

## **LANDSLIDES – IT'S TIME THEY ARE PREVENTED**

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**Based on some observations in Western ghats:**

**Four common scenarios are identified.**

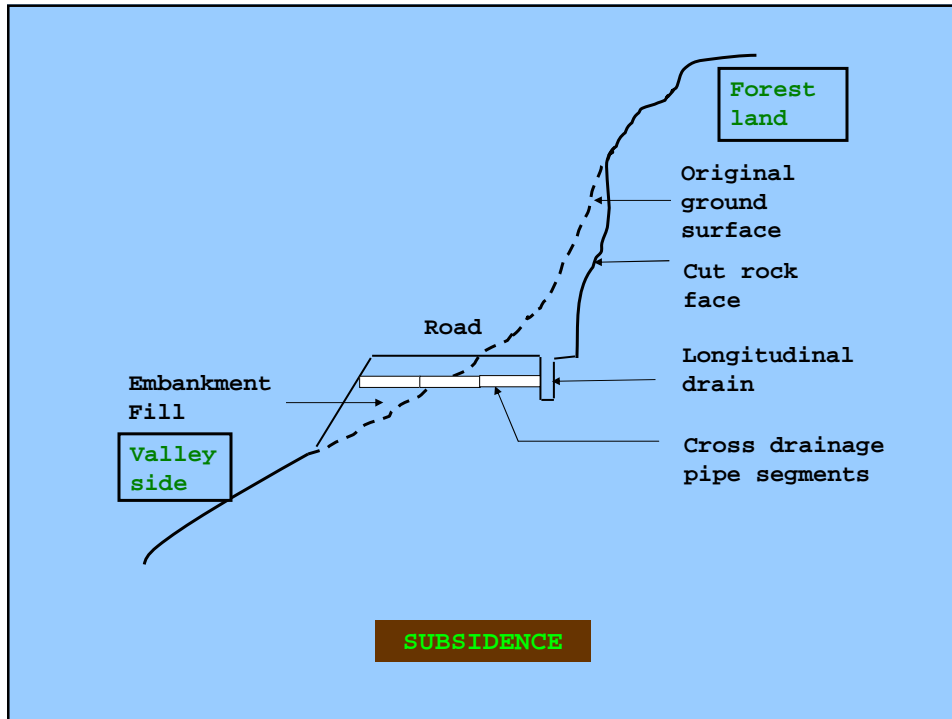
- 1. Subsidence**
- 2. Slide along a hidden rock surface**
- 3. Rock fall at tunnel portals**
- 4. Alignment compatible with joint patterns**



**SUBSIDENCE**



**SUBSIDENCE**

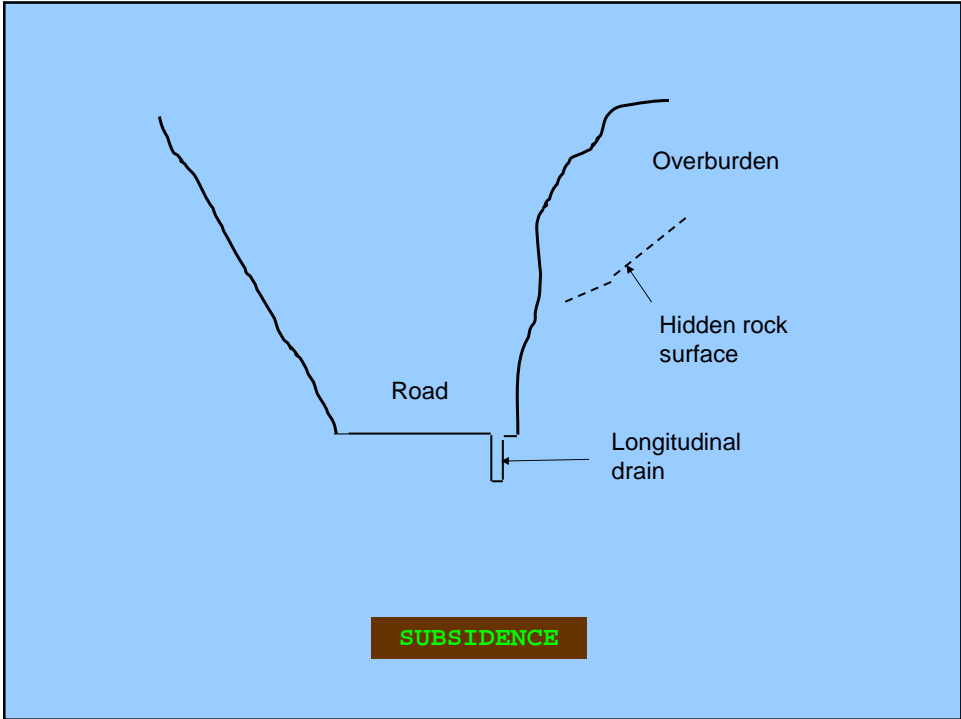


**WHAT TO DO:**

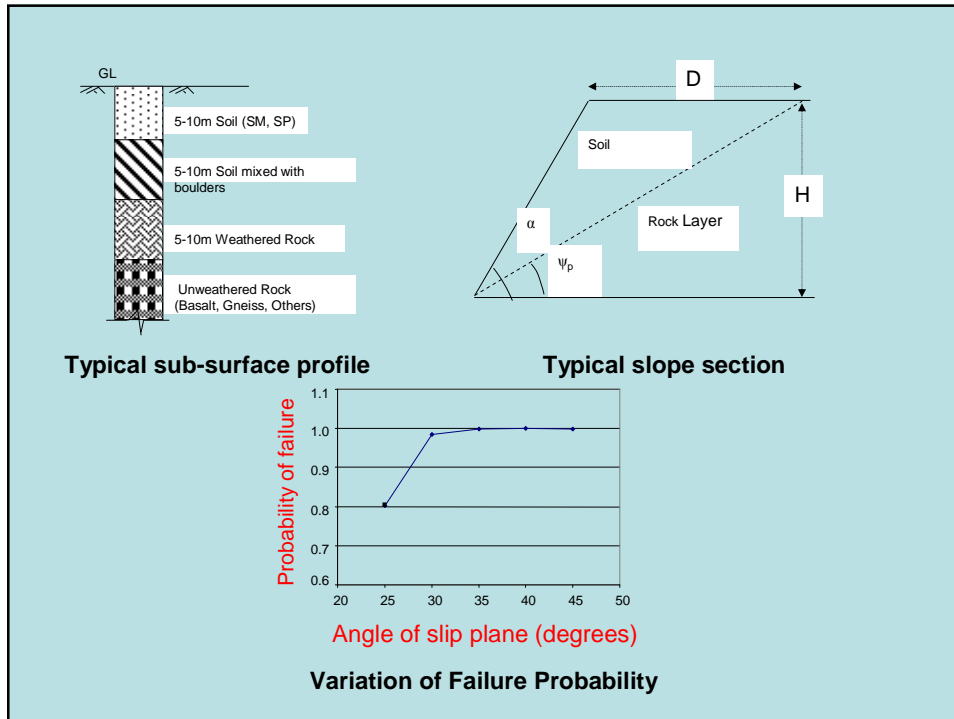
1. such sites are easily identified because of the need for highway to rest partially on an embankment;
2. (a) abandon the site  
 (b) construct a via-duct  
 (c) provide a stable retaining structure;  
 (d) ensure proper drainage  
 – use a single pipe instead of segments.



**SLIDE ALONG A HIDDEN ROCK SURFACE**



**SUBSIDENCE**

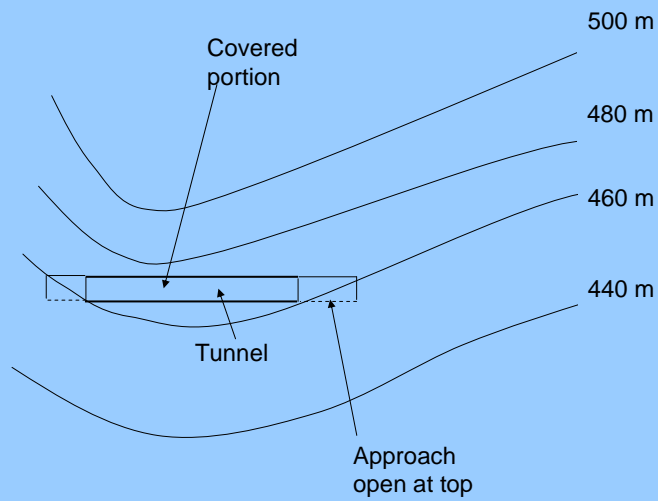


**WHAT TO DO:**

1. such sites can be identified during initial surveys;
2. use of GPR or other such techniques could help in locating hidden rock surface;
3. (a) slope trimming  
(b) adequate drainage  
(c) bally benching / piles  
(c) other retaining structures.



**DEBRIS FLOW AND ROCKFALL**



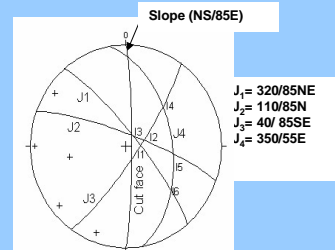
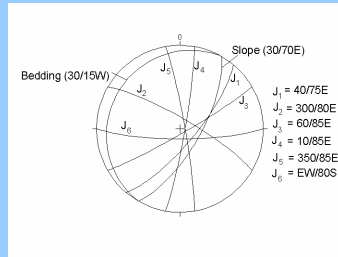
**ROCK FALLS AT TUNNEL PORTALS**

**WHAT TO DO:**

1. extend covered portion on either side of tunnel
2. provide a cushioning surface on the roof for falling debris/rock



**ROCK FALL**



**JOINT PATTERN AT TWO LOCATIONS 1 km APART IN SAME FORMATION**

**WHAT TO DO:**

1. cut the slope face in varying directions along alignment to minimize daylighting of joints.

**Summary:**

- 1. these scenarios can be anticipated and prevented**
- 2. modern tools such as GPR, GPS, Remote Sensing are available**
- 3. considerable recurring maintenance costs can be saved**



**Thank You**