

Analysis and execution of road work on NH-5

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ABSTRACT:

Road Transport is vital to India's economy. It enables the country's transportation sector contribute 4.7 percent of India's gross domestic product, in comparison to railways that contributed 1 percent, in 2009-2010, despite railways handling of passenger and pure cargo. Road transport has gained in importance over the years despite significant barriers and inefficiencies in inter-state freight and passenger movement compared to railways and air. The government of India considers road network as critical to the country's development, social integration and security needs of the country. India's road network carries over 65 percent of its freight and about 85 percent of passenger traffic. Indian road network is administered by various government authorities, given India's federal form of government. National highways connect capitals, important places, ports and places of strategic importance of various states. Though national highways account for only 2% of the total road length, they carry nearly 1/3 of the total traffic. Flexible pavement is composed of a bituminous material surface course and underlying base and sub base courses. The bituminous material is more often asphalt whose viscous nature allows significant plastic deformation. Most asphalt surfaces are built on a gravel base, although some 'full depth' asphalt surfaces are built directly on the sub grade. Depending on the temperature at which it is applied, asphalt is categorized as hot mix asphalt (HMA), warm mix asphalt, or cold mix asphalt. Flexible Pavement is so named as the pavement surface reflects the total deflection of all subsequent layers due to the traffic load acting upon it. The flexible pavement design is based on the load distributing characteristics of a layered system. It transmits load to the sub grade through a combination of layers. Flexible pavement distributes load over a relatively smaller area of the sub grade beneath. The initial installation cost of a flexible pavement is quite low which is why this type of pavement is more commonly seen universally. However, the flexible pavement requires maintenance and routine repairs every few years. Highway surveys involve the location of alignments and computation of volumes materials that must be added, removed, or moved. It initially requires a topographic survey of the site. For large projects, photographic method will be used to develop the base map. The base map is used by surveyors and other professional to create a base plan for the project. After the alignment has been established, the quantities of earth that must be added or removed are computed. The goal of most projects is to minimize the hauling distances of the earth. This is done using mass diagrams. Eventually surveyors layout the elevation and slope of the various sub-grades, base, and top coat materials. The end result is a smooth alignment with smooth transitions from straight to curved sections allowing for safe public transportation.

INTRODUCTION :

National Highway 5 (NH-5) is a major National Highway in India that runs along India's east coast through the states of Orissa, Andhra Pradesh

and Tamil Nadu. The northern terminal is at Jharpokharia in Orissa and the southern terminal is at Chennai in Tamil Nadu. NH 5 is a part of the golden quadrilateral project undertaken by

National Highways Development Project. Under the new national highway numbers NH 5 is renamed as NH 16. NH 5 runs for a distance of 1533 km. In Tamil Nadu NH 5 starts from Chennai and shortly enters Andhra Pradesh from Gummidipundi. In Andhra Pradesh, it passes through most of the coastal towns in nine coastal districts including Nellore, Ongole, Chilakaluripet, Guntur,

Vijaywada, Eluru, Tanuku, Rajahmundry, Tuni, Visakhapatnam, Srikakulam, Tekkali and Palasakasibugga. In Orissa, it passes through Baripada, Balasore, Bhadrak, Cuttack, Bhubaneswar and Berhampur. Our project is on Six Laning of Chilakaluripet - Nellore section of NH 5 from km 1182.802 to km 1366.547 (approx length-183.620 km) in the state of Andhra Pradesh under NHDP to be executed as BOT project on DBFOT pattern. The project was awarded to M/s. KMC-BSCPL JV. BSCPL share is 50 %.

Classification of roads as per IRC (Nagpur Plan) National Highways: These are main highways running through the length and breadth of the country connecting major ports, foreign highways, state capitals, large industrial and tourist centers etc. State Highways: These are arterial routes of states linking direct headquarters and important cities within the state and connecting them with National Highways or Highways of the neighboring states. Major District Roads: These are important roads within a district serving areas of production and markets, and connecting these with each other or with the main highways. Other District Roads: These are roads serving rural areas of production and providing them with outlet to market centers, taluka/tehsil headquarters, block development headquarters, or other main roads. Village Roads: These are roads connecting villages or groups of villages with each other and

to the nearest road of higher category. Geometric Design Standards The layout and other geometric features of a road have direct influence on the initial cost of its construction and the efficiency and economy of its use by traffic. The safety of operation is also significantly affected by geometric design. The geometric design of a highway is influenced significantly by terrain conditions.

Different road materials used: The most important pavement materials are soils, mineral aggregates, bituminous binders, and stabilizers like lime, cement, etc. Mineral aggregates constitute about 90 percent of total volume of road construction materials used. All roads have to be founded on soil and are required to make optimum use of the locally available materials, if it is to be constructed economically. Materials used in the structural layers of the pavement should be selected based on availability, economy and previous experience.

Soil as road construction material: Sub grade soil is an integral part of the road pavement structure as it provides support to the pavement as its foundation. The main function of the sub grade is to give adequate support to the pavement and for this the sub grade should possess sufficient stability under adverse climatic and loading conditions. The formation of wave, corrugations, rutting and shoving in black top pavements are generally attributed to poor sub grade conditions. When soil is used in embankment construction, in addition to stability, incompressibility is also important as differential settlement may cause failure. Soil is used in its natural form (gravel and sand) or in a processed form (stabilized layer) for pavement construction. Soil is also used as a binder in water-bound macadam layers. Soil is therefore, considered as one of the principal

highway materials. The foundation of other cross-drainage structures (culverts, bridges and retaining walls) rests on soils and their stability depends on the soil strength, knowledge of soil properties is necessary to select the embankment material, pavement structure, drainage system and foundation of structures. When a high embankment rests on soft ground, its stability can be predicted by studying the properties of soil. Frost action, common in high altitudes, can be taken care of if the soil properties are well known. Soil consists mainly of minerals matter formed by the disintegration of rocks, by the action of water, frost, temperature, and pressure or by plant or animal life. Based on the individual grain size of the soil particles, soil have been classified as gravel, sand, silt, and clay. The BIS gives the following limits of particle size. Gravel 80-4.75 mm Sand coarse 4.75- 2.00 mm Medium 2.00-0.475 mm Fine 0.475-0.075 mm Silt 0.075- 0.002 mm Clay

Bituminous material: Bitumen is a viscous liquid, semisolid or solid material, colour varying from black to dark brown having adhesive properties consisting essentially hydrocarbons is derived from distillation of petroleum crude or natural asphalt and soluble in carbon disulphide. Bituminous materials used for paving purposes are penetration grade bitumen and liquid bitumen (cutbacks & emulsion). The bituminous binder should possess the following qualities. $\frac{3}{4}$ Adequate viscosity at the time of mixing and compaction. $\frac{3}{4}$ Not highly temperature susceptible. $\frac{3}{4}$ Should not strip from aggregate in presence of water.

Site clearance: General: Site clearing generally consists of the cutting and/or taking down, removal and disposal of everything above ground

level, including objects overhanging the area to be cleared such as tree branches, except such trees, vegetation, structures or parts of structures and other things which are designated in the contract to remain or be removed by others to which the engineer directed to be left undisturbed. The material to be cleared usually but not necessarily is limited to trees, stumps, logs, brush, undergrowth, long grasses, crops, loose vegetable matter and structure. The entire road area shall be cleared as described above, unless otherwise shown on the drawing and/or directed by the engineer.

Setting out: The right of way (R.O.W) shall be surveyed and set out before any site clearance is cleared out. Wooden pegs usually indicate the surveyed rights of ways. Procedure for setting out:

1. Fixing of centre line of alignment by using total station, theodolite.
2. Calculating curvature and refractures(for curves and embankment) by using auto levels or dumpy level.
3. To establish traverse bench mark (TBM) at required intervals adjacent to alignments.
4. Location of levels at major conflict junctions.
5. To mark the longitudinal and cross sectional pavement structure.
6. To make efficient, minimum and desired sight distance at major conflicts and terrain and also setting out of horizontal curves throughout the alignment was done by using theodolite and total survey station.

CONCLUSIONS :

The general objectives are for the Concession Company to make the main NH5 road [and the service roads] as safe as possible for all users. The Concession Company shall follow [and shall also show it has followed] all relevant Indian publications on road safety, especially The Manual for Safety in Road Design (A guide for Highway Engineers) prepared in



September 1998 for MOST. A formalised safety audit procedure must be followed [to optimise the safety process, and ensure safety is properly and formally considered] by the Concession Company during the detailed design [and during the Construction and post construction periods].

References

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