Highway Surveys and Location

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Highway Location

Location of proposed highway is an important first step in its design. Particular location is based on:

- Topography
- Soil characteristics
- Environmental factors such as noise and air pollution
- Economic factors
Techniques for highway surveys

Surveys usually involve measuring and computing horizontal and vertical angles, vertical heights (elevations) and horizontal distances. Data from surveys are used to produce maps with contour lines and longitudinal cross sections.

- Surveying Techniques:
- Ground surveys
- Remote sensing
- Computer graphics

Ground Surveys

- Transit: Used for measuring angles in both vertical and horizontal planes
- Level: Used for measuring changes in elevation
- Measuring tapes: Used for measuring horizontal distances (Nowadays Electronic Measurement Devices (EDM’s) are used)
- Modern transit frameworks can do all three (vertical and horizontal angles, distance and elevation measurements)
Remote Sensing

Measurement of distances and elevations using devices located above the earth such as:

- Airplanes (aerial photography or photogrammetry)
- Global Positioning Systems (GPS) using orbiting satellites
Computer Graphics

The combination of photogrammetry and computer techniques. Information obtained from photogrammetry is stored in a computer which allows plotting the highway route, make changes very easily and realize the effects of the change immediately.
Principles of Highway Location

Four different faces for the location of a highway:

- Office study (existing information)
- Reconnaissance survey
- Preliminary location survey
- Final location survey
Office Study

Obtain available data relating to the following:
- Topography, geology, climate and traffic volumes
- Social and demographic, land use and zoning patterns
- Environmental issues (wildlife, historic and archeological sites, effects on air, noise and water pollution)

Office Study

- Economic (unit costs for construction and trends of agricultural, commercial and industrial activities)

Preliminary analysis will identify unsuitable sites for the highway such as sites of archeological importance.
Reconnaissance Survey

Identify several feasible routes using aerial photographs and taking into account the following:

- Terrain and soil conditions
- Serviceability to industrial and populated areas
- Crossing of other transportation facilities (rivers, railroads or other highways)
- Directness of the route

Preliminary Location Survey

Feasible routes are set as closely as possible and preliminary vertical and horizontal alignments determined.

All feasible routes are evaluated for:

- Economics
- Environmental impact
Final Location Survey

- Detailed layout of selected route. Final horizontal and vertical alignments determined and final positions of structures (bridges, tunnels etc) located
- Set out of points of intersection (PI) of straight portions of the highway and fit horizontal curves between them

The fitted curve is determined through trial and error for best alignment based on both engineering and aesthetic factors (easier with computer techniques).
Location of Highways in Urban Areas

Urban areas present complex conditions which means in addition to the factors previously discussed for the location of a highway the following must also be taken into account:

- Connection to local streets
- Right of way acquisition

Location of Highways in Urban Areas

- Coordination of the highway system with other transportation systems (airports, railroad, subways, busses etc)
- Adequate provisions for pedestrians
Bridge Location

Highway location determines bridge location, not the reverse. Only in cases where the bridges need to be skewed or foundation problems exist, the location of the bridge can be a factor in highway location due to higher costs associated with the above mentioned bridge conditions.