

EFFECTS OF THE WAR ON STATE HIGHWAY WORK

Samuel C. Hadden,

Chairman, State Highway Commission of Indiana

When the program for this Road School was prepared some weeks ago, the topic assigned me was: "What It Takes to Perfect a State Highway System". Since the assignment of that subject, our country has actively entered the second World War, and this fact takes all thought of attaining perfection entirely out of our minds. In a world as imperfect as that in which we are now living, any discussion of perfection is out of order. We might dwell on that subject just long enough, however, to remark that two of the conditions that must be present if we are ever to attain perfection of our State Highway System are a long era of unbroken peace and a long era of prosperity. Since such eras are neither present nor near at hand, we may as well abandon the original subject entirely and discuss one more in keeping with the present times and circumstances. With this thought in mind, I have obtained the permission of the Chairman of this Road School to change my subject to read: "Effects of the War on State Highway Work". I am sure that is the subject uppermost in the minds of all the members of the State Highway Organization, of all the contractors and others who co-operate with the Highway Department, and of the press and general public so far as highway matters are concerned.

Of first importance now, as always, is the subject of finances. It is well known that certain appropriations are made for other purposes before any money accrues to the account of the State Highway Department. Not only are the costs of collecting the automobile license and gasoline taxes deducted from the yield of these taxes, but the appropriation for the State Police, the appropriation to the general fund, and the appropriations to the cities and counties for street and road purposes, are prior claims on the proceeds before any money goes to the State Highway Department. In ordinary times, and especially in good times, it is probably to the advantage of the State Highway Department to have these other appropriations fixed in amount so that large increases in revenues will directly benefit the state department. But when the yield of these taxes decreases, all shrinkage comes out of the money that would ordinarily go to the State Highway Department. It is recognized that, with tire rationing and the curtailment in the production, sale, and use of motor vehicles, the yield of our motor-vehicle-tax revenues may shrink substantially and even greatly this year. Just how much this shrinkage will amount to, no one can say at this time; one man's guess is as good as another's. We do not know for sure that all the restraints that can be imposed have as yet been imposed; there may be

others still to come. Even the effects of the present restraints are not yet clearly evident, although there is a likelihood of a substantial reduction in the State Highway revenues.

It may be, however, that the shrinkage for the year will be less than now seems likely. While there are various influences operating to reduce travel and revenues, there are certain compensating influences operating in the other direction. Moreover, it is impossible to tell just how long people will voluntarily refrain from the use of their cars, if they will run; and it is also impossible to tell how long people will be permitted to use their cars even if they want to and can obtain tires, repairs, etc.

Despite all these uncertainties, it is clearly incumbent upon us, and it is our firm intention, to carry on our customary activities as nearly as possible in a normal manner, consistent only with our great obligations in connection with the war effort. It is our hope that the total amount of our construction



Fig. 1. Widening with concrete along brick section of U. S. Highway 31 at Whiteland preparatory to resurfacing.

this year will not shrink greatly as compared with recent years, even though we are shifting the emphasis from roads carrying only general traffic to those carrying a very large volume of traffic created by wartime conditions and activities. Hoping, and believing, that we may accept this as our guiding philosophy in the present year, we may now turn our attention to some of the definite effects of the war upon several of the major subdivisions of the State Highway Department. Let us consider them one by one.

ROADSIDE IMPROVEMENT

Roadside improvement came into the highway picture: (1) when the strictly engineering approach set up conditions for which mechanical solutions were not the answer, and (2) when, as the width of right-of-way increased from 60 to 70 feet to the 100 or 200 feet required for the modern road, vegetative cover had to be established on at least 70 per cent of that right-of-way.

Alteration of landscape practices in gradients, the longer warped slopes superseding the old $1\frac{1}{2}:1$ slopes all cut to the

same plane, was one of the definite factors in holding maintenance costs stable in spite of the rapidly increasing areas within the right-of-way. Sodding, seeding, mulching, and soil treatment processes are being improved constantly, and new and more economical methods are being tried out each season.

When certain standards for shoulder widths were set up for military highways, it was revealed that Indiana's minimum had been meeting these standards for several years. This accomplishment cannot be credited to any one group, but it is significant that this progress mentioned above, all of definite value to a wartime road, has come about since the start of the roadside-improvement demonstration program.

The recreational features, such as roadside parks and tables, might seem to be a side issue, when considered in the presence



Fig. 2. Steel mesh reinforcing no longer used in construction because of war priorities.

of war. However, the value of recreation to morale is nowhere disputed. The value of low-cost recreational facilities in every section of the state becomes increasingly important as traffic movement is curtailed, or becomes more hazardous because of the condition of older cars and tires. There are many features of our daily existence that should be curtailed before the wholesome and economical outdoor picnic areas are sacrificed on the theory that this might in some way improve our war effort.

TRAFFIC

The State Highway Commission has not been operating under war conditions long enough to know exactly what effect and influence the war will have on state highway traffic.

We are of the opinion that the war will bring about a complete change in the traffic pattern on Indiana highways, and will affect greatly the kind, location, and volume of work done on our roads. This change, which is already under way, will bring great concentrations of defense workers on certain routes, increased commercial-vehicle concentrations on others, and probably will sharply reduce week-end pleasure and recreational travel. That these trends are already under way is evidenced by the facts that during December, 1941, on the state highway system there was a reduction of over 500 accidents as compared to November, and that all of this decrease was on Friday, Saturday, and Sunday, with the other four days of the week showing slight increases. From this one month's experience, it appears that rationing of tires and



Fig. 3. Widening shoulders after pavement widening on U. S. 31 south of Scottsburg.

discontinuance of new car production will be seen most heavily in reduced pleasure travel. Attempts to conserve cars and tires will result in more passengers per vehicle and lower speeds. It is ironical that persons who wouldn't reduce speed to save a life will do so to save a tire.

This change of emphasis from recreational and pleasure travel to commercial and industrial traffic will reduce traffic strains on some roads, and greatly increase them on others. This necessitates a reclassification of roads and changes the work required on them. At the same time, priorities on critical materials make it increasingly difficult for us to obtain signs, signals, and paint to mark these roads properly, and the further

diversion of experienced traffic personnel into the armed forces and into defense industries will place heavier burdens on those who remain.

I do not want to burden you with statistics, but I do ask your forbearance as I relate to you a few most interesting figures concerning the traffic flow on our state highway system for the years 1937, 1940, and 1941.

In 1937 the computed total vehicle miles on the entire system was 3,219,948,000. In 1940 this figure jumped to 4,146,749,000, an increase of 926,801,000 vehicle miles. The year 1941 showed an increase over 1940 of 543,224,000 vehicle miles. In other words, the increase in that one year over the previous year was more than half the increase of 1940 over 1937. In 1937



Fig. 4. Traffic confusion on State Road 62 at Charlestown Powder Plant before dual-lane construction and addition of pedestrian overhead structure.

the average number of vehicles per mile of road per year was 373,274; in 1940 it was 420,447; and in 1941 it had skyrocketed to 475,525. In 1937 the average number of vehicles per mile of road per day on the state highway system was 1,023; in 1940 this figure was 1,152; and in 1941 the number was 1,303. Using 1937 as a standard of 100 per cent, we had traffic increases in percentages as follows: 1937, 100 per cent; 1940, 112.6 per cent; and 1941, 127.4 per cent.

Even though this county has been at war for a very short time, we have been operating under a National Defense Program for over a year. Typical defense installations are the Charlestown Powder Plant and the Kingsbury Ordnance Plant. Let me give you a picture concerning the traffic on State Road 62, south of Charlestown where the world's largest powder plant is located.

In 1937 the average number of vehicles per day was 525. In 1941 this number leaped to 6,317, or 1150 per cent over 1937. On State Road 62 just north of Jeffersonville, we have a similar picture, also due to the location of the plant at Charlestown. In 1937, State Road 62 at that location carried an average of 650 vehicles per day, while four years later, in 1941, this figure jumped to 8,300 vehicles per day,—1177 per cent over 1937.

The Ordnance Plant at Kingsbury, in LaPorte County, is responsible for the following comparative figures: In 1937, on U. S. 20, east of Michigan City, the average traffic count was 4,640; in 1941 it was 6,200, an increase of 34 per cent. On State Road 35, north of U. S. 6, the average traffic count was 1,250, whereas in 1941 it was 6,500, an increase of 420 per cent.

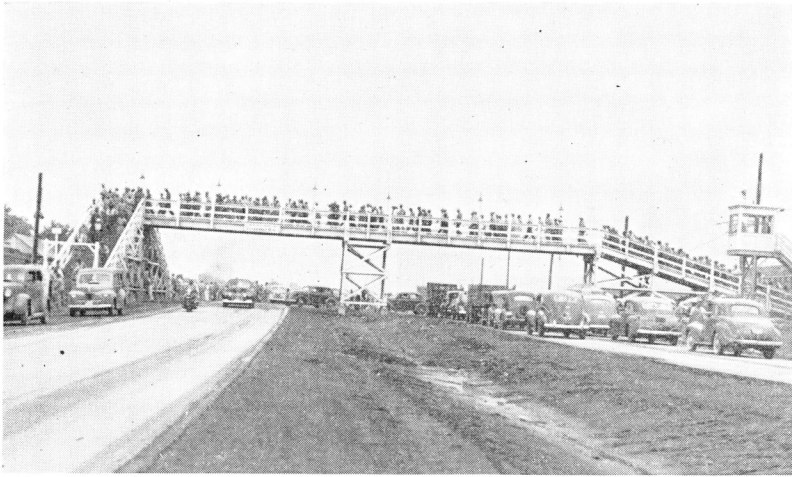


Fig. 5. Scene at Charlestown Powder Plant after construction of dual-lane highway on State Road 62 and addition of pedestrian overhead structure and traffic control facilities.

Eventually 20,000 employees will be working at the Kingsbury Plant, and a continued increase in the amount of traffic will be experienced before it becomes static.

The National Defense Program created many individual problems on the state highway system, but the effect of the war will be to add to those problems that we are attempting to solve now. It is anticipated that tire rationing will reduce somewhat the miles driven by the average motorist for pleasure, as will the curtailment in the production and sale of passenger automobiles. During the past year, commercial traffic has increased in volume of vehicles; and these commercial vehicles are now being loaded more heavily as a result of national defense. The traffic flow of commercial vehicles has increased, and it is reasonable to suppose that it will continue to gain. Since war was declared, army convoys are

becoming more numerous on our state highway system. All these facts point to the conclusion that highway work during the war will be concentrated in certain areas and on certain specified routes of the state system.

At this early date, no one can foresee where this will lead us during the war, but for 1942, unless there are further restrictions placed on the use of motor vehicles and gasoline, the following is indicated:

- (a) Little reduction in total of vehicle-miles traveled—commercial and pleasure vehicles.
- (b) Regrouping of type and location of traffic to form an entirely different pattern.
- (c) Voluntary speed reduction and increased care in driving.
- (d) Congestion around industrial areas and on city streets.
- (e) Traffic confusion and delay during blackouts.
- (f) Over-all reduction in accidents and fatalities.
- (g) More attention to maintenance and regulation to reduce traffic inefficiencies and continued emphasis on construction.
- (h) Probable strict routing of traffic to save time and reduce congestion.

About 37 per cent of our highway system forms what might be called our industrial network. It seems that we shall be forced to concentrate most of our effort on this group of roads and to attempt in every way possible to reduce delays, confusion, and accidents. This 37 per cent of our system in 1941 accounted for 72 per cent of our total accidents; so we shall not be neglecting our accident problem by this selective application of our traffic effort.

ENGINEERS

Enlistments and the selective-service law have caused vacancies in our engineering department. Engineers who were reserve officers in the Army have resigned to join the armed forces—the Air Corps, the Engineer Corps, and the Artillery. Other engineers have resigned to accept engineering positions in industry, at salaries prohibitory for us to pay. Our budget for personal service (salaries) is fixed by the General Assembly, and we are not in position to meet salaries offered to our engineers who accept positions in industrial and defense plants. Those who remain with us will work harder than ever before, and we believe they will do so gladly.

ROAD AND BRIDGE CONSTRUCTION

Our experience points to the conclusion that our future program for road and bridge construction, throughout the duration of the war, will be confined to those roads that are, or will be, designated as Access Roads and those roads included in what is known as the Strategic Network System.

Access Roads. Access Roads are defined as those "roads (including bridges, tubes and tunnels thereon) to military and naval reservations, to defense industries and to defense industry sites, and to the sources of raw materials when such roads are certified to the Federal Works Administrator as important to the national defense by the Secretary of War or the Secretary of the Navy, and for replacing existing highway and highway connections that are shut off from general public use by necessary closures or restrictions at military or naval reservations and defense-industry sites." (Sec. 6, Defense Highway Act of 1941.)

These projects are initiated within either the War or the Navy Department through the district engineer under whose jurisdiction the reservation or defense plant lies. The procedure requires the approval of the Secretary of War or the Secretary of the Navy, then of the Federal Works Administrator, who turns over the proceedings to the Commissioner of the Public Roads Administration. The Commissioner, through his District Engineer who is in charge of the Federal Highways in the district in which the project is located, authorizes the Highway Commission of the State in which the project lies to proceed with plans, specifications, bids, and construction. The Congress has authorized, in the Defense Highway Act of 1941, the appropriation of \$150,000,000 for expenditure on such Access Roads.

Indiana will be affected in such territory as that surrounding the various reservations and defense-industry sites, such as Charlestown, Burns City, Kingsbury, Indianapolis, Newport, and Columbus. Payments for the construction of such Access Roads will be made largely or entirely from the federal appropriation.

Strategic Highway Network. There has been prepared for each state, by the Federal Works Administrator, and approved by the Secretary of War, a diagrammatic map showing thereon roads that are combined to form what is designated as the Strategic Highway Network.

The Congress has authorized the appropriation of \$25,000,000 to be apportioned among the several states, under the formula used in the Federal Highway Act for normal federal aid to state highway departments, for expenditures to carry out projects to correct critical deficiencies in lines of the strategic network of highways and bridges, during the continuance of the emergency declared by the President on May 27, 1941. Indiana's share is approximately \$600,000.

Roads in Indiana designated on the strategic network include: U.S. 40 across the state; U.S. 31 from the Ohio River to the Michigan state line; U.S. 20 across the state; U.S. 50 traversing the state; U.S. 67 from Indianapolis to Anderson; S.R. 9 from Anderson to Huntington; U.S. 24 from Huntington to the Ohio state line; U.S. 52 from the Ohio line to U.S. 41

in Benton County, north of Fowler; and U.S. 41 from its junction with U.S. 52 to the Illinois state line; U.S. 36 from Indianapolis to the Illinois line; and S.R. 15 from Bristol to the Michigan line.

The Defense Highway Act of 1941 authorized expenditures for construction of roads and bridges on the strategic network on the basis of 75% of the cost being defrayed by federal funds and 25% by state highway funds. This Act also increased federal participation in construction under provisions of the existing Federal Highway Act, up to 75% of the total cost, provided the construction is performed on the strategic network.

Projects on the Strategic Network originate with, and are initiated by, the State Highway Commission in the same manner as is provided in the Federal Highway Act.

Even if the money is available for our proposed program, we still have a high hurdle to take. Before we can proceed with construction we must have priority ratings on each project, if materials included on the critical list are used. This really means that, if these critical materials are used, our projects must be confined to Access Roads or to the Strategic Network. We have no assurance that even all such projects will receive priority ratings. If State projects are to be constructed, the critical materials will have to be eliminated. From these statements, one can readily discern that there will be many interferences with our normal procedure; but all these will be cheerfully endured and taken in our stride.

Rigid pavements and reinforced structures must be re-designed in order to eliminate, as far as possible and still adhere to good engineering practice, all critical materials, especially steel. This means plain concrete pavements, the elimination of expansion joints, and the use of contraction joints spaced twenty feet apart, to replace our former reinforced concrete pavement design in which we used steel mesh reinforcement, contraction joints at forty-foot intervals with load-transfer bars, and expansion joints one hundred and twenty feet apart, including load-transfer bars.

In our new design of concrete pavement, only 2.20 tons of steel are required per mile; these are the $\frac{5}{8}$ " bars for tie bars at the longitudinal joints only. We have been constrained to eliminate reinforced structures, if the span is twenty feet or less, by substituting unreinforced arches, batteries of pipe of vitrified clay or concrete.

It is difficult to substitute other types for structures of over twenty-foot span without reinforcing steel. We may have to adopt the expedient of using untreated timber structures for such spans over twenty feet for the duration of the war, and following the emergency construct permanent structures using steel or reinforced concrete. Of course, such an expedient would not be used for spanning the Wabash or White Rivers.

We will be able to continue our road-widening and resurfacing projects, since steel and other materials at present on the critical list are not required. Much of the work we are most anxious to do falls into these untroubled categories, for which we are devoutly thankful.

MAINTENANCE

Obviously, at all times and under all circumstances, we must maintain our highways and protect our immense investment in our wonderful highway system. This is our first and our greatest responsibility.

The maintenance fund of the State Highway Department is limited to a specific sum, set by appropriation by the legislature. It is inelastic. We are losing experienced mechanics, machinery operators, laborers, and capable office help to defense industries because we cannot raise the pay of these men as much as we would like to do and stay within our budget. This problem has affected every district, and some subdistricts, especially those in the vicinity of the various defense plants.

Traffic concentrations around defense plants have been highly detrimental to roads of the intermediate type and have also caused serious failures of other road surfaces and bases, and even of rigid pavements, which have been adequate and ample to withstand the normal traffic they were designed to carry.

The lack of available new equipment has increased the necessity of overhauling and repairing old equipment, with the attendant difficulties encountered in obtaining repair parts. There is a definite shortage of machinery repair parts and this fact, combined with delayed deliveries, even under priority ratings, has affected the efficiency of our normal maintenance work.

Operating as we do on a fixed budget, the quantities of materials we purchase must of necessity be reduced, because of the increased cost of these materials. Labor costs have increased to the extent that the number of mechanics, operators, and laborers has been reduced.

Just what our own tire problem will be is not yet definitely known. Tire rationing has become a stern reality. True it is that tires for vehicles engaged exclusively and solely in the transportation of road maintenance materials—and this means trucks—come within one of the seven eligible groups for new tire purchases. However, unless there is a revision of the regulations governing this rationing, there will not be enough tires to fill the requirements of these eligible groups. It looks as if we will have to go slow on passenger-car tires in more ways than one.

We will be forced to retread or recap as needed the tires we now have. It is a huge problem, and we will have to meet it

as we go and try to solve it with as little confusion and dislocation of our work as is possible. It will require perseverance and will test our fortitude and challenge our ingenuity.

We have reviewed briefly some of the effects of the war on our procedure and our program. Our organization will rise to every occasion and meet every responsibility.

PLANNING FOR THE POST-WAR PERIOD

Walter H. Blucher,

Executive Director, American Society of Planning Officials,
Chicago, Illinois

Sixty days ago while we in the United States of North America were giving half-hearted attention to the defense of our country, many of us were thinking of the post-defense period—of what we were going to do if somebody else won the war for us.

Today, when most of us are giving almost whole-hearted attention to the winning of the war, talk of the post-war period doesn't seem very realistic. I say "almost whole-hearted support" because I believe that most of us as yet have no realization of the size of the task before us, the effort required, or the sacrifices necessary to win the war.

Our first task is to win the war. To that end we must direct all our energies. If we are to plan for a post-war United States of America, we must be sure that we, not somebody else, are in a position to make and carry out those plans.

I think we can and will win this war. It may take a little longer than it would if all of us took it more seriously, but when the showdown comes we will get together and forget all individual profit motives.

And so we don't want to win the war only to lose the things we fought for.

It isn't wholly unrealistic to think now of the post-war period, to think of the things we are fighting to preserve. And although we might want to relegate post-war planning into a little corner in the back of our heads, realism tells us that we cannot separate war planning from after-we-have-won-the-war planning. They merge together, and I hope to demonstrate shortly why they are inseparable.

There are at least three aspects of post-war planning. First, there must be some planning for the peace that is to follow the termination of the war. I doubt very much if we are in any position to say what the terms of that peace shall be. If the war ended tomorrow, we wouldn't know what to do with Messrs. Hitler, Himmler, and Hirohito. We don't have to bother about Mussolini. We wouldn't know whether they ought to be shot, interned, or turned over to the Poles for a just