

made with a view to securing light grades. This does not mean, however, that it should be made absolutely flat. Money spent on cutting a grade below 1% had better be spent on building additional length of road.

Routes Now Being Shortened

Present-day travel and traffic are not confined to neighborhoods nor even to counties, as was formerly the case. Long trips for both automobile and truck are common. This means that the roads must be as direct as possible. Although the neighbors did not complain when compelled to go half a mile out of the way by Mr. A's door, the people from the next town or next state much prefer to go straight and leave out Mr. A's house. This becomes important to the community also when an additional half-mile means an additional cost of \$15,000 to \$20,000, in the case of a hard-surfaced road. So strong is the tendency nowadays to locate on the shortest routes possible that sometimes good sized villages and even towns are left to one side of a main highway. In cases of small towns with narrow, crooked streets, it is doubtless for the best interest of the great majority of the users of the highway to miss the town and allow it to have a branch road into it.

Another effect of motor truck traffic is to require much heavier bridges. As is the case with the roads, bridges need also to be wider than formerly. In view of the high cost of such bridges, good location will eliminate as many bridges as consistent with good alignment, and will utilize such crossings as will make the cost of bridges a minimum.

The use of motor vehicles and the extension of travel beyond the bounds of local communities has had another marked influence on the location of highways. A few years ago a road was often located with but little or no regard to the roads of the adjacent counties or states. Sometimes one would hear it said, "If they want to come over here let them fix a way to get to our road." Now the case is different, except in rare instances. The road authorities in one county or state want to consult those in the adjoining county or state so as to ensure a suitable connection. Two counties will now issue bonds for a joint bridge between them, whereas a few years ago one would have feared the other would steal its trade.

A consideration of these factors, which have merely been touched upon, shows that much is involved in the selection of a proper location for a highway. The location should be made only after thorough study of all conditions pertaining to the road under consideration and by a man experienced in weighing the relative importance of the different factors.

Chief Factors Affecting Location

The chief factors affecting road location are, in the speaker's opinion, the following, listed in the order of their importance: (a) Drainage; (b) grades; (c) alignment; (d) present and probable future traffic; (e) cost.

In these days when so many different kinds of culverts and bridges are being constructed, streams and surface water are not such obstacles to road building as formerly. In general, the location of drainage structures is made to suit the location of the road, particularly on important highways. Often, however, relocation of existing roads can be made, and certainly new roads should be located, so as to utilize desirable stream crossings and well-drained ground. One feature of location that is often neglected is that of following southern slopes of hills and providing for plenty of sunlight on the road. While we in this state are not hindered much by snow drifts and ice, we do suffer from mud holes caused by the road's being shaded all day long. Probably no other one thing can accomplish so much for a muddy stretch of road at the same cost as to cut off the shade or to relocate it on a southern exposure. This is, in effect, a form of drainage, since it helps to keep the road dry.

As indicated before, the matter of grades is of greater importance to-day than ever before. There is, however, nearly always in hilly country a conflict between good grades and good alignment. In many cases suitable grades and alignment can both be secured by a judicious use of curves,

without seriously increasing the cost. In cases where the two cannot be combined at low cost, however, neither should be sacrificed for the other if the road is one of much importance. The only alternative then is more expensive construction, using heavy cuts and fills when necessary. The death of a single person, caused by a bad curve, would more than offset the saving of a few thousand dollars in cost. Then, too, with an expensive type of surface and the maintenance through a long period taken into consideration, the ultimate cost of the road with good grades and straight alignment may be less than that of one with poor alignment or bad grades. The addition of 1 mile to the length of a road which carries an average of 10 motor vehicles per day costs the travelling public \$3,650 additional per year, besides the extra cost of upkeep. This is equivalent to the interest on an investment of \$73,000 at 5%. Hence, from a business standpoint, the public would be justified in such a case in spending a considerable sum to cut off the extra mile.

Restriction of Loads Necessary

The location of a highway should also be made with due consideration to both present and future traffic. The amazing increase in volume of motor truck traffic and in the size of loads hauled within the past few years has upset many of our old ideas of road building and has shown us the necessity of looking to the future. It is equally important that we look to the future in our legislation so as to prevent unreasonable loads on the roads we are now building.

Along with the consideration of traffic requirements, present and future, arises the question of cost. In the past we were inclined to consider only present cost. We are beginning now to look forward to the cost of maintenance. County boards are now willing to spend thousands where formerly they hesitated about spending a few hundred. Sometimes our eagerness is so great for a smooth, hard-surfaced road, which so many people seem to think will last forever, that we are willing to spend far more than the traffic for years to come will justify. But regardless of the type of construction used at present, the location should be such as to provide efficient transportation at the lowest possible cost for maintenance. It is obvious, therefore, that there is need for thorough study of both present and future cost before we make final and fixed locations of our roads.

The spring meeting of the American Society of Mechanical Engineers will be held May 24th to 27th, in St. Louis, Mo. There will be special excursions to Keokuk and Tulsa. At Keokuk the hydro-electric plant will be inspected, and at Tulsa, Oklahoma, the oil fields and refineries will be visited. The train for Tulsa will leave St. Louis May 27th. The Keokuk trip will be in advance of the meeting. The members will leave New York May 21st at 5.30 p.m., arriving in Keokuk May 23rd at 7.30 a.m.

In recommending to the House of Commons that a National Bureau of Standards should be immediately established, Hume Cronyn, of London, Ont., chairman of the Select Committee of Scientific and Industrial Research, said that the function of the bureau will be not only to do work similar to the Bureau of Standards at Washington, but also to assist in the development of the natural resources of Canada. First, said Mr. Cronyn, the bureau should be charged with the standardization of measures, including the standards of length, volume, weight, heat, electricity and other kinds of energy, and with seeing that the materials required in the construction of public works comply with the specifications; second, it should be charged with the organization and supervision of researches into such processes and methods as would assist in the development of natural resources, in the expansion of existing industries or furthering of new industries, and the utilization of materials formerly discarded as waste. "The establishment of such an institute will be a paying venture," declared Mr. Cronyn. "The need is pressing, the rewards to the country will be great and the expenditure proposed will be amply justified."