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ANALYSIS AND CONSTRUCTION OF 6 LANE NATIONAL HIGHWAYS FOR EXISTING OF 4 LANE

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Abstract

Road Transport is essential to India's economy. It empowers the nation's transportation division contribute 4.7 percent of India's GDP, in contrast with railroads that contributed 1 percent, in 2009-2010, in spite of rail routes treatment of traveler and immaculate load. Street transport has picked up in significance throughout the years in spite of critical boundaries and wasteful aspects in between state cargo and traveler development contrasted with railroads and air. The administration of India considers street arrange as basic to the nation's improvement, social incorporation and security needs of the nation. India's street organize persists 65 percent of its cargo and around 85 percent of traveler activity. Indian street system is regulated by different government specialists, given India's elected type of government. National interstates interface capitals, critical places, ports and places of key significance of different states. Despite the fact that national interstates represent just 2% of the aggregate street length, they convey almost 1/3 of the aggregate movement. Flexible pavement is made out of a bituminous material surface course and hidden base and sub base courses. The bituminous material is all the more regularly black-top whose gooey nature permits noteworthy plastic disfigurement. Most black-top surfaces are based on a rock base, albeit some 'full profundity' black-top surfaces are fabricated straightforwardly on the sub review. Contingent upon the temperature at which it is connected, black-top is arranged as hot blend black-top (HMA), warm blend black-top, or frosty blend black-top. Adaptable Pavement is so named as the asphalt surface mirrors the aggregate redirection of every single consequent layer because of the activity stack following up on it. The adaptable asphalt configuration depends on the heap dispersing qualities of a layered framework. It transmits load to the sub review through a blend of layers. Adaptable asphalt circulates stack over a generally littler zone of the sub review underneath. The underlying establishment cost of an adaptable asphalt is very low which is the reason this sort of asphalt is

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all the more usually observed all around. Notwithstanding, the adaptable asphalt requires upkeep and routine repairs at regular intervals.

Expressway overviews include the area of arrangements and calculation of volumes materials that must be included, evacuated, or moved. It at first requires a topographic review of the site. For substantial activities, photographic technique will be utilized to build up the base guide. The base guide is utilized by surveyors and other expert to make a base arrangement for the venture. After the arrangement has been set up, the amounts of earth that must be included or evacuated are figured. The objective of most activities is to limit the pulling separations of the earth. This is done utilizing mass charts. In the long run surveyors design the height and slant of the different sub-evaluations, base, and top coat materials. The final product is a smooth arrangement with smooth moves from straight to bended areas taking into account safe open transportation.

Key Words: Road Transport, Flexible pavement, asphalt surfaces, Expressway, performance.

1. INTRODUCTION

1.1 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 passés 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.

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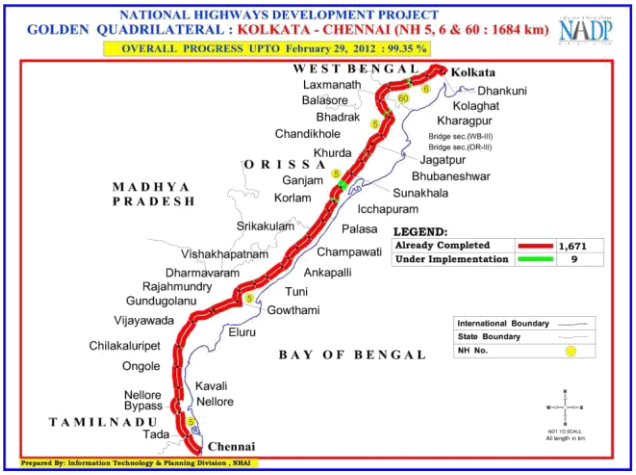

Fig 1.1 National Highway 5

Classification of roads as per IRC (Nagpur Plan)

National Highways: These are main highways running through the length and breadth of thecountry 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 importantcities 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 productionand 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 themwith 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 tothe nearest road of higher category.

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2. EXECUTION OF SITE WORK

Site investigation:

A site investigation report is the basis for all the subsequent decisions regarding cleanup of a contaminated site. This report describes the findings of the desk study and the field work and discuss their implications with respect to the proposed development of the site. An assessment is made in terms of likelihood of the presence of contamination that may affect the feasibility of the site for the intended use.

The sequence of a site investigation is as follows:

- Desk Study
- Site Reconnaissance
- Preliminary report or feasibility study
- Preliminary Ground Investigation - Planning of main GI
- Preliminary report
- Main Ground Investigation
- Laboratory testing
- Final report

Desk study:

The desk study is work taken up prior to commencing the work on site and the Ground Investigation. It should always be the first stage of the Site Investigation and is used to plan the Ground Investigation. The work involves researching the site to gain as much information as possible, both geological and historical.

Site reconnaissance:

The Site Reconnaissance phase of a site investigation is normally in the form of a walk over survey of the site. Important evidence to look for is:

- **Hydrogeology**: Wet marshy ground, springs or seepage, ponds or streams and Wells.

- **Slope Instability**: Signs of slope instability include bent trees, hummocks on the groundand displaced fences or drains.
- **Mining**: The presence of mining is often signs of subsidence and possibly disused mineshafts. Open cast mining is indicated by diverted streams replaced or removed fence/hedge lines.
- **Access**: It is essential that access to the site can be easily obtained. Possible problemsinclude low overhead cables and watercourses.

Planning a site investigation:

The main investigation is the full investigation of the site using boreholes and trial pits and includes the preparation of the site- investigation report with revised plans and sections, interpretation and recommendations for design.

They consider that there are two aspects to the site investigation .The geological structure and character of the site and the testing of the soil both in the laboratory and in-situ.

Ground investigation:

Ground investigation is taken to be that other than the information available from the walk over survey as discussed previously.

There are two principal methods of investigating the ground conditions, trial pits and boreholes. In addition, the reader should be aware of geophysical techniques such as seismic surveys, which are not discussed here.

Sampling:

Sampling can be either undisturbed, of which in-situ testing is a form, or disturbed. On our site, we used both disturbed and undisturbed/representative.

Reporting:

The Site Investigation report for a highway design scheme should answer all the questions set out in the planning phase of the Investigation. This should include an assessment of the viability of the proposed route and indication of any alternatives.

Included in the report should be a location of all the boreholes, trial pits, other excavations and their logs. These logs should give as much information as possible on the soil and rock structure as it is possible to obtain.

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.

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.

Steps involved in surveying:

- ¾ Benchmark
- ¾ Temporary benchmark at regular intervals.
- ¾ Centre line marking
- ¾ Road markings
- ¾ Profile marking (for longitudinal and cross sectional structures)
- ¾ Establishment of different levels providing gradients as per to design considering different factors like-

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- SSD(STOPPING SIGHT DISTANCE)
- OSD(OVERTAKING SIGHT DISTANCE)
- ISD(INTERMEDIATE SIGHT DISTANCE)

Fig 2.1Surveying using dumpy level

Plants and equipments:

Site clearing of trees, vegetation, undergrowth, bushes and minor structures are carried out by dozers and or hydraulic excavators. Trees that cannot be felled by the aforesaid equipment shall be felled by using saws. Major structures that cannot practically be cleared by hydraulic excavators and/or dozers, these demolitions can be carried out using pneumatic tools, explosives and/or other specialized equipment depending on the size and type of structures. Before commencing explosive demolition all necessary permits and licenses will be obtained and a blasting plan detailing the size of charges, locations of holes, system of detonation and safety precaution will be forwarded to the engineer together with the request sheets.

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Fig 2.2: Double barrel Asphalt Premix plant.

Fig 2.3 Single barrel Asphalt Premix Plant.

Fig 2.4 Sensor Paver

Fig 2.5 Aggregate Crusher

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Sequence of works:

Prior to the commencement of the site clearance, the following shall be carried out either independently or jointly with the Engineer's Representative.

I. The right of ways (R.O.W) shall be surveyed and set out according to the data stated in the drawings.

II. Photographs shall be taken of structures, landscaping trees and shrubs, fences, telephone and electrical poles and other if they are payable under individual measured item apart from the general site clearance in the bill of quantities.

III. The above site clearance items shall be measured according to the method of measurement jointly with the Engineer's Representatives. The location of these items shall be identified according to the survey data or offsets from the centerline of the proposed alignment in road construction.

IV. Prior to demolition of existing buildings, liaison with the respective authorities terminates the utilities supply to the building.

V. Removal of landscaping trees and shrubs shall be carried out with the prior approval of the concerned authority.

VI. Fencing or others that are to be relocated or salvaged shall be carried out according to the drawings or as per the instructions given by Engineer.

VII. Obtain confirmation that the employer or relevant authority have acquired the right of way lands.

VIII. Access roads to the site shall be constructed if required to enable vehicles, equipment and plants to be brought into the site.

IX. Solid waste dumps sites shall be predetermined within or outside the site for the dumping of the site clearing materials.

X. The site clearance then shall be proceeded to clear the trees, vegetation, undergrowth, bushes and minor structures by hydraulic excavators or dozers.

Different laboratory tests on field:

Laboratory test for CBR:(California Bearing Ratio)

CBR: The ratio of the force per unit area required to penetrate a soil mass with a plunger of50mm diameter at the rate of 1.25mm/minute to the required corresponding penetration of standard material.

Generally the ratio is determined for 2.5mm and 5.0mm penetrations, and where the ratio at 5.00mm is consistently higher than that at 2.5mm, the ratio at 5.00mm is considered.

Fig2.6 CBR apparatus

Grain size analysis of soil:

Free swell index = $[V_d - V_k] / V_k \times 100\%$

Where,

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V_d = volume of soil specimen read from the graduated cylinder containing distilled water. V_k = volume of soil specimen read from the graduated cylinder containing kerosene.

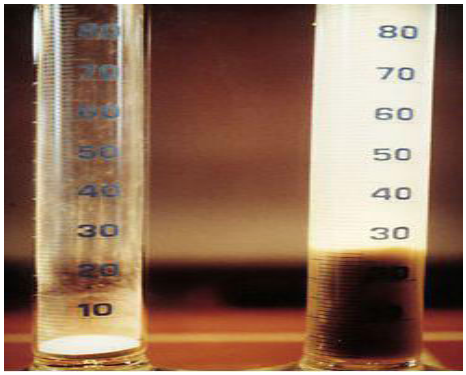

Fig 2.7 Grain size analysis

Determination of plastic limit and liquid limit of soil:

This test is done to determine the plastic limit of soil as per IS: 2720 (Part 5) – 1985.The plastic limit of fine-grained soil is the water content of the soil below which it ceases to be plastic. It begins to crumble when rolled into threads of 3mm dia. The apparatus used:

i) Porcelain evaporating dish about 120mm dia.
ii) Spatula
iii) Container to determine moisture content
iv) Balance, with an accuracy of 0.01g
v) Oven
vi) Ground glass plate – 20cm x 15cm
vii) Rod – 3mm dia. and about 10cm long

Preparation of sample:

Take out 30g of air-dried soil from a thoroughly mixed sample of the soil passing through 425µm IS Sieve. Mix the soil with distilled water in an evaporating dish and leave the soil mass for naturing. This period may be upto 24hrs.

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Fig 2.8 equipment to determine the liquid limit of the soil

3. RESULT:

This chapter presents results and discussion on the findings of the experimental investigations carried out.

The sample results of dry density and moisture content is shown in the figure below.

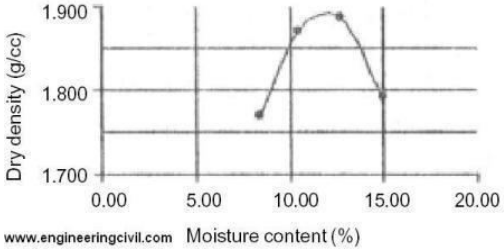

Fig 3.1 dry density vs moisture content

The graph for liquid limit of soil is shown in the figure below

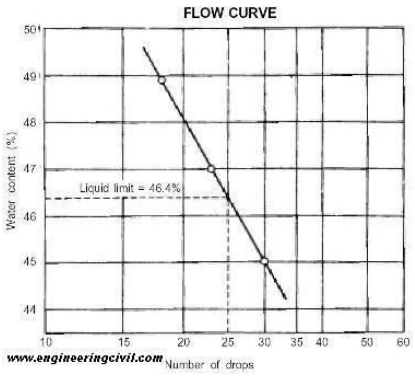

Fig 3.2 No of Drops vs moisture content

5. CONCLUSION

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].

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