

RESEARCH PAYS OFF

Caltrans Trims Footings and Costs From Concrete Median Barriers

Hundreds of miles of safety shaped concrete median barriers to prevent vehicles from crossing the median and causing fatal head-on accidents have been constructed in the 1970s and 1980s. Accident experience has been good and maintenance costs have been low. In the early stages, barrier slipform machines, which reduced construction costs and cut construction time, were developed. The California Department of Transportation (Caltrans) initiated a research effort to determine if costs for this efficient streamlined barrier could be still further reduced.

PROBLEM The original Caltrans barrier design included a 10-in.-deep by 24-in.-wide continuous footing that helped ensure barrier integrity. The most common construction sequence was to (a) excavate a footing trench, (b) pour the footing concrete, and (c) slipform the barrier before the footing concrete attained initial set. This time-consuming process of installing barriers on existing highways not only caused traffic delays but also had the potential for causing construction-related accidents.

SOLUTION Caltrans value engineers recommended in a study report that the footing be eliminated. Because analytical methods are not reliable to justify major changes in barrier design, a test barrier was constructed and crash-tested. Caltrans and the Federal Highway Administration jointly funded this research, which had a total cost of \$42,600.

The test was conducted in 1976 with a 4,700-lb passenger car traveling 61 mph and impacting a 120-ft-long barrier at an angle of 26°—a severe proof test. No movement or damage to the barrier resulted in this test. Thus, for such conditions, Caltrans researchers determined that, except for a reinforced 10-ft-long footing at the barrier ends, footings were not required.



APPLICATION Caltrans amended the standard plan for concrete median barriers to eliminate the footings. One continuous No. 4 rebar was added to the existing No. 4 rebar in the upper stem to help prevent broken chunks of concrete from flying into opposing traffic lanes in severe impacts. Two continuous No. 4 rebars were added at the bottom of the barrier to minimize lateral movement and to maintain reserve strength of the barrier in very severe impacts. The redesigned barrier could be slipformed directly on top of pavement or on a compacted aggregate base in one operation. The barrier still remains connected to bridge decks by means of dowels.

BENEFITS Because direct savings were not always calculable from construction records, construction methods varied, and construction costs increased yearly, precise savings are difficult to calculate. However, taking into account these variables, Caltrans estimated an average savings for barriers constructed without footings to be \$5 per linear foot. In a 3-year period ending June 30, 1981, Caltrans built over 292,000 linear feet of barrier for a savings of over \$1,460,000. These barriers were installed more quickly and with less disruption to traffic than were the old barriers with footings.

Savings are still accumulating, not only in California but in other states that are using the new design. This carefully aimed research, long since paid for by the resultant savings, has brought significant benefits to taxpayers, motorists, contractors, and highway engineers.

*For further information, contact
Roger Stoughton, California
Department of Transportation,
5900 Folsom Boulevard,
Sacramento, California 95819
(telephone 916-739-2308).*