

CHAPTER 10

LANDSCAPING AND RESTORATION OF CONSTRUCTION AREA

10.1 LANDSCAPING

As a part of various project related activities it is also proposed to develop nature parks, Children parks, gardens, and other recreation facilities near the project area once the construction activities of the project are over. It is proposed to earmark a provision of Rs. 80 lakh for this purpose.

10.2 RESTORATION OF ROAD SITES

The approach roads will have to be constructed as a part of the access to the construction site. In a pristine and relatively undisturbed environment like Arunachal Pradesh, construction of roads disturbs the scenic beauty of the area. In addition, hilly terrain, landslides are often triggered due to road construction because of the loosening of rocks by water trickling from various streams.

Steeply sloping banks are liable to landslides, which can largely be controlled by provision of suitable drainage. The basic principle is to intercept and divert as much water as possible, before it arrives at a point, where it becomes a nuisance. The other erosion hazard is that of surface erosion of the bank, which is best controlled by vegetation. However, in a steeply sloping terrain, difficulty lies in growing vegetation on steeply sloping banks. Engineering solutions such as surface drainage, sub-surface drainage, toe protection and rock bolting can be used. Landslides can be stabilized by several methods - engineering or bio-engineering measures alone or a combination of these. The cost required for implementation of various measures has already been incorporated in the overall budget earmarked for construction of roads.

In hilly terrain, road construction often generates significant quantity of wastes (muck) due to the stripping of the rocks to make way for the roads. The stripped muck is generally cleared by dumping the material along the slopes.

These dumped materials finally flow down to the valleys and ultimately finds it way to the river. This practice is not acceptable and more systematic approach needs to be adopted. The stripped material will have to be collected and dumped in the designated muck disposal area which will have check dams to prevent the muck to flow down into the river. After disposal operation is complete at a dump site, the dump yard will be contoured and vegetated.

The various aspects to be considered while making the project road are briefly described in the following paragraphs:

10.2.1 Design

- Where the road is in cutting, half cut and half fill type selection which involves least disturbance to the natural ground should be adopted subject to considerations of economy and road stability being satisfied.

- The cut slopes should be made stable for the type of strata in the initial construction stage itself by adoption of appropriate slopes with benches, etc. including the use of stabilizing structures like breast walls, pitching, etc.

10.2.2 Construction

- Area for clearing and grubbing should be kept to the minimum subject to the technical requirements of the road. The clearing area should be properly demarcated to save trees and shrubs and to keep tree cutting to the minimum.

- Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control of features can follow immediately thereafter, if the project conditions permit; otherwise temporary erosion control measures shall be provided between successive construction stages. Under no circumstances, however, should very large surface area of erodible earth material be exposed at any one time by clearing and grubbing.

- The method of balanced cut and fill formation should be adopted to avoid large difference in cut and fill quantities.

- The cut slopes should be suitably protected by breast walls, provision of flat stable slopes, construction of catch water and intercepting drains, treatment of slopes and unstable areas above and underneath the road, etc.

- Where rock blasting is involved, controlled blasting techniques should be adopted to avoid over-shattering of hill faces.

- Excavated material should not be thrown haphazardly but dumped duly dressed up in a suitable form at appropriate places where it cannot get easily washed away by rain, and such spoil deposits may be duly turfed or provided with some vegetative cover.

10.2.3 Drainage

- Drainage of the water from hill slopes and road surface is very important. All artificial drain must be linked with the existing natural drainage system for which separate detailed engineering survey may be carried out and planning done.

- The surface drains should have gentle slopes. Where falls in levels are to be negotiated, check dams with silting basins should be constructed and that soil is not eroded and carried away by high velocity flows.

- Location and alignment of culverts should also be so chosen as to avoid severe erosion at outlets and siltation at inlets,

10.2.4 Grassing and Planting

- Deforestation and road construction should be bare minimum and strict control must be exercised in consultation with the forest department. Equivalent amount of new trees must be planted as integral part of the project within the available land and if necessary, separate additional land may be acquired for this purpose.

- Depending on the availability of land and other resources, afforestation of roadside land should be carried out to a sufficient distance on either side of the road.

10.2.5 Control of Landslides along the Roads

Steeply sloping banks are liable to landslides, which can be controlled by drainage. The basic principle is to intercept and divert as much water as

possible, before it arrives at a point, where it becomes a nuisance. The erosion hazard that of surface erosion of the bank is best controlled by vegetation, but the difficulty lies in growing vegetation on steeply sloping banks. Engineering solutions such as surface drainage, sub-surface drainage, toe protection and rock bolting can be used. Landslides can be stabilized by several methods – engineering or bio-technical measures alone or a combination of these.

10.3 RESTORATION OF CONSTRUCTION SITES

During the construction of main features like Dam, Tunnels, Power House and other building structures of the project including residential and project roads, various slopes may be disturbed which require to be stabilized using bio-engineering measures like benching and terracing and plantation of grasses, herbs, shrubs and trees. A provision of Rs. 55 lakhs can be earmarked for this purpose.

A total expenditure required for landscaping and restoration of construction sites is $(80+55) = \text{Rs. 135 lakhs}$.