3. HIGHWAY ALIGNMENT & SURVEYS

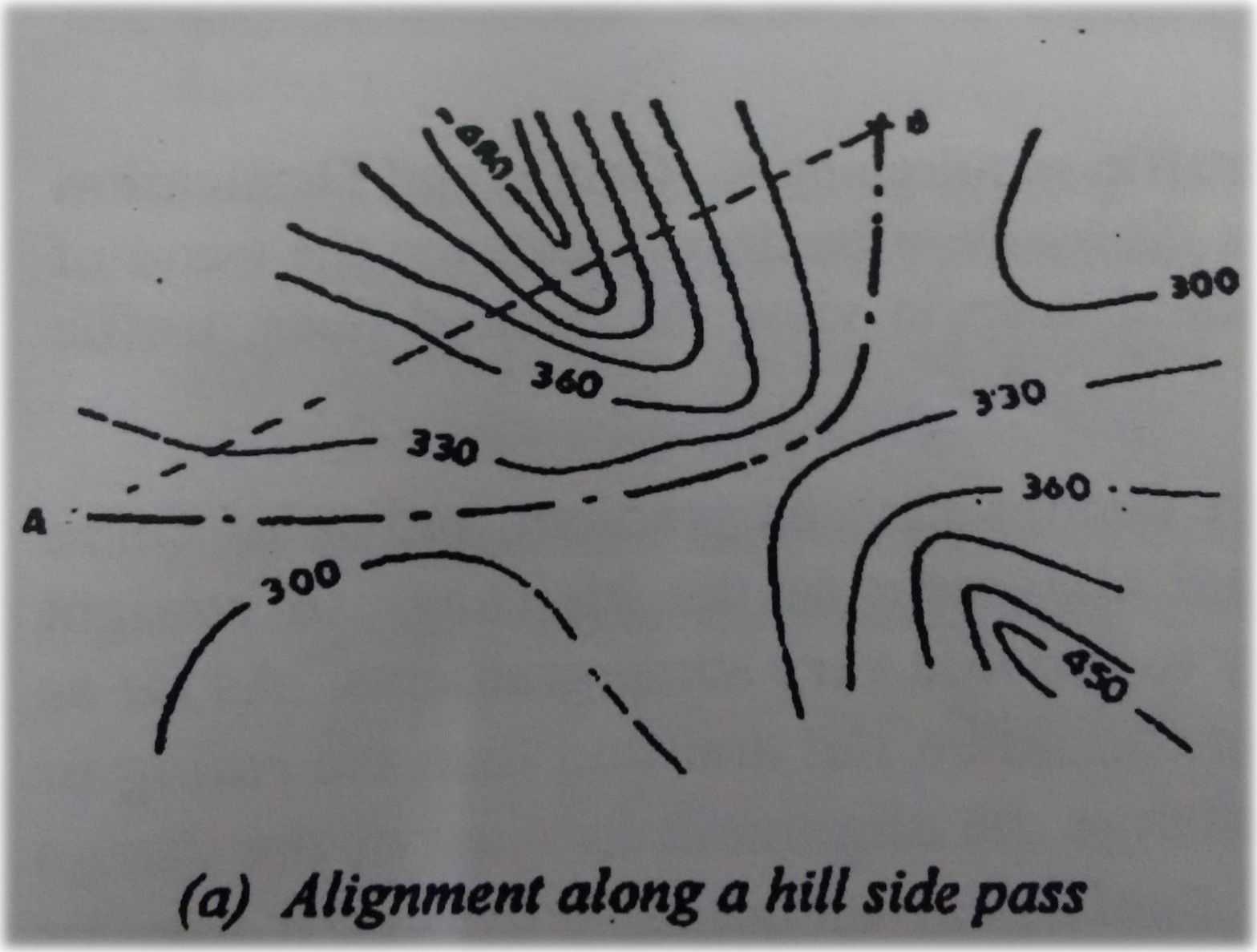
Factors Controlling Alignment

1. Obligatory Points
   a. Points through the alignment is to pass.
   b. Points through which alignment should not pass.
2. Traffic
3. Geometric Design
4. Economics
5. Other Considerations

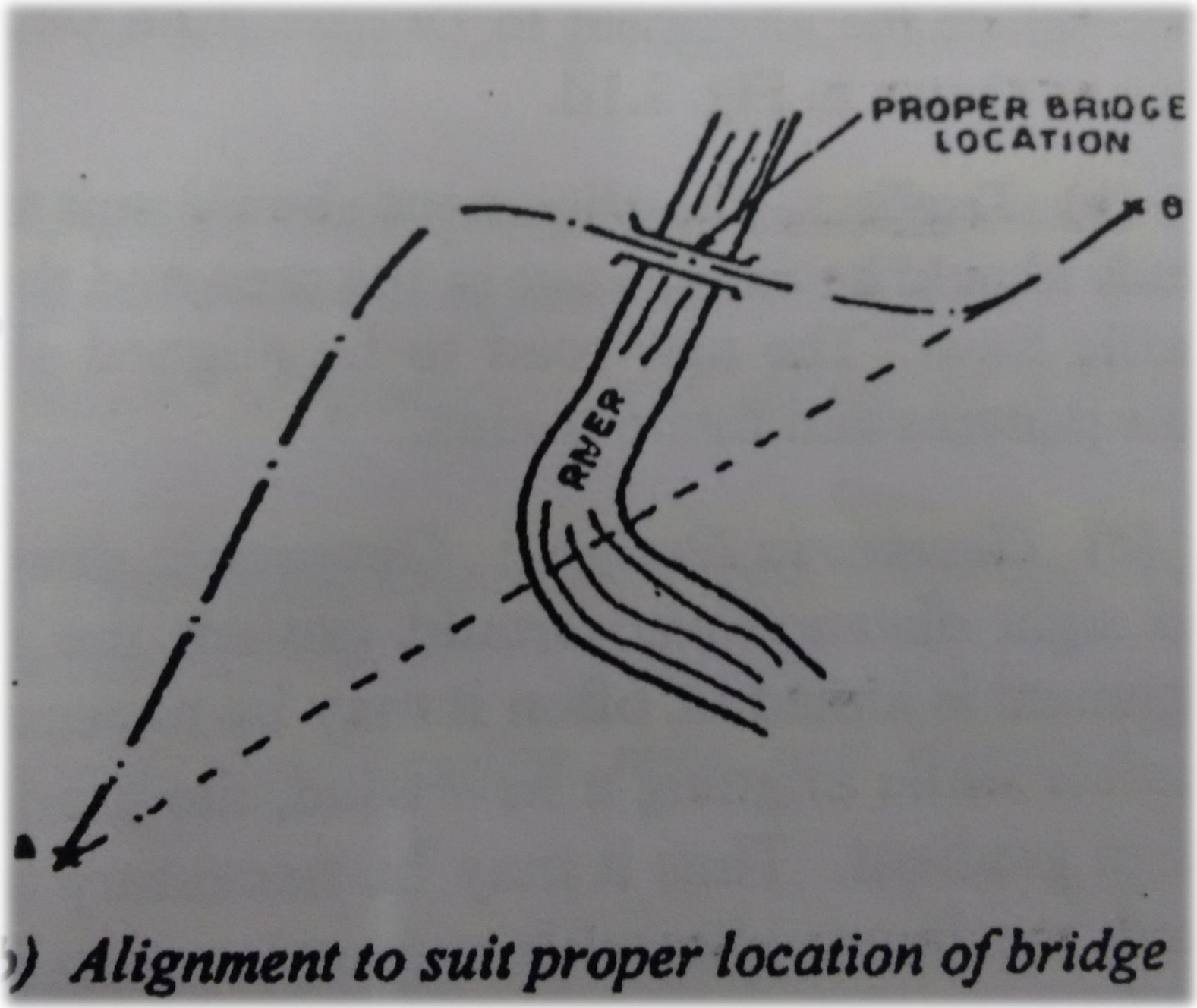
In hill roads additional care has to be given for

1 Stability
2 Drainage
3 Geometric Standards of hill roads
4 Resisting length

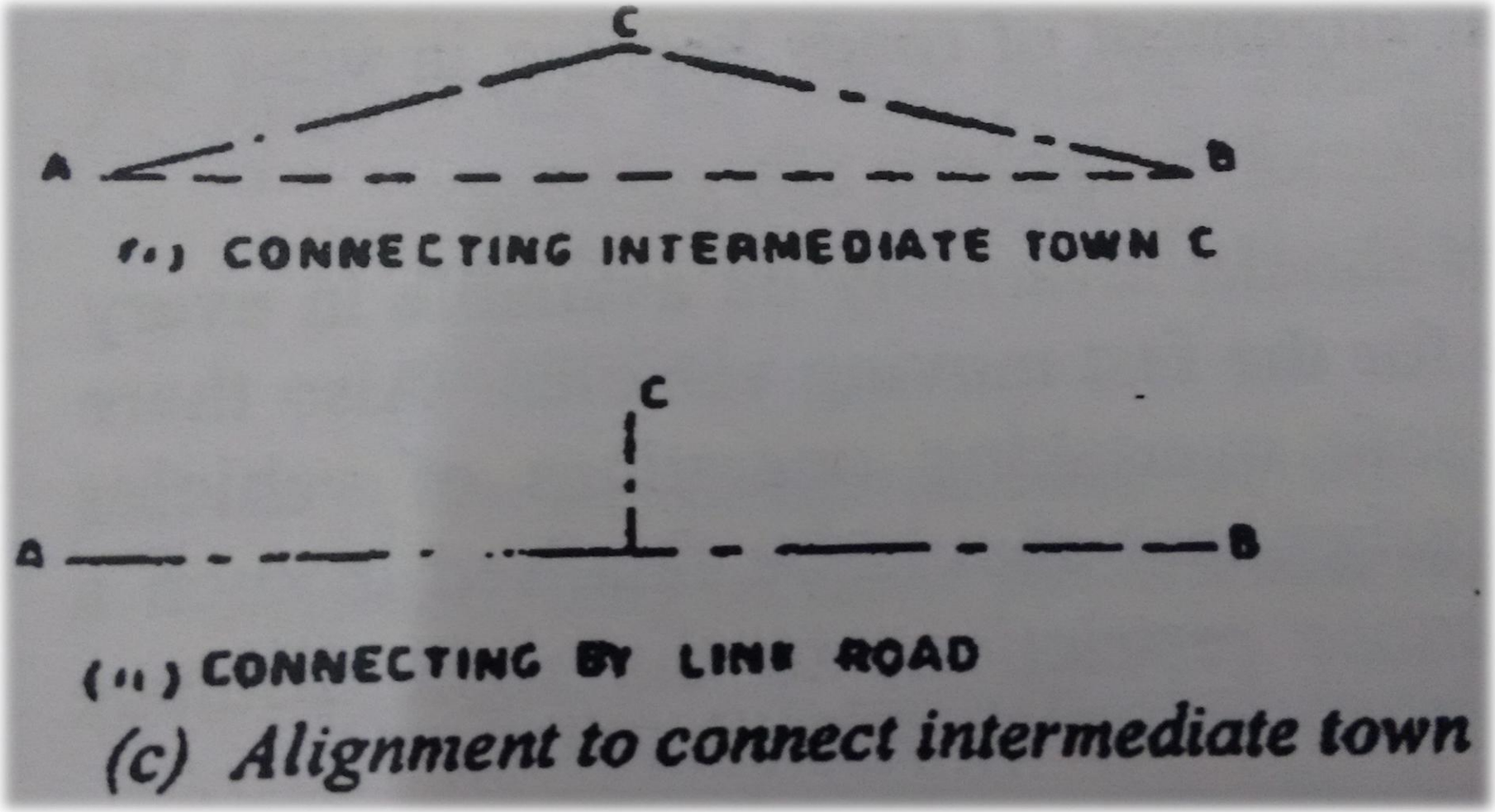
a. Points through which the alignment is to pass



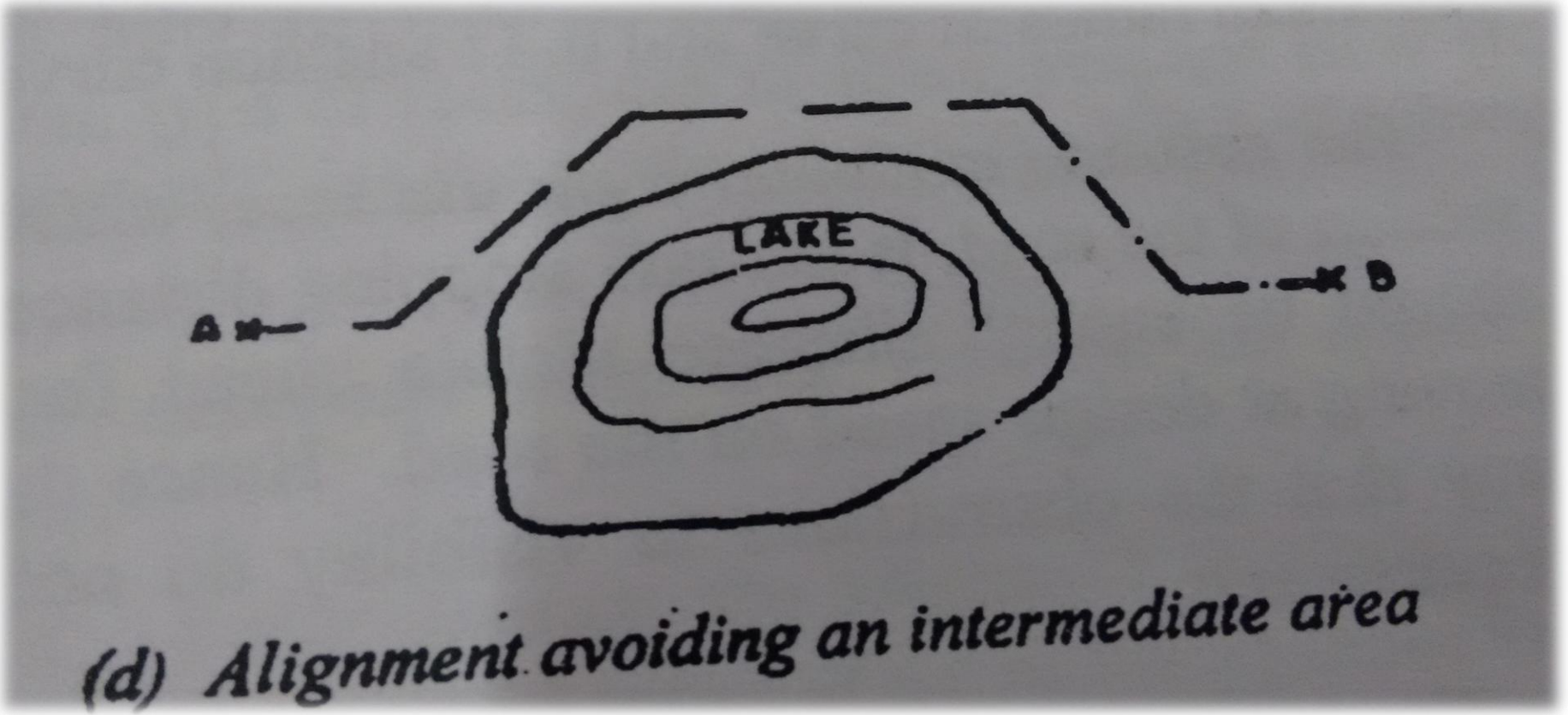
(a) Alignment along a hill side pass



b) Alignment to suit proper location of bridge



(c) Alignment to connect intermediate town



(d) Alignment avoiding an intermediate area

Special considerations while aligning roads on hilly areas

1. Stability: A common problem in hill roads is that of land slides. Hence special care should be taken.
2. Drainage: Numerous hill-side drains should be constructed.
3. Geometric Standards of hill roads: Different sets of geometric standards are followed in hill roads with reference to gradient, curves and speed.
4. Resisting length: It is the total work done to move loads along the route taking horizontal length, the actual difference in levels between the two stations and the sum of ineffective rise and fall in excess of floating gradient.

Engineering Surveys For Highway Locations

The stages of the engineering surveys are

1. Map study
2. Reconnaissance
3. Preliminary Surveys
4. Final location and detailed surveys

1. Map Study

- Alignment avoiding valleys, ponds or lakes
- When the road has to cross a row of hills, possibly of crossing through a mountain pass
- Approximate location of bridge site for crossing rivers, avoiding bend of the river, if any,
- When a road is to be connected between two stations, one of the top and the other on the foot of the hill, then alternate routes can be suggested keeping in view the permissible gradient.

2. Reconnaissance

- It is to examine the general character of the most feasible routes for detailed studies.
- Only simple instruments like abney level, tangent clinometer, barometer etc. are used by reconnaissance party to collect additional details rapidly.
- Valleys, ponds, lakes , marshy land, ridge , hills which are not available in map.
- Approximate values of gradient, length of gradients and radius of curves of alternative alignments.
- Number and type of cross drainage structures, maximum flood level and natural ground water level along the probable routes.
- Sources of construction materials, water and location of stone quarries.

3. Preliminary Survey

- To survey the various alternative alignments proposed after the reconnaissance and to collect all the necessary physical information and details of topography, drainage and soil.
- To compare the different proposals in view of the requirements of a good alignment.
- To estimate quantity of earth work materials and other construction aspects and to workout the cost of alternate proposals.
- To finalize the best alignment from all considerations.

Conventional Methods of preliminary survey:

- Primary traverse
- Topographical features
- Levelling work
- Drainage studies and Hydrological data
- Soil survey
- Material survey
- Traffic studies

Rapid Method and Modern Technique:

- Aerial photographic surveys and photogrammetric methods are very much suited for preliminary surveys.
- Using GPS, exact co ordinates can be found out.

4. Final Location and Detailed Survey

- The alignment finalized at the design office after preliminary survey is to be first located on the field by establishing the centerline.
- Detailed survey should be carried out for collecting the information necessary for the preparation of plans and construction details for highway projects.
- Temporary bench marks are fixed at intervals of about 250m and at all drainage and underpass structures.

Drawings and Reports

Drawings:

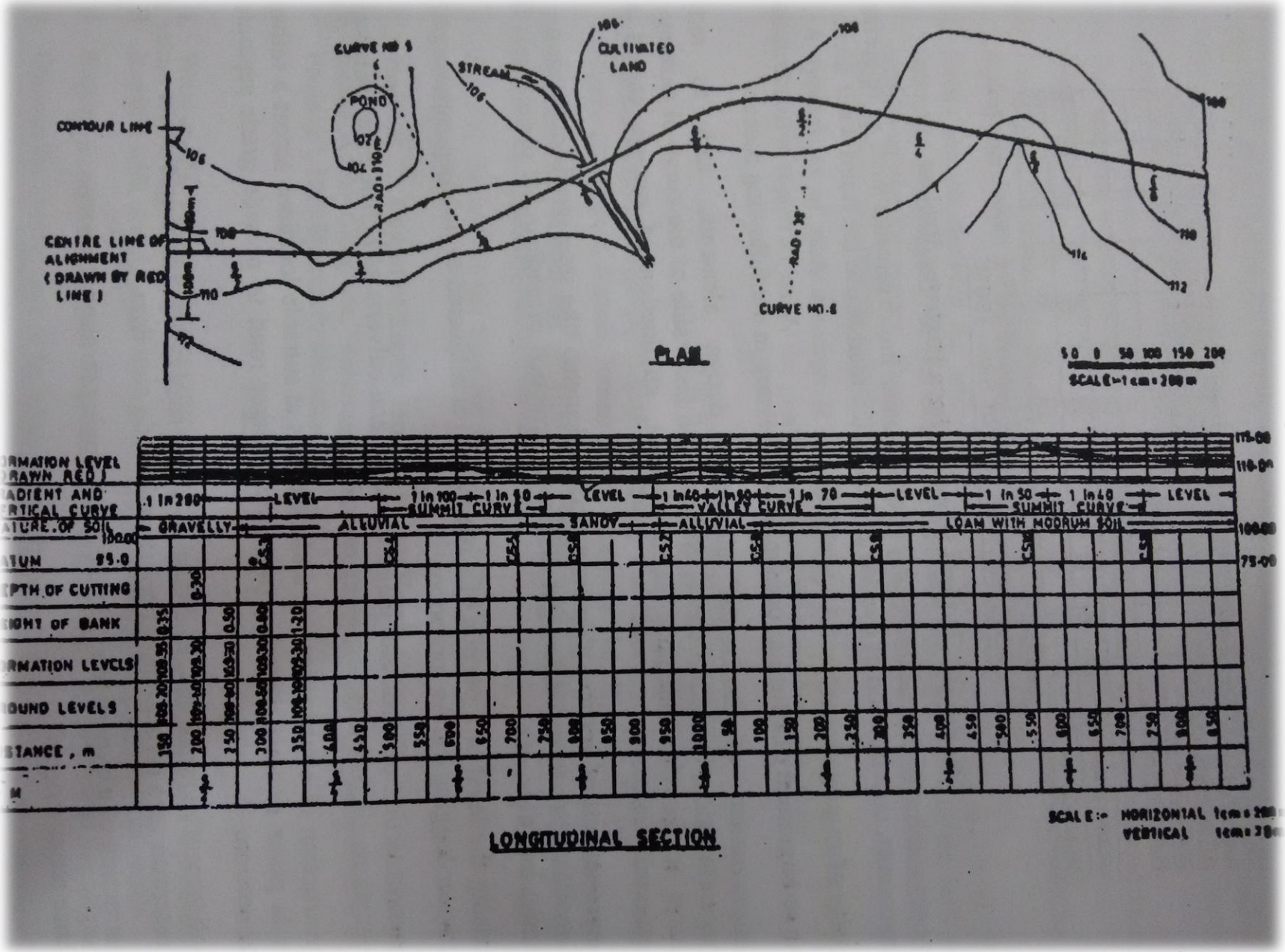
The following drawings are usually prepared in highway project:

1. Key map: Proposed and existing roads, important places to be connected.
2. Index map: General topography of the area.
3. Preliminary survey plans: Shows various alternative alignments
4. Detailed plan: Ground plan with alignment and the boundaries.
5. Land acquisition plans and schedules: are usually prepared from the survey drawings for land acquisition details.

Project Report

Following are important parts of the project document.

1. General details of the project & its importance
2. Feature of road including selection of the route, alignment, traffic etc.,.
3. Road design & specification
4. Drainage facilities & CD structures
5. Materials, labours and equipment
6. Rates
7. Construction programming
8. Miscellaneous items like diversion of road, traffic control, road side amnesties, rest houses, etc.,.



Typical Drawing of Highway Project

New Highway Project

It may be divided into following stages

1. Selection of route, finalization of highway alignment and geometric design details.
2. Collection of materials and testing of subgrade soil and other construction materials mix design of pavements and design details of pavement layers.
3. Construction stages including quality control.

Steps in a New Project Work

1. Map Study
2. Reconnaissance Survey
3. Preliminary Survey
4. Location & Final Alignment
5. Detailed Survey
6. Material Survey
7. Design
8. Earthwork
9. Pavement Construction
10. Construction Controls

Re-alignment Project

Necessity of re-alignment

1. Improvement of horizontal alignment design elements, such as radius, super elevation, transition curve etc.
2. Improvement of vertical alignment design elements like steep gradients, changes in summit curves to increase sight distance etc.
3. Raising the level of portion of road which is subjected to flooding, submergence during monsoons.
4. Re-construction of weak and narrow bridges and culverts.
5. Construction of over- bridges or under-bridges at suitable locations across a railway line in place of level crossing.
6. Construction of a bypass to avoid the road running through a town or city.
7. Defence requirements.