of control in this particular phase: first, the protection of our own employees who are engaged on the project as inspectors or overseers of the work, and second, the reduction of accidents on contract work, from the public relations standpoint. Accidents on contract jobs usually stem from the contractor's operations in performing his work. Nevertheless, the reaction from the public or the press is usually directed toward the highway department. We have found excellent control possible through the inclusion of a special provision in our specifications. This provision does not bind the contractor to safety provisions set up by our own department. It simply binds him to

his own publication, the *Manual of Accident Prevention in Construction*, compiled and published by the Associated General Contractors of America. By use of a special provision in our project specifications this manual becomes part of our contractual documents and as such is just as binding as any provision in the contract which specifies quantity or quality of work performed. We are at present working on a plan to arrange for a precontract conference between the contractor, his insurance-carrier representative, a construction inspector from our state labor department, a representative of the highway district engineer and a representative from our own safety division.

What we have outlined in this paper has been along the lines of tangible corrections. But what about employee compliance, without offering incentives or exerting the disciplinary factor? We can only offer the plan we have found most effective, adopted within the past year. Up until a year ago we conducted foreman's safety meetings in each district. They were effective in accident-prevention education up to a certain point. We knew that we were not reaching all of the foreman as evidenced by the repetitive frequencies of accidents in the same type of operation. We conducted an IQ test at the foreman level. As a result of this test we were able to catalog the various attitudes and discovered this interesting factor.

Five percent of the men tested were over-enthusiastic. They, in most cases were youthful, theoretical-minded individuals who would have to be check-reined rather than encouraged.

Fifteen percent were enthusiastic. They practiced accident prevention daily on and off the job. They usually were progressive individuals who wished to improve their own working conditions. The accident-prevention program gave them a needed outlet. When screening this group as individuals, we found that they had been the "wheel-horses" in operational activities in the past.

The largest group, 60 percent, were the show-me type. The advantages of an accident prevention program had to be clearly demonstrated to them personally either by education, example, personal gain, or experience. Fifteen percent were the do-nothing type—old in spirit but not necessarily in age. The remaining 5 percent were definite obstructionists.

On what common ground could we meet these five groups? Our prime responsibility as

a department is public service in the form of constructing and maintaining our highway system. Individually and collectively our foreman had that common bond. So, rather than accident-prevention meetings, we have operational-training meetings conducted by the district administrative forces. In this manner we were able to bring in the same principles, but not in a direct manner. The barriers have fallen and the foremen more readily accept the procedures as part of the operational standards.

It brought home to us the fact that accident-prevention training and operational training are synonymous. Instruct and direct the employee in how to do his job efficiently and it follows he will also perform it safely.

Regarding any program or policy, there comes a time when the vital question must be answered, "Does the program or policy pay?" An affirmative answer to this question provides the foundation for continuance.

Accident prevention lends itself to this kind of evaluation. As a business investment it is as tangible as any normal source of income.

The results in the writers' department have been most encouraging. Employee morale has been increased by the knowledge that the impersonal entity called The Department is actually an agency interested in the individual's safety and welfare. The public relations of the department have been improved by the reduction of adverse public criticism which normally comes when an accident occurs.

A gratifying result is indicated by a substantial reduction in direct-compensation costs. This past year the direct-compensation reduction was \$33,665.35. If one uses the same yardstick recognized nationally, the actual savings would be approximately \$135,000. This would seem to speak for itself, since several miles of road can be built with this dollar saving.

One of the greatest accomplishments, since human suffering is the most important element, is that the accident-frequency rate of our department has been reduced 75 percent within a 3-year period. While our present figure is still higher than a few public-employee groups, it is definitely better than average and is definitely headed in the right direction—down. We see no reasons why other highway departments cannot obtain similar results if they follow similar techniques.