

doing right it is true, but not nearly so often as in doing wrong. It is far better that you lose your position by doing your duty than by failing to do your duty.

Co-operation Between County Highway Superintendents and State Highway Superintendents Necessary.

It frequently comes to my attention that some of our employes are in more or less conflict with local road officials because of either the county or state having a monopoly on certain supplies of road material. While each must have certain rights and responsibilities, it must ever be remembered that the taxpayers of the state are paying the bills and that if either set of officials can accommodate the other in any way without sacrificing to any extent his own work, it is his full duty to do so. A man can be **smaller than his job**, as **big as his job**, or **bigger than his job**, according to his treatment of others associated with him either directly or indirectly. Regardless of whether or not we may have exclusive lease on a pit, we do not expect to bar the counties from securing gravel from the pit where it is not necessary to do so, and where it would be a great convenience to them to secure such gravel. Likewise, I feel that it is the duty of the county to co-operate with the state to the same degree. You should not forget that while you occupy one position this year that you might occupy the other position another year; that we are all working to the same end, and that is to provide for the people of the state a convenient and economical means of transportation.

HIGHWAY MAINTENANCE FROM THE STANDPOINT OF SERVICE, SAFETY AND ECONOMY.

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There are some general requirements which any maintenance organization must possess, chief among them being fixation of responsibility. Without this being definitely placed and commonly understood and respected by each party affected, positive control over the work would be lost. The employee must be loyal to his superior authority. Fairness combined with discipline not only creates respect but there is inert driving power in it. To permit men in lower ranks "to go over the heads" of an immediate superior, tends to confusion and jeopardizes efficiency.

Each employee being assigned to some particular work, it is necessary that he be skilled in that particular thing he has to do. Here is a wonderful opportunity to carry out the apprentice system in road maintenance. A man begins at the most menial thing and, making good, is advanced to more responsibility. In this way an employee in a responsible position is familiar with all of the details of the work under him and efficient results will be had.

It is said that in a certain railroad executive office hangs a card which reads: "If the President of this Railroad should quit tomorrow all the company would have to do would be to hire a new office boy." Should not the same principle of organization as this card conveys be built into state and county highway departments? Possibly it is too much to hope for such an ideal condition of things, but by not working along that line thousands of dollars are annually wasted due to the questionable tenure of office or employment regardless of service. Continually breaking in green men on jobs requiring sound judgment, technical knowledge and experience, is done at the price of efficiency. This frequent turnover in personnel may meet with the approval of the public, in fact it appears at times that the public demands it. But, instead of gradually **building up** an efficient organization, one is **maintained** that tends to experiment upon the public with all the "new ideas" acquired with each change. On the other hand a maintenance organization must not be allowed to get into a rut formed by usage, routine or self-emulation.

The demands our highways are being called upon to meet are so great and changes in the methods of doing things are so rapidly taking place, that each man must study carefully his problems and develop his power of observation and application.

The organization we would have cannot be made up of misfits and function properly. The problem of maintaining our highways today is becoming more and more complex. It is not like construction with its specifications definitely laid down, hence the necessity for men having initiative, the ability to meet and overcome resistance and an inclination to serve the public with the best.

To maintain roads economically in a first class condition, the maintenance must be systematic and continuous. Systematizing the work requires a careful study of all the activities and the relation of each with the other. The different units must respond quickly to demands made upon them and to the proper directing authority.

The fact that our highways, no matter how well built, will not render continuous and efficient service without proper maintenance, is evidenced wherever the roads are only now and then

given the "once over." The amount and frequency of maintenance required depends somewhat upon climatic conditions and the nature and amount of traffic, due consideration being given the type of wearing surface. However, with the traffic increasing as it has been in recent years, the pass word for the maintenance organization might well be—"continuous work."

Experience has proven that the patrol system of maintenance must be installed to insure good roads at all time. When this system is functioning properly it will do wonders since the responsibility for the upkeep of a certain section of road is placed upon one person only. The whole organization is founded upon the patrol unit. Each section consists of a fixed mileage and when possible the patrolman should be stationed near the center of the section to which he is assigned. When choosing patrolmen, the maintenance superintendent should endeavor to get men who take more than passing interest in their work. A man placed in this position should be a good worker and be willing to take advice and learn. He must demonstrate his ability in this work and should, at all times, be courteous to the traveling public.

There is perhaps nothing more annoying to the highway user as he drives along the road than to have his attention repeatedly called to something that has been neglected. This may be a hole in the road surface, a washout in the grade, a broken down culvert or one of a thousand things. Neglected maintenance is an advertisement of slipshod methods, is the most expensive in the end and breeds disrespect for the highway and its keeper. We should, therefore, remedy these defects promptly and, instead of trying to keep a roadway in as good condition as when it was first built, strive to make it better year by year.

If this is not done, we will soon find ourselves vainly attempting to handle traffic under hazardous, if not impossible, conditions. One thing is certain and that is the motor vehicle is not going back to the day of the ill-kept highway. Rather, it is setting the pace for a highway development whose limits can scarcely be predicted. And when we speak of highway development, it is not wholly construction or reconstruction or maintenance. The big job is to maintain the road already constructed in good condition, the road that should be reconstructed and the road that is unimproved and perhaps breaking down.

What is wrong when a state or county maintains its roads well for a period, then neglects them? The answer is—organization. Results obtained will depend largely on the man in responsible charge, whether he be engineer, superintendent or commissioner. This man must be thoroughly familiar with the work at hand. He must be capable of handling men and should have a good working knowledge of machinery used in road work.

Maintenance departments must organize and equip for fighting snow. In many cases the regular maintenance forces and equipment can be used effectively. The principal thing is to be ready for fighting snow ahead of time and the work should be started as soon as the snow begins to fall and every possible effort made to prevent drifting. On account of the uncertainty of the work, and the probability that much snow removal equipment will be used only a few days during the season, taking the entire years interest and depreciation charges, the economic solution may be impossible, yet avoidance of serious traffic delays and interruptions will fully justify such work. In case snow removal is confined to a limited mileage, it is important that continuous routes be laid out without regard to county lines.

Safety Requirements.

Until quite recently, highway construction and maintenance was carried on with little regard to the element of safety. This is now considered one of the prime requisites of modern highway construction and a design that overlooks this is not good. There are a great many things entering into the design of a highway and until this time the design did not take into account the great volume of fast moving traffic. During these years thousands of miles of roads have been improved—the last word in highway construction being carried out. Then, a few years later, we find that many details of a construction nature must be added through maintenance. Road authorities must acknowledge the necessity of safe highways and devise methods of making them such.

During recent years much has been accomplished along this line but we have only begun. Maintenance forces must assume the burden of this work and maintain the highways for both safety and service. With the constantly growing volume of traffic it may be assumed that the number of accidents on the highways will proportionately increase, yet by safe driving together with the elimination of danger points, accidents may be reduced to a minimum. No matter where you go it is easy to find points on the highway which were comparatively safe for traffic a few years ago, but which are now the cause of many accidents. These dangerous conditions must be eliminated.

Sharp curves should be eliminated by lengthening the radius to not less than five hundred feet or by relocating and, on the most important main roads, all curves should be super-elevated having a radius of one thousand feet or less. Low type surfaces such as gravel and macadam tend to loosen and wear away rapidly on the inner side of sharp curves. Frequent replacement of material should be made and an effort made to keep the surface as compacted as possible.

The surfacing of main highways should be at least eighteen feet wide since the maximum width of truck bodies generally run about eight feet and there must be reasonable clearance for two lines of fast moving traffic.

Grades should be of uniform width and the shoulders must be sufficiently strong to carry turn-out traffic. Shoulders should be wide enough—say five to six feet—on all heavily traveled roads so vehicles may drive out on them and not interfere with moving traffic. A law was recently enacted in Michigan which prohibits vehicles from parking on the traveled portion of the highway. To abide by the law at all times and in all places may mean inconvenience for the driver but it is a great aid for highway accident prevention and should be adopted by all states. It would be well to note that this requires widening narrow road grades which is usually a matter of maintenance.

Good sight distances for both horizontal and vertical curves intersecting highways and railroad grade crossings should be obtained. Trees, shrubbery and obstructions of any kind, regardless of value, should be removed if by so doing the location will be made more safe.

Fruit stands, loading platforms and gas and oil filling stations should not be tolerated at the edge of the road grade. They are a source of danger and congestion to traffic and often interfere materially in maintaining a road grade and drainage.

Protection along deep road ditches should be afforded by means of well built guard fence constantly maintained with a white surface. The fence should be so constructed that in case it was struck by a motor vehicle there would be no danger of a section of railing going through the car, possibly injuring an occupant of the vehicle. In my judgment, a well built cable guard fence is the safest for highways and the most effective.

Many times the low type road built some years ago has an excessive crown. This should be cut down to a point where it is not a source of danger to the motorist.

As a rule pavements have been built where traffic demands are heaviest and we should do everything to safeguard traffic. An effective means of traffic control is to paint lines from four to six inches wide down the center of pavements, thus providing lanes which serve to divide and direct traffic. This should be carried out at least around curves, preceding bridges and narrow places in the road, approaches to steep hills or any place where there is a danger from overlapping traffic. The addition of a traffic centerline increases the safety to highway users as shown by observations of the habits of drivers on marked pavements. This is something that the traveling public welcomes and it promotes confidence for the driver when in heavy traffic.

I feel that center line marking of pavements is so essential to present day traffic that I will describe a method originated in Wayne County, Michigan, and adopted by a number of other Michigan counties. The outfit consists of a Ford truck on which is mounted a compressed air machine. A wooden wheel two feet in diameter and four inches wide covered with felt about one inch thick, revolves on an axle supported by framework attached to the rear of the truck. The wheel is placed on the left side of the frame so it will follow the left hand wheels of the truck. As the truck is driven down the road, the paint is applied to the felt about one foot above the pavement and is, in turn, transferred to the pavement as the wheel revolves. With such equipment two men can mark five or six miles of pavement per day which makes the cost very reasonable.

There is no such thing as a safe railroad grade crossing, but granting a crossing is not to be eliminated by relocation or the grades separated, we have the grade crossing to maintain in as safe a condition as possible. Care must be taken to see that the crossing is smooth. The most desirable crossing is one that is paved or has been given a substantial bituminous surface. At all grade crossings on dust laden roads, a section five hundred feet in length each way from the crossing should be treated with a dust layer. By keeping the dust laid the driver's vision is not impaired and the treated strip is a reminder to him that a grade crossing is near. The crossing should be planked or paved for the full width of the traveled way at least, preferably to the full width of the road grade.

In the interest of public safety all advertising signs and obstructions along the highways should be removed. This might include the setting back of rural mail boxes such that traffic would clear the box and post.

Reports should be required on all highway accidents and these filed with the proper highway authorities. The report should give the location and cause of such accidents and when these are compiled and studied it would be of great value to a road department as a guide in planning further improvements to reduce accident hazards.

It is only a question of time, I believe, when our heavily traveled roads will be policed and with the aid of rigid legislation, the motor vehicle driver will have more respect for all users of the highways. Regardless of the fact that the roads are being maintained in a safer condition all the time, there seems to be a growing indifference on the part of motorists.

It is evident that our duty is not only to maintain the highways in good condition, pursuing the work in an economical manner and with the least possible inconvenience to traffic, but

the frequency of highway accidents continue to be one of the outstanding problems. There is something wrong when motor vehicles annually take a toll of human life in the United States comparable to that great catastrophe, the World War. The solution may lie in part to proper education of the driving public, yet great responsibility rests upon road maintenance organizations.

Dust Prevention.

There are many reasons why roads should be kept as near dustless as possible. The enormous quantities of dust annually swept from our lower type roads proves a nuisance and is unhealthy not only to people traveling the highways, but to persons, live stock and vegetation adjacent to them. Clouds of dust add an extra element of danger to people using the roads. Material blown or swept from the road itself is lost and must be replaced at a big annual expense. These are but a few of many objections that might be named as a public menace.

There are two general ways in which the dust problem on gravel roads may be solved—by retaining the dust on the road surface and by preventing its formation. Materials such as calcium chloride and oils are commonly used with varying results. The results obtained are only temporary, hence the amount that can be economically spent for such treatments is not great.

The use of refined tars for surface treating gravel roads has had considerable attention in recent years, and excellent results are being had. The solution to our problem is to apply a bituminous material which, when applied properly, will render the gravel road dustless, grip each individual particle in the road surface and hold them together, enabling the surface to be maintained economically in a smooth and satisfactory condition. The big thing is to maintain the surface in an unbroken condition which necessitates patrol attention.

Road Marking.

One of the most important functions of a maintenance organization is to adequately mark the highways under its jurisdiction. Automobile clubs, associations, civic organizations, business interests and others have attempted to mark, in one way or other, the highways long enough. The time has come for both county and state to agree upon this matter and get into action. The Mississippi Valley Association of State Highway Departments has probably done more in the way of standardization of highway signs than any other group. Last year this association made some very definite recommendations on caution and warning signs that are applicable for county and state alike. In addition there should be erected standard distance and direction

signs throughout the state. There is no plausible reason why one state should have caution and warning signs different than another state—nor one county different from another county or state in which the counties are located.

Motorists are quick to make comparisons of the highway service rendered by different organizations. The condition of the highways largely determines the pleasantness of the trip, but the marking or lack of it makes the impressions that are not soon forgotten. So let us forget county and state lines and post our highways with uniform signs promoting safety and convenience to the traveling public.

If a county or state highway maintenance organization wants to make a decided hit with the public, then maintain all detours well. The motorist has too long considered the detour as a veritable appendix on the road system and he has been largely right—why? For the reason that it was a trouble maker and no part of the organization, construction or maintenance, wanted to adopt it.

We know the average driver of a motor vehicle is prejudiced when it comes to detours, but let us do our share and he will generally be tolerant to the extent of his. Don't close the main road and then start to maintain a detour—just change the system about and see what a soothing effect it will have on the driving public. Give the detour fully as much attention as the road for which it is intended, and with the right kind of marking and patrolling, the big troubles will be removed.

There can be no such thing as efficient maintenance without the work being planned some time in advance of its being done. It takes a number of years to develop a good maintenance organization and during that time a program is being worked out that is imperative for economical results. A man cannot pick up in any one or two seasons, the many details of this work and become familiar with the history and behavior of the various roads he may have under his control. A road must be "known" to be handled in an economical way and when this is the case, much trouble and expense may be saved. In other words, it is much better to prevent certain things from developing on a road than to try to correct what might have been avoided. This is where a man's full knowledge of conditions he has to work under pays good dividends in service and economy.

It is important that accurate costs be kept on the maintenance of different roads and of different types. These costs should be studied from year to year and are of great value when adjusting the annual budget.