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Highways and Their Maintenance Methods

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Abstract:
Roads, and means of transport, make a crucial contribution to economic development and growth and bring important social benefits. Poorly maintained roads constrain mobility, significantly raise vehicle operating costs, increase accident rates and their associated human and property costs, and aggravate isolation, poverty, poor health, and illiteracy in rural communities. This Note highlights the economic and social importance of regular road maintenance and recommends ways to achieve sustainable road maintenance with scarce public resources. Its audience is not specialists but rather people who need to understand road maintenance enough to discharge their responsibilities effectively: government policy-makers, mayors, ministry staff, new World Bank staff and staff in sectors such as rural development and social funds. The reference section offers sources providing more detailed information.

The maintenance of roads involves the co-ordination of a wide range of seemingly unrelated activities. In practice to achieve a good standard of effective maintenance it is essential that different aspects of the work should integrate smoothly. The task facing the Engineer in Road Maintenance is to maintain a network of roads within available budgets. This is made difficult by the amounts of road which are built to inadequate standards and the increase in both the volumes of traffic and in the axle loadings combined with decreasing budgets and the expectation of further cuts in public expenditure. This is noticeable both in rural areas where the intensification and diversification of agricultural production has resulted in minor roads of minimal pavement construction having to accommodate relatively large volumes of traffic and more particularly commercial vehicles which on occasion can barely fit onto the road, and in urban areas where the growth of towns and cities has incorporated areas serviced by minor roads now carrying heavy volumes of traffic. Of these the majority of National Primary and some national Secondary roads have been realigned to modern design standards.

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The remainder are old pre automobile tracks which received an overlay of gravel and surface dressing during the 1950/60's with subsequent granular overlays and Surface Dressing. Due to the dispersed settlement pattern in Ireland we have a proportionately long road network for our population. The maintenance of these roads will continue to be an ongoing problem, resources will not allow for complete structural overlays or realignment of a significant proportion of these roads. During the past decade and a half funding has been available to allow a higher expenditure on Road Maintenance than was previously available, resulting in significant improvements in the standard of road pavements through the country. The challenge for engineers over the next few years will be to maintain the road network to an acceptable level with less resources than have been previously available.

INTRODUCTION

Although the need for maintenance is widely recognized, it is still not getting adequately done. Many countries spend just 20–50 percent of what they should be spending on maintenance of their road network. There are many reasons why this is so. This Note explains some of them and shows how to overcome them. The challenges include distinguishing maintenance from other types of road work; calculating how much maintenance will cost; where to get the money; and how to plan for it institutionally; and contracting maintenance work.

WHY IS MAINTENANCE IMPORTANT?

Streets are among the most significant open resources in numerous nations. Street enhancements carry quick and once in a while emotional advantages to street clients through improved access to medical clinics, schools, and markets; improved solace, speed, and wellbeing; and lower vehicle working expenses. For these advantages to be supported, street enhancements must be trailed by a well-arranged program of upkeep. Without normal upkeep, streets can quickly fall into decay, counteracting acknowledgment of the more drawn out term effects of street enhancements for advancement, for example, expanded rural creation and development in school enlistment.

Deferring street upkeep brings about high immediate and backhanded expenses. In the event that street deformities are fixed immediately, the expense is normally humble. On the off chance that imperfections are ignored, a whole street segment may bomb totally, requiring full reproduction at multiple times or more the expense, by and large, of upkeep costs. The South African National Road Agency Ltd. (SANRAL) gauges that fix costs ascend to multiple times upkeep costs following three years of disregard and to multiple times following five years of disregard. To maintain a strategic distance from such raising expenses, SANRAL first "allocate[s] its accessible financing assets to perfect support activities (e.g., reseals and overlays), and from there on

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to increasingly broad upkeep activities (e.g., recovery), lastly to new development" (SANRAL 2004).

WHAT IS MAINTENANCE?

The objective of support is to safeguard the benefit, not to redesign it. Not at all like real street works, must support be done normally.

i. Road support contains "exercises to keep asphalt, shoulders, slants, seepage offices and every single other structure and property inside the street edges as close as conceivable to their as- built or recharged condition" (PIARC 1994). It incorporates minor fixes and upgrades to dispense with the reason for deformities and to maintain a strategic distance from exorbitant reiteration of upkeep endeavors. For the executives and operational comfort, street support is sorted as standard, occasional, and dire.

ii. Routine support, which involves little scale works led consistently, points "to guarantee the every day pass capacity and wellbeing of existing streets in the short-run and to anticipate untimely weakening of the streets" (PIARC 1994). Recurrence of exercises changes yet is for the most part once or more a week or month. Run of the mill exercises incorporate roadside skirt clearing and grass cutting, cleaning of silted trench and courses, fixing, and pothole fix. For rock streets it might incorporate regarding like clockwork.

iii. Periodic support, which spreads exercises on an area of street at normal and moderately long interims, points "to protect the basic respectability of the street" (WB Maintenance site). These tasks will in general be huge scale, requiring particular gear and gifted faculty. They cost more than routine upkeep works and require explicit recognizable proof and making arrangements for execution and frequently even plan. Exercises can be named preventive, reemerging, overlay, and asphalt reproduction. Resealing and overlay works are for the most part attempted in light of estimated weakening in street conditions. For a cleared street repaving is required about at regular intervals; for a rock street re-graveling is required about at regular intervals.

iv. Urgent upkeep is embraced for fixes that can't be predicted however require prompt consideration, for example, crumbled ducts or avalanches that square a street.

v. Maintenance does exclude recovery, building shoulders, or extending streets. In the event that the segments to be remade comprise in excess of 25 percent of the street's length, the work is restoration, not upkeep.

HOW TO INCORPORATE MAINTENANCE INTO PROJECT AND SECTOR STRATEGIES

To make sure that street upkeep isn't disregarded, it should be consolidated into task and part methodologies. That requires a reasonable and practical methodology for street organize the board that takes care of the accompanying key standards: Use the center system idea. As a standard guideline, 80 percent of traffic streams more than 20 percent of the street arrange. This center system is frequently the duty of the national

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government's expressways service. These most intensely dealt streets ought to get need for full everyday practice and intermittent upkeep. Clearly dole out to explicit organizations "proprietorship" of streets and obligations regarding improvement, upkeep, and need setting. Frequently, when development or overhauling has been finished by the national street organization through an advance or award, obligation regarding support stays vague or is given over to the "network." Good practice shows that the office that actualizes the street development or restoration be in charge of ensuing daily practice and intermittent upkeep (Malmberg Calvo 1998). For instance in India the national interstates (around 65,000 km) are the duty of the Ministry of Roads and Highways, while state roadways (Around 124,300 km) are the obligation of the states. At each level a similar office is in charge of improvement just as systems for upkeeps of its "own" organize. Involve all organizations and foundations related with streets at national, provincial, area, and nearby network levels just as street clients and different partners in distinguishing street issues and arranging street intercessions. Different partners incorporate associations managing the travel industry, medicinal services, provincial advancement, farming, and mining; street client affiliations; network associations; nongovernmental associations; and organizations. Determine the general degree of subsidizing required and the parity among development, recovery, and upkeep. Need for support assets ought to go to streets that are practically significant and in sensibly great condition. Routine support ought to be incorporated as a cost part in donor funded street development tasks regardless of whether upkeep is completely financed by government assets, to guarantee that it isn't disregarded. Develop benchmarks for improving streets. Structure principles and upkeep practices ought to be looked into to guarantee the maintainability of the whole street organize. For example, for low-volume streets plan benchmarks may pressure openness and sturdiness instead of width and speed. Include upkeep of extensions, street signs, walkways, and other street structures. Disregarded street structures and signs lead to expanded street mishaps and, on account of extension weakening; can prompt street terminations and system disturbances. Assess ability to subsidize, oversees, and administers street upkeep. Global benefactors have turned out to be progressively associated with street support projects, and this can be a decent if impermanent answer for some street organizations. For the more drawn out term, benefactors should make a progressively steady wellspring of assets. Assess the limits of metropolitan, locale, and commonplace street offices to play out any administration and supervision duties assigned by the focal street office.

Define destinations and create plans for street upkeep limit building, including preparing, specialized help, and neighborhood income age. In college most engineers will have been introduced to the basics of road pavement

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design, the structural design of the road pavement is determined by the estimated traffic volume over the design life of the pavement and the ground conditions, giving a depth of layered construction to provide for a 20 year life, road pavements designed and constructed in the last 30 years have been designed and constructed according to this approach. Pavement overlays are designed on the basis of strength testing and the relevant depth of construction is added to the road structure Last winter (2009-2010), with heavy rainfall during November and December, followed by severe frost in January resulted in severe damage to many sections of roads throughout the country, noticeably on old portions of road, not on newly constructed, strengthened or Surface Dressed roads. Why is this? What can road maintenance engineers do to prevent a similar occurrence in future? The Road network in Ireland consists of National Primary roads 2739 km National Secondary roads 2676 Regional, County and Urban Roads 89,000 km. (Approximate figure) other lectures in this course will deal with the design of pavements and structural overlays; my intention is to concentrate on basic routine operations which can significantly increase the life of the road pavement. All our roads are founded on natural soils, which with the exception of organic material such as peat are treated by Geotechnical Engineers as granular materials as are the non bitumen bound layers in the road structure.

Fig.1.1. Mixed proportional.

Granular materials which are saturated with water will lose 90% of their strength resulting in pavement failures. This is what happened during last winter. If this is to be avoided two things are necessary, the road must have adequate drainage, and its surface must be sealed against the ingress of water.

Fig.1.2. Mixed ratio damages

ROAD CONSTRUCTION WITH TEST RESULTS

Sub level soil is a fundamental piece of the street asphalt structure as it offers help to the asphalt as its establishment. The principle capacity of the sub level is to give satisfactory help to the asphalt and for this the sub evaluation ought to have adequate steadiness under antagonistic climatic and stacking conditions. The development of wave, folding, rutting and pushing in dark top asphalts are for the most part ascribed to poor sub evaluation conditions. At the point when

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soil is utilized in dike development, notwithstanding dependability, incompressibility is likewise significant as differential settlement may cause disappointment. Soil is utilized in its characteristic structure (rock and sand) or in a handled structure (settled layer) for asphalt development. Soil is additionally utilized as a fastener in water-bound macadam layers. Soil is in this way, considered as one of the main parkway materials. The establishment of different cross-waste structures (courses, scaffolds and holding dividers) lays on soils and their steadiness relies upon the dirt quality, learning of soil properties is important to choose the dike material, asphalt structure, seepage framework and establishment of structures. At the point when a high bank lays on delicate ground, its soundness can be anticipated by contemplating the properties of soil. Ice activity, normal in high heights, can be dealt with if the dirt properties are notable. Soil comprises for the most part of minerals matter shaped by the breaking down of rocks, by the activity of water, ice, temperature, and weight or by plant or creature life. In light of the individual grain size of the dirt particles, soil have been delegated rock, sand, residue, and mud.

Types of soil: Soils happen in a genuinely wide assortment in our nation. A portion of the significant soil types found in the nation are:

1. Alluvial soils: These are for the most part found in the indo-gangatic plane. For the most part, these are made out of extensively coordinating divisions of sand, sediment, and mud, and make reasonable for good sub grade material.
2. Fine sand: It is kept for the most part to abandon territories in the north western piece of the nation. This dirt needs folio division and isn't all around evaluated.
3. Coastal soils: The sands/sandy soils framing the seaside alluvium normally make a decent sub-grade.
4. B.C soils: Black cotton soils happen in parts of Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka. This dirt is portrayed by articulated volume changes (swelling after wetting and shrinkage in the wake of drying) and low qualities at high dampness content.
5. Red gravelly soils: The moorums and red gravelly soils are found in different pockets and are less dangerous.

The wide scope of soil types as parkway development materials have made it compulsory with respect to the roadway specialist to indentify and group the various soils. The characterization of soil according to IS terminology, the general scope of the most extreme dry densities of these materials and their estimated CBR esteems are given beneath.

3.1 Road aggregates:

These need to manage the worries because of the wheel loads and subsequently they ought to have adequate solidarity to oppose squashing. They ought to be hard enough to oppose wear because of rough activity of

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traffic. The totals in the asphalt are additionally exposed to affect subsequently durability is another alluring property of totals. The stones utilized ought to be sturdy and oppose deterioration because of activity of climate, this property is called soundness.

Coming up next are the most usually accessible shakes in India from which street totals can be gotten.

Totals may have adjusted cubical precise flaky or extended state of particles. The flaky or lengthened particles will have less quality and sturdiness henceforth excessively flaky and extended particles ought to be maintained a strategic distance from. Coming up next are the physical necessities of coarse totals utilized for WBM according to IS 2386.

Grading requirements: The WBM is carried out in layers. The coarse aggregates for each layer should confirm to any of (3) grading below. The use of grading no 1 shall be restricted to subbase courses only.

3.2 Bituminous material:

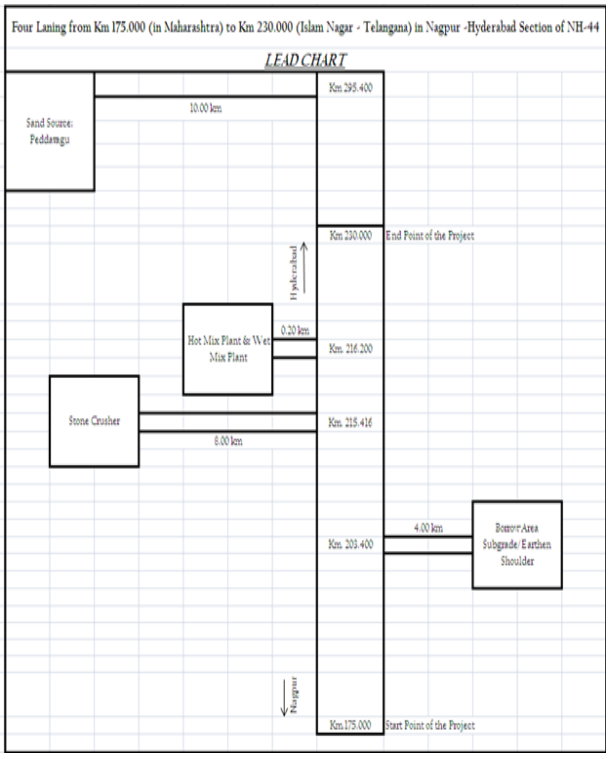
Bitumen is a thick fluid, semisolid or strong material, shading differing from dark to dim darker having cement properties comprising basically hydrocarbons is gotten from refining of oil rough or normal black-top and dissolvable in carbon disulphide. Bituminous materials utilized for clearing reasons for existing are entrance grade bitumen and fluid bitumen (reductions and emulsion).

3.3 Execution of site work:

Case study:

With the reference from my department HOD I had a chance to do the work regarding my M.Tech. Project in the NH-44 road maintenance AP-06 Package, Which was taken by SOMA ENTERPRISE Ltd.

Design, Construction, Development, Finance, Operation & Maintenance period for AP-6 Package viz, of 4-Laned Stretch from Maharashtra/Telangana Border (Km 175.000) to Islam Nagar (230.000) of Nagpur-Hyderabad section of NH-44 in the state of Telangana, under North- South corridor (NHDP Phase – II) for Routine Maintenance Grand Total Amount in Rs.**30612040.** for II nd Periodic Maintenance from km:175+000 to km:229+600 of NH-44. Cost of II nd Renewal Coat (including Existing Kerb raising) **51.53 cr**



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Here I have prepared a Document behalf of my project work, Detailing below various steps involved in this road construction.

3.4 Site investigation:

A site examination report is the reason for all the consequent choices with respect to cleanup of a defiled site. This report depicts the discoveries of the work area ponder and the field work and talk about their suggestions as for the proposed advancement of the site. An appraisal is made as far as probability of the nearness of tainting that may influence the plausibility of the site for the planned use.

The grouping of a site examination is as per the following:

- Desk Study
- Site Reconnaissance
- Preliminary report or possibility ponder
- Preliminary Ground Investigation - Planning of fundamental GI
- Preliminary report
- Main Ground Investigation
- Laboratory testing
- Final report

Targets of site examination:

The key targets for a thruway configuration Site Investigation are as per the following:

1. Suitability: Are the site and surroundings reasonable for the parkway?
2. Design: Obtain all the structure parameters essential for the works.
3. Construction: Are there any potential ground or ground water conditions that would influence the development?
4. Materials: Are there any materials accessible on location, what amount and quality?
5. Effect of changes: How will the plan influence adjoining properties and theground water?
6. Identify Alternatives: Is this the best area?

Not with standing these, it is important to examine existing highlights, for example, inclines. On the off chance that there is a disappointment of such a component, at that point it is important to explore the disappointment and recommend therapeutic works.

3.5 Site clearance:

Site clearing for the most part comprises of the cutting or potentially bringing down, evacuation and transfer of everything over the ground level, including articles overhanging the zone to be cleared, for example, tree limbs, aside from such trees, vegetation, structures or parts of structures and different things which are assigned in the agreement to remain or be expelled by others to which the specialist coordinated to be left undisturbed. The material to be cleared for the most part yet not really is restricted to trees, stumps, logs, brush, undergrowth, long grasses, crops, free vegetable issue and structure. The whole street zone will be cleared as depicted above, except if generally appeared on the illustration and additionally coordinated by the architect.

3.6 Plants and equipments:

Site clearing of trees, vegetation,

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undergrowth, shrubs and minor structures are done by dozers or potentially water driven excavators. Trees that can't be felled by the previously mentioned hardware will be felled by utilizing saws. Real structures that can't for all intents and purposes be cleared by water driven excavators or potentially dozers, these annihilations can be done utilizing pneumatic devices, explosives and additionally other particular hardware relying upon the size and kind of structures. Prior to starting touchy devastation every single important grant and licenses will be gotten and an impacting plan itemizing the size of charges, areas of openings, arrangement of explosion and wellbeing insurance will be sent to the designer together with the solicitation sheets

Sequence of works:

Preceding the initiation of the site leeway, the accompanying will be done either autonomously or together with the Engineer's Representative.

i. The right of ways (R.O.W) will be studied and set out as indicated by the information expressed in the illustrations.
ii. Photographs will be taken of structures, arranging trees and bushes, wall, phone and electrical posts and other on the off chance that they are payable under individual estimated thing separated from the general site leeway in the bill of amounts.
iii. The above site leeway things will be estimated by the strategy for estimation mutually with the Engineer's Representatives. The area of these things will be distinguished by the overview information or balances from the centerline of the proposed arrangement in street development.
iv. Prior to decimation of existing structures, contact with the particular specialists ends the utilities supply to the structure.
v. Removal of arranging trees and bushes will be completed with the earlier endorsement of the concerned specialist.
vi. Fencing or others that are to be migrated or rescued will be completed by the illustrations or according to the guidelines given by Engineer.
vii. Obtain affirmation that the business or pertinent specialist have gained the option to proceed lands.
viii. Access streets to the site will be developed whenever required to empower vehicles, gear and plants to be brought into the site.
ix. Solid waste dumps destinations will be foreordained inside or outside the site for the dumping of the site clearing materials.
x. The site freedom at that point will be continued to clear the trees, vegetation, undergrowth, hedges and minor structures by pressure driven excavators or dozers.

3.6.1 Excavation for cutting:

The removal of removing will be conveyed as per the illustrations and to the slants, levels, profundities, widths and statures appeared on the illustrations. Before beginning of works, surveyor will utilize the review information of street arrangement and TBM given by the architect to setting out the degree of cutting as per the cross areas and put in such pegs, bars, locate rails and

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reference markers important to control the works.

3.7 Filling for embankment:

The bank will be developed to the level, statures, widths and slants appeared on the illustration with following systems.

3.8 Subsoil channel:

This work will incorporate the supply and establishment of subsoil channels built as per the agreement particular at the areas and as per the lines, levels and grades as appeared on the illustrations as well as coordinated by the Engineer.

3.8.1 Granular sub-base:

Sub base is the most reduced of all the asphalt layers comprising of regular sand, mooram, rock, squashed stone or mix thereof important to consent to the reviewing prerequisites of Table 400-1 Grading I.

3.8.2 Wet mix macadam: General:

Wet mix macadam (WMM) is a base material in road pavement structure, which is batched from a mixing plant, and laid in position with a paver.

3.8.3 Thick bituminous macadam:

DBM is a bituminous street base blend comprising of reviewed totals, bitumen and filler. It is utilized in principle asphalt course.

3.8.4 Blending:

The materials including any additional filler will be gauged or estimated into a mechanical blender and altogether blended in such a way, that all specifics of the total are totally and consistently covered.

3.8.5 Bituminous solid wearing course General:

The B.C. wearing course is the last layer of the asphalt. The material quality will meet the prerequisites of MORTH Technical details.

The total will be surface dry and will be blended at 155 degree Celsius to 163 degree Celsius temperature. The blend material as conveyed to the laying site will be 120 to160 degrees Celsius.

3.8.6 Dry lean solid:

The work will comprise of development of dry lean solid sub base for Cement Concrete Pavement as per the prerequisites of MORT&H Specifications. IRC 43-1972 and IRC 15-1981. The development will likewise be in similarity with lines, evaluations and cross segments appeared on illustrations or potentially as coordinated by the Engineer.

3.8.7 Repairs:

Correction, if any will be taken up before overlaying PQC. The low spots, free material, pot openings and so forth will be made great by utilizing new lean solid material appropriately compacting equivalent to per details. For fixing nectar brushed surface, and whatever other spots which can't be fixed with DLC material, concrete with totals of size 10mm and underneath will be utilized in the wake of roughening the surface.

Typical construction of cross section in highway:

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Fig 3.10: cross section in highway

3.8.8 Water bound macadam base:

The fundamental need of WBM base is to circulate the heap over a delicate sub-level so that there will be no sinking of the street outside into the sub-level. WBM is built with hard and delicate metals called totals got from breaking/pounding of rocks. The totals spread in layers are interlocked by rolling and holding together with screenings, blinding material and water.

Road aggregate: These need to hold up under the worries because of the wheel loads and henceforth they ought to have adequate solidarity to oppose pulverizing. They ought to be hard enough to oppose wear because of rough activity of traffic. The totals in the asphalt are likewise exposed to affect consequently durability is another alluring property of totals. The stones utilized ought to be sturdy and oppose breaking down because of activity of climate, this property is called soundness. Coming up next are the most ordinarily accessible shakes in India from which street totals can be gotten.

3.9 Wet Mix Macadam (WMM):

Evaluated total and coarse material and water are premixed in pug factory and will be laid in at least one layers. The thickness of a solitary compacted layer will not be under 75mm and can be expanded to 200mm when compaction is with vibratory roller. The totals will fulfill the physical necessity of totals for example effect estimation of 30 percent (max) and flakiness record 30 rate (max).

HIGHWAY MANITANCE

It is a basic fact of road maintenance that providing and maintaining adequate drainage is the most important factor in prolonging the life of the road pavement. The most effective action that can be taken by a road engineer to maintain the road pavement and prolong its life is to ensure that the pavement is adequately drained and that water does not pool on the road surface. There should be no such thing as a flat road; roads are built to falls, with either camber or super elevation to assist in draining the water to the road edge. When water has reached the road edge there must be a drainage system in place to remove the water from the pavement. This can be a piped system with gullies in urban areas, stoned drains on large roads and motorways and water cuts, possibly with side drains on rural roads. Over time silt and grit from the road is washed into these systems, rendering them ineffective unless they are regularly cleaned, a drainage system is useless unless it can accept the water coming to it. There should be a regular system of checking drainage outlets and cleaning them to ensure they function

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properly. Problem areas can be easily identified by driving the road on a wet day and investigation/remedial works carried out in dry conditions. Localised ponding is often a result of an accumulation of silt and debris in gullies and watercuts which can be easily cleaned, equally the openings of bridges, culverts and pipes passing under the road should be checked for blockages during conditions of low flow.

Preserving and keeping each type of roadway, roadside, structures as nearly as possible in its original condition as constructed or as subsequently improved and the operation of highway facilities and services to provide satisfactory and safe transportation, is called maintenance of Highways. The various maintenance functions includes;

1. Surface maintenance
2. Roadside and drainage maintenance
3. Shoulder and approaches maintenance
4. Snow and ice control
5. Bridgesmaintenance
6. Traffic service.

Highway maintenance is closely related to the quality of construction of original road. Insufficient pavement or base thickness or improper construction of these elements soon results in expensive patching or surface repair. Shoulder care becomes a serious problem where narrow lanes force heavy vehicle to travel with one set of wheels off the pavement. Improperly designed drainage facilities, mean erosion or deposition of material and costly cleaning operation or other corrective measures. Sharp ditches and steep slopes require manual maintenance as compare to cheap maintenance of flatter ditch and soil by machine. In snowy country, improper location extremely low fills and narrow cuts leave no room for snow storage, creating extremely difficult snow removal problems.

Fig.4.1. Surface maintained.

Failure Of Highway Construction

One might assume that the maintenance of footpaths for pedestrian use would not present difficult problems to Road Engineers. The high proportion of claims received by Local Authorities arising from trips and falls on footpaths would seem to belie this assumption. The major contributors to footpath defects are:

1. Bad construction
2. Traffic mounting paths
3. Badly reinstated excavations in the path

5.1 BAD CONSTRUCTION:

Numerous pathways come up short on the solidarity to play out their capacity because of lacking establishments or poor

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development techniques or materials. The Law forbids mounting asphalts with vehicles, yet numerous drivers ignore this, the most noteworthy of bumpers being drivers or conveyance vehicles. Unearthings in the way. This should be an avoidable issue however it is by all accounts a most basic trouble, an uncovering are completed routinely yet much of the time sufficient reestablishment is excluded. Now and again the Local Authority staff may themselves be a piece of the issue by unearthing pathways to fix underground administrations. A significant advance in pathway upkeep is the readiness of a trail stock by the individual in charge of keeping up the trail which will permit an evaluation of the general state of bits of way, and the estimation of the essential assets to impact a sufficient fix program. This can be a rebuking exer Surface fix utilizing emulsion and chip Surface fix utilizing a hot macadam cise on the grounds that beside the issues brought about by enormous regions of depleted asphalts the architect will more than once run over minor imperfections which can be fixed requiring little to no effort yet speak to a danger to walkers. These fixes ought to be affected right away. Real fixes or restoration ought to be arranged similarly as different road works tasks to guarantee top notch work and areas ought to be spread out in a way to guarantee productive work. Numerous trails are not obliging to individuals influenced by physical handicap. In setting up a plan of trail fix or the designer ought to know about the necessities of handicapped individuals and take preferred position of the chances to encourage their versatility, contact with neighborhood incapacity activity gatherings will demonstrate productive in uncovering unsuspected obstructions to portability.

5.2 REPAIRS

While flawed solid asphalts can commonly just be helpfully fixed by the expulsion of faulty zones and the development of another area of asphalt, it is conceivable to reestablish bituminous ways by utilizing a bituminous slurry seal which will give a slip safe and level surface without apparently raising the profile of the way. This technique can likewise be utilized on solid ways experiencing surface raveling. The unit expenses are positively contrasted and the expense of evacuation of the current way and recreation.

5.3 ROAD EDGES/CHANNELS

With the expanded motorization of street clearing an issue ending up progressively obvious is the raveling of the street edge at the kerbside. This might be caused to some extent by lacking fixing of the region between the kerb and the edge of the street, especially if the kerb was initially set after the street was built, however the activity of mechanical brushes will influence everything except very much developed streets. Potential arrangements are fixes utilizing fixing techniques or the utilization of a slurry seal 3 – 500mm wide at the kerb edge, the last has been attempted and found to give a tasteful arrangement. Asset USAGE Given that assets are deficient, it is basic that Engineers should

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target and direct the utilization of accessible assets in order to boost the addition to the street arrange from the support modified. The accentuation on Local Authority inspecting has generally been to guarantee that funds are spent in a legitimate and right way. It is unavoidable that the topic of significant worth for cash and the proficient utilization of assets must be tended to by specialists coordinating street support activities. In Ireland the Road Maintenance Engineer can complete the elements of various individuals engaged with development, tasks, the person may satisfy the obligations of surveyor, architect, occupant engineer, site specialist and certifier, regularly all inside a similar morning. It is the adaptability inalienable in this plan which can take into consideration the inventive utilization of materials and strategies to boost the arrival on venture of open assets. While recognizing that assets are constrained, engineers must guarantee that work under their bearing is done as per the pertinent gauges. Work seriously done will prompt a misuse of assets in redressing deserts.

5.4 WORK RESOURCES:

An outcome of the low degree of financing for street support and of expanding automation of exercises is that the work power accessible to Local Authorities has contracted during the last 10 – 15 years. There is an immense accessibility of ability and involvement in street support accessible inside Local Authorities which must be appropriately prepared to accomplish achieved and the right strategies for handling these undertakings. This must be done through preparing both formal and casual. The formal preparing ought to be by methods for addresses and courses outfitted towards the necessities of the specific specialists and went for improving their insight into the strategies and procedures being utilized. All the more critically casual preparing and consolation ought to be given nearby by the Engineer, Supervisor and Foreman. Street Maintenance staff ought to be urged to build up their aptitudes in the wide scope of tasks to be accomplished. This ought not be a single direction process – while street laborers don't have the specialized preparing of architects as a rule they will have a long encounter of the work they are doing and a valuation for the reasonable items of the undertaking which designers should notice.

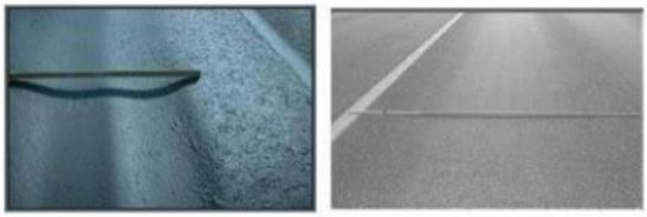

Fig.5.1. Routing method output.

CONCLUSION

1. Form the case study it is observed that II Periodic Maintenance from km: 175+000 to km: 229+600 of NH-44 AP-06 Package. Cost of II Renewal Coat (including Existing Kerb rising) **51.53 cr**. Which was taken by SOMA ENTERPRISE Ltd.
2. Routine Maintenance consist Cleaning of Road, Plantation & Maintenance, Cleaning of

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Undesirable Vegetation, Cleaning & Maintenance of Toll Plaza, Drinking water supply, Cleaning of Drains from the research program it is concluded plantation & maintenance consist more amount for highway maintenance (i.e, grand total amount for 2 years **Rs.5,28,58,600** including Plantation & Their Maintenance for 2 years Rs.1,65,47,320 were needed).

3. There is significant potential for improving the traditional road maintenance approaches through application of better material technologies, effective, safe, environmentally friendly methods and standards for road maintenance, in order to prolong the service life of road and other road elements.
4. To protect investment made in highways and to maintain the economic & safety of public road system highway maintenance becomes very necessary.
5. The objectives of the programmed were developed following a series of workshops involving specialists from each of the partner road authorities.
6. It was recognized that the traditional approach without pan-European cooperation, often resulted in duplication of research. The research program sought to address the problem into an optimized management framework.
7. Limitations on resources will ultimately limit what can be achieved but the task facing Engineers from day to day is to achieve the highest standards within the constraints of available resources. It is hoped that the methods and suggestions outlined in this paper will be of some assistance towards this.

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