

eral-Aid Highway Act of 1956, the Bureau of Public Roads financed a smaller loop to determine the requirements of the so-called basic vehicle to help develop the incremental type of analysis pertaining to contribution to highway costs.

For the four major loops, it was decided to have one set of loadings at 18,000-pound single and 32,000-pound tandem, respectively, as per the AASHO 1946 recommendation. Another set of loadings was 22,400 pounds single and 40,000 pounds tandem as the maximum range that was actually allowed in any State.

We then established a set of loadings below and one above these in order to give four points on any curve for a more exact analysis.

The loadings on this small fifth loop that was added by the Bureau of Public Roads were 2,000 pounds and 6,000 pounds, respectively.

We will not attempt to go into all of the detail that came from this \$27 million research project, but the general conclusions and consensus developed by the highway departments are outlined in the AASHO statements being presented here today.

The section 210 requirement of the Federal-Aid Highway Act of 1956 directed the Secretary of Commerce, in cooperation with other Federal offices and agencies, and the State highway departments, to make a comprehensive study of: (1) the effects in design, construction, and maintenance of Federal-aid highways from the use of vehicles of different dimensions, weights, and other specifications, and the frequency of the occurrences of such vehicles in the traffic stream; (2) the proportionate share of design, construction, and maintenance costs of Federal-aid highways attributable to each class of user on such highways; and (3) any direct or indirect benefits occurring to any class, in addition to the benefits from the actual use of highways, which are attributable to highway expenditures.

In undertaking the study, four different approaches were used. These were: (1) the incremental method, (2) the differential-benefit method, (3) the cost-function method, and (4) the gross-ton-mile method. There is still a fifth approach that could have been used as a modifying factor, especially to the incremental method. We refer to the highway geometric space requirement of the various size vehicles in the traffic stream under varying conditions of traffic density, geometric layouts, and terrain as related to grades and sight distances.

In other words, the equivalent space that a large vehicle actually requires, as related to an equal number of automobiles, because of their weight-power ratios, and the grades and alinement of the highway.

On a level piece of highway, where the truck is able to travel at highway speeds, it actually requires the equivalent space of two automobiles, but when sustained upgrades are involved, and when passing is not possible, the truck may act as an impediment to the traffic and cause the practical capacity of the highway to be reached because of congestion queuing up behind the slow vehicles. In rolling or mountainous terrain, one truck may actually require an equivalent space of 18 to 20 automobiles under such an evaluation.

The incremental method is based on the concept that the cost of providing a highway increase with the weights of the vehicles to be accommodated, and with the frequency with which they appear in the traffic stream.