Runaway Truck Ramps Are Saving Lives and Reducing Damage

By Earl C. Williams and C. Franklin Horne

In recent years, transportation officials across the nation have become increasingly concerned about the potential danger of and the real destruction caused by runaway trucks. Every steep hill, ridge, and mountain range presents a potential hazard over which highway managers and transport personnel have no control. For this reason, state highway officials are experimenting on an individual basis with solutions to this problem, trying to minimize the loss of human lives and property damage which may result when a truck's brakes fail. There are now approximately sixty-five EERRHV* runaway truck ramps, also called emergency escape ramps, built and another fifteen in the planning stages throughout the country. There are however, no formal design or construction criteria for guidance in planning these essential safety devices.

The Tennessee Department of Transportation has performed an investigation into the subject of runaway truck ramps. The study objective was to develop a "state-of-the-practice" report for use by transportation planners and engineers. The study was conducted by reviewing and analyzing existing runaway truck ramps across the nation and identifying the benefits and shortcomings of each. It was found, for instance, that no one type or style of runaway ramp is feasible in all situations; each location and physical condition must be considered individually. Another vital factor in the success of the emergency escape ramp involves informing the motoring public of the function and purpose of the escape ramp.

Truckers themselves were the first to see the advantages of runaway truck ramps. The earliest ramps used were logging roads. A trucker would see that one of these roads could be used to stop his truck by traveling up the positive grade. As the number of runaway trucks increased and the accidents became more severe, highway officials searched for a way to solve the problem. Engineers saw the potential of these old logging roads and began signing them. These roads used gravity to stop the runaway truck.

Another early attempt to stop the runaway truck also came from the truckers. They began utilizing the sand piles which were placed along side the roadway by maintenance crews for use during snowy and icy weather. Truckers saw the piles of sand as an effective cushion for their speeding rigs, much as a haystack would soften a fall.

The evolution of the primitive runaway truck ramp is to the point

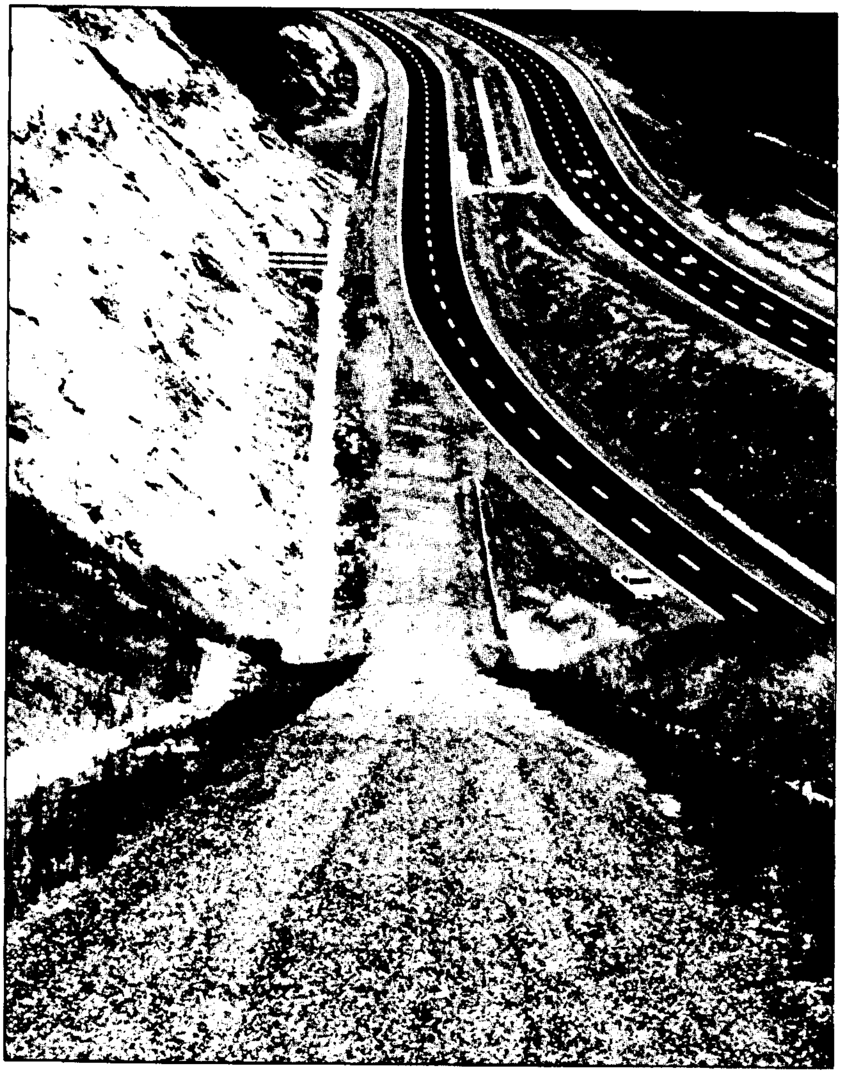

Figure 1.

* Emergency Escape Ramps for Runaway Heavy Vehicles.

where engineers design them for effect. Today, there are two basic types; the gravity ramp and the arrester bed, and a third type which is a combination of these two.

The gravity ramp is a surfaced road that runs on a positive uphill grade (Figure 1). The surface is either paved or it has a hard gravel surface. These ramps vary in length up to 3,000 feet, depending upon the steepness and length of the grade.

Figure 1 shows a gravity ramp on Interstate 77 in Virginia which has a very steep positive grade, and was built in anticipation of the runaway truck problem because this section of highway is newly opened.

Among the positive points of a gravity ramp is that this type ramp doesn't require special equipment to remove the truck from the ramp area. Also, routine maintenance is minimal because workers are not required to work on the ramp to return it to operation after it has been used. The gravity ramp is not affected by adverse weather such as rain or snow. This type of ramp, however, is usually expensive because it must be long enough to dissipate the forward energy of the truck. This usually means that a special roadway must be designed and built. The gravity ramps cannot always be located where they are needed most because of the terrain, and they are sometimes built where they have minimal effect. Another problem with this type of ramp is that gravity will stop the truck, but there is no way to stop it from rolling back if it has lost all braking. The result is usually a jacknifed or overturned truck. Records of ramp usage are also difficult to keep for the gravity-type ramp. Often a truck will use the escape ramp to stop and then return on its way without anyone knowing that the ramp has been used.

The other type of runaway truck ramp is the arrester bed. This ramp sometimes uses gravity to slow the truck, but the primary retardant is loose sand or gravel that causes the truck to slow down and become mired in the loose material. As a truck enters an arrester bed, it gradually decelerates, sinking deeper and deeper into the sand or gravel until the truck is actually bogged down to its axle and stopped. Figure 2 shows an arrester bed on U.S. 52 in Virginia using sand to save a runaway truck.

Obviously, the arrester bed doesn't need to be nearly as long as a pure gravity ramp, and the initial cost is lower. The surface doesn't require a special treatment and it is easier to locate near the problem area. Once the vehicle is stopped in an arrester bed, there is no chance that it will roll back into traffic. Also, there is a very little, if any, damage done to the vehicle. It sometimes takes two wreckers, however, to pull a tractor and trailer out of an arrester bed. This can be expensive to the truck operator, sometimes costing as high as $600.

After a truck has used the ramp, the surface must be redressed by a maintenance crew. This requires that a crew and machinery be available at all times. Snow and freezing rain have caused minimal problems for the arrester bed. Sand does not drain as well as gravel does, and is therefore more prone to freezing. But brake failures do not occur as often in cold weather when snow and ice might be present on the ramp.

An example of a ramp designed purely as an arrester bed of gravel is on I-24 coming down Monteagle Mountain in Tennessee (Figure 3). This ramp is on part of the old highway and was converted for use as a runaway truck ramp. Since I-24 was formerly U.S. 41, runaway trucks have been a problem for many years. This ramp was built in 1975 at a cost of $153,000. It is 550 feet long and 50 feet wide and uses 36 inches of pea gravel. During the first fifteen months this ramp was operational, 132 trucks entered the ramp.

Also in use today is a combination gravity ramp and arrester bed (see Figure 4). This type of design relies on the loose surfacing material to assist in bringing the runaway vehicle to a stop. Design lengths have been from 550 feet to 2,200 feet and the widths have been some 18 feet to 50 feet; grades vary from a plus 2.7 percent to a plus 26 percent. Surfacing material can be loose gravel or pea gravel with a depth of 12 inches or more. In many cases a berm has been constructed at the end of these ramps. Performance results have been excellent. These require the same maintenance as the arrester bed types of ramps. Colorado, Idaho, Oregon, Vermont, and West Virginia have these ramps in use.

Locations which have the most critical need for a runaway truck ramp are often those which possess the least desirable conditions for placement of the ramp. The adjacent terrain must have an adequate area to physically build the facility. The shorter a ramp is that will allow safe stopping for the design speed, the easier it is to locate the ramp at the most desirable location. The best location is in advance of a critical curve or the bottom of the grade.

The width of the arresting bed is important as it is possible to have more than one vehicle at a time in the escape ramp. In rare instances there have been as many as three vehicles in one escape

Figure 2.

Figure 3.

Because of the question of liability, highway administrators are reluctant to build runaway truck lanes where available lengths and grades are not favorable without more positive assurance that they will work satisfactorily. As the state-of-the-practice evolves for runaway truck ramps and use proves the effectiveness of the facilities this will become evident to public officials, the trucking industry, and the motorist. Success records of existing ramps are already impressive and, as more ramps are built and placed into operation, their benefits will show them to be the most cost-effective method of controlling runaway trucks.

Williams (F) is research engineer for the Tennessee Department of Transportation. He is a Registered Professional Engineer in Texas and Tennessee and has been involved with ITE and the Transportation Research Board for the past twenty-five years. He has served consecutively on one or more committees of these organizations for the past twenty years. He is a past President of S.S.I.T.E. and is presently an International Director representing District V. He is a Fellow member of ASCE.

Horne is a program manager with the Tennessee Department of Transportation's Office of Research and Planning. He has been involved with all facets of transportation research, planning, and programming for the past seven years. At the present time he is involved with the administrative functions of TDOT's Research Programs and other Departmental special projects.