4.1.8 Gradients and Criteria for Climbing Lanes

**Background**

Restricted overtaking opportunities and the presence of slow moving vehicles can result in substantial congestion and high accident rates through injudicious overtaking. Congestion effects are greatest on long steep gradients. The situation is worse in many developing countries because of the presence of overloaded trucks and buses with very low power-to-weight ratios, and animal drawn vehicles.

In such circumstances, the provision of an auxiliary climbing lane can be extremely beneficial to enable vehicles travelling up the gradient to overtake safely and efficiently. However, the criteria for introducing and evaluating climbing lanes are complex and involve length and severity of gradient, traffic composition, level of flow and an estimation of the speed differences between the various vehicle groups. Overtaking opportunities on the adjacent sections of road are also significant. If the overall alignment is tortuous with few other overtaking opportunities, the provision of a climbing lane may be particularly beneficial.

**Problems**

Climbing lanes, by the nature of the terrain in which they are installed, will often involve expensive construction, and accurate estimation of the economic benefits is particularly difficult and uncertain.

The provision of a climbing lane on a two-way, two-lane road may encourage vehicles travelling downhill to overtake, resulting in a high accident rate with high levels of severity.

In heavy flows, there may be merging and accident problems when the climbing lane ends and the overtaking and overtaken flows merge.

**Summary**

As auxiliary lanes, climbing lanes are particularly effective as they operate at locations where the maximum overtaking advantage can be obtained from the relative power-to-weight ratios of light and heavy vehicles. The case for their introduction is largely economic, and relatively high traffic flows are usually needed for their justification. However, even though the extra width of a ..........
Possible Solutions/Benefits

- Simple empirical and other models exist which can be used to estimate the effects of introducing climbing lanes. However, these models relate to traffic conditions in developed countries, where the differences in the performance of vehicles in the traffic stream are usually substantially less than in developing countries.

- Simulation models can be used to estimate the effects for a broad range of climbing situations, but are based on time saved rather than vehicle operating cost or accident savings because there is little relevant data. Guidance is given in ref. 4 on the increases in mean speed to be expected.

- Clear signing, road marking and, in some cases, physical barriers are needed to ensure that the absolute right of way of climbing vehicles is safely upheld.

- Climbing lanes should start before the gradient, and end after it, to ensure as small a speed differential as possible between overtaking and overtaken streams to aid safe and efficient overtaking and merging.

- Maximum benefits have been found to be achieved within the first few hundred metres of the start of a climbing lane. Particularly with shorter climbing lanes, it is essential that the start is clearly marked and that heavy vehicles block the remaining traffic for as short a time as possible.

- Although the major benefits of a climbing lane are in terms of values of travel time saving, there is some evidence to suggest that they also result in a reduction in the accident rate. Accident savings may also occur on adjacent sections of road, if the climbing lane reduces levels of frustration and injudicious overtaking on these approach sections.

- In some situations climbing lanes will occur on both sides of a sag or crest curve, serving the two directions of traffic. In these situations the opposing flows must be separated by solid lines and hatched areas may be provided as an additional safety measure.

Other relevant sections: 4.1.3, 6.8.5
Key external references: 1, 4

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...Designing Links...

![Fig 4.20](image1.png)

**Fig 4.20**
Estimated speed increase with climbing lane
(ref 4)

![Fig 4.21](image2.png)

**Fig 4.21**
Additional climbing lane in Papua New Guinea. Note recent footway. Unfortunately road markings not yet renewed
TRL

........lane is required, there may be some situations in which the provision of that is cheaper than having to build in a full overtaking sight distance. There are detailed design differences between the various standards, although an indication of parameters is given in the figures above (based on UK standards). Clear signing and marking is required and it may be appropriate to have physical separation between opposing flows.