

11. Headwalls—Drop inlets—Culverts

Eliminate headwalls. Where an entrance structure is necessary on a culvert it will be so designed and, *if necessary*, protected by guide rail. Culverts will be extended to provide a safe recovery area. Large culverts are usually in high fills that require guide rail. In those cases where there are large culvert open ends that are not protected there is a potential hazard. However, guide rail placed just above the culvert end of a slope steeper than 1 on 5 is practically useless. Therefore, any protection that you deem necessary for such a situation will have to be substantially in the normal location for guide rail and so placed as to intercept a car coming in either direction on a 2-lane highway or from just the one direction on a divided highway with adequate median or median protection.

Drop inlet grates in medians and other such exposed locations must be flush, with no raised portions, to permit *free* passage of a wheel of a vehicle. It is suggested that you use a bar type grate with the bars parallel to the ditch. Let the grate be rectangular with the long dimension along the ditch line.

12. Slopes

Flatten slopes wherever possible. You may be able to eliminate guide rail by so doing. *All other* things being *equal* and based *only* on relative damage to a vehicle and passengers from striking the guide rail or going down the slope, the following is a *GUIDE* for fill heights *without* guide rail:

Slope	Ht. fill (feet)
1 on 2-----	10
1 on 3-----	20
1 on 4-----	40
1 on 5-----	50
1 on 6-----	60

Remember this is a *guide* and must be so regarded. If there is a river or lake at the bottom of the slope or other hazards or limiting factors such as trees, houses, buildings, or other such fixed objects, this cannot apply. Also if the alignment together with the fill produces a mental hazard or optical illusion or if the curvature is too severe to be adequately marked by delineators, then you must use your best judgment. I am sure you will not find many places where you can spread out so much on *high* fills.

The determination as to which slopes to use is one based on R.O.W. geographic features, neighborhood development, economics and aesthetics.

We expect that you will solve the problems listed in the "Dangerous Dozen" by Orders on Contract and, if necessary, field change drawings. In any case do it *early* in the contract—give the contractor a break. Try to get agreed prices on any work for which there is no bid item. If these changes are initiated early enough, the work can be done concurrently with the rest of the job and no extensions of time should be required.

Mr. McEWEN. What did Mr. Lefevre say about rock cuts? Is that in the letter? Does he refer to rock cuts?

Mr. W. MAY. "For fixed objects of this kind less than 30 feet from pavement on 50-mile-per-hour-plus highways, protect with guiderail."

Mr. McEWEN. What was the date of this letter?

Mr. W. MAY. June 8, 1967.

Mr. McALPIN. Counsel, if I might just add, this is of significance. This concerns going projects.

Mr. McEWEN. Mr. Chairman, the reason I ask this, I say to the gentlemen here present, is that I recently traveled over a very good primary four-lane highway, Route 12 running northeast from Alexandria Bay. This road was opened just last fall. There are a number of rock cuts in there, and at a number of exits the slopes appear to be severe.

There are new type guardrails at several places, but through none of those rock cuts are there any guardrails. And the rock cuts are much closer to the paved portion than the standard set forth in Mr. Lefevre's