ABSTRACT
In India, large quantities of fly ash being generated, as most of our energy demand is met through coal based thermal power station. The fly ash generation is expected to grow further as coal would continue to remain major source of energy at least for next 25 years. The fly ash which is a resource material, if not manage well, may pose environmental challenges. On the other hand, development of transport infrastructure is imperative for rapid economic growth of the country. During the recent past, road transport has come to occupy a dominant role in the transportation system. The use of fly ash in National Highway Roads and embankment construction not only facilitate mass disposal of fly ash but also provide significant benefits in terms of engineering and economic considerations. This Project report emphasis on the proper Management of fly ash in the Construction of National Highway Projects.

INTRODUCTION
The increasing demand for electricity has led to setting up of a number of thermal power stations. This in turn has led to increasing production of power plant wastes like fly ash. There are 125 thermal power plants in the country, which currently produce about 170 millions tons of fly ash every year. The current worldwide production of the fly ash is more than 700 million tons. With the increase in demand of power energy and coal being the major source of energy, more and more thermal power plants are expected to be commissioned in near future. As per estimates, fly ash generation is expected to increase to about 225 millions tons by 2017. On the other hand, development of transport infrastructure is imperative for rapid economic growth of the country. During the recent past, road transport has come to occupy a dominant role in the transportation system. Growth of road transport has been around 8 to 10 percent in respect of both freight and passenger traffic. Share of the freight traffic by road, has risen phenomenally from 11 percent in 1951 to about 60 percent at present. The total number of automobiles on our roads has increased from 0.30 million in 1951 to about 27 million at present. The development of road network has not kept pace with it. Neglect of road network has led to a host of problems like congestion, delay, and higher vehicle operating cost, accidents and environmental degradation. Resources provided, so the quality of our road net work needs large scale improvement. The use of fly ash in National Highway Roads and embankment construction not only facilitate mass disposal of fly ash but also provide significant benefits in terms of engineering and economic considerations. This Project report emphasis on the proper Management of fly ash in the Construction of National Highway Projects.

SCOPE OF THE STUDY
Although the scope for use of fly ash in concrete, brick making, soil-stabilization treatment and other applications has been well recognized, only a small quantity of the total ash produced in India is currently utilized in such applications. Most of the ash generated from the power plants is disposed off in the vicinity of the plant as a waste material covering several hectares of valuable land. The bulk utilization of ash is possible in two areas, namely, ash dyke construction and filling of low-lying areas. Coal ash has been successfully used as structural fills in many developed countries. However, this particular bulk utilization of ash is yet to be implemented in India. Since most of the thermal power plants in India are located in areas where natural materials are either scarce or expensive, the availability of flyash is bound to provide an economic alternative to natural soils in the Embankment construction and other application in National Highway Projects.

OBJECTIVE OF THE STUDY
- To Study of fly ash for highway projects.
- To Study design criteria for project.
- Involved field aspect of fly ash for project.
- Analysis of study data regarding fly ash utilization.
- Give Suggestion & Discussions for effective Utilization of fly ash for Highway Projects.

LITERATURE REVIEW
Second Nizammudin bridge approach road Embankment
The Nizammuddin bridge constructed over river Yamuna at New Delhi was to be connected to the main roads on eastern and western side by construction of about 2 km approach road . The peculiarity of the site was a challenge to the engineers especially when they propose to use a non conventional material for construction of embankment. The eastern embankment of about 1.7 km length is in flood zone and is of about 7 to 8 meter height. The systematic and gainful utilization of fly ash a geotechnical material in earlier cited projects, gave confidence to the engineers of PWD, Delhi supported by CRRI Delhi and fly ash mission, PWD Delhi took up the use of fly ash for construction of this embankment.

OKHLA fly over bridge and Hanuman setu embankments
Carrying the conviction based on the analysis and the past experiences, efforts were launched with project agencies designing/implementing roads and embankments projects for use of fly ash. As it happens in the initial stages it was very difficult to convince the project authorities that fly ash if not better is at least as good as soil for such application on technical aspects and is definitely better on economical aspects. The discussion with Public Works Department (PWD), Delhi engineers for Okhla fly over bridge embankments during 1995 was a break through. PWD, Delhi engineers were quite supportive and had good understanding of the subject. PWD Delhi agreed to use fly ash for this...
project embankment. To start with, fly ash was used for half the width of the embankment and the balance half was made by use of soil, primarily because the project engineers wanted to have a real life comparison between workability and suitability of the two materials.

The experience was so satisfying that within next few months PWD, Delhi took a decision to use fly ash for Hanuman Setu, near old Delhi railway station. It was experienced by the project team that working on fly ash, especially in rains is much better and project work can be started within two hours of rain on fly ash, as compared to about 6-8 hours on soils. This is primarily because of higher permeability of fly ash.

**STUDY OF FLY ASH FOR HIGHWAY PROJECTS**

Fly ash is generated in huge quantities every day in major thermal power stations of India. The safe disposal of this fly ash is the major socio-economic problem before the authorities and is becoming a costly affair for them. Conventional method of concrete road construction consumes the natural resources like stone metal, sand, murum etc. and hence causes ecological imbalance. The use of fly ash in concrete road construction will save such resources. The cement is also costly ingredient of concrete. A part of cement and sand can be replaced by good quality fly ash to the extent of 10-30 percent and 5-15 percent respectively.

The use of fly ash in highway projects will solve the disposal problem and automatically reduce the construction cost. Hence this project is aimed to describe the use of fly ash in National Highway construction. If the fly ash is utilized on large scale in Embankment construction in National Highway Projects, the infrastructure development can be completed at lesser cost and will also help for environmental protection of our country.

**ECONOMY IN USE OF FLY ASH**

Use of fly ash in National Highway road construction results in reduction in construction cost by about 10 to 20 per cent. Typically cost of borrow soil varies from about Rs.100 to 200 per cubic metre. Fly ash is available free of cost at the power plant and hence only transportation cost, laying and rolling cost are there in case of fly ash.

Hence, when fly ash is used as a fill material, the economy achieved is directly related to transportation cost of fly ash. If the lead distance is less, considerable savings in construction cost can be achieved. Similarly, the use of fly ash in pavement construction results in significant savings due to savings in cost of road aggregates.

If environmental degradation costs due to use of precious top soil and aggregates from borrow areas quarry sources and loss of fertile agricultural land due to ash deposition etc. The actual savings achieved will be much higher and fly ash use will be justified even for lead distances up to say 100 km.

**MANAGEMENT FOR HANDLING OF FLY ASH**

The material for fly ash embankment shall be obtained from Thermal Power Station. Fly ash shall be delivered to the site in covered dump truck to minimize loss of moisture and dusting. Haulage of fly ash material shall proceed only when sufficient spreading and re-compaction plant is operating at the place of deposition. The stockpiling of flyash if required shall be done by taking proper precautions to avoid dusting. Traffic movements shall be restricted to those areas which are kept moist to prevent dispersing ash into air by tyres of passing vehicles. The approved ashponds will be cleared of vegetation by dozing into heaps.

The fill material will be dug out by hydraulic excavator/JCB, loaded into tippers trolleys and transported for construction of embankment in layers. The tippers will be directed to systematically unload embankment flyash material to facilitate spreading by dozer / hydraulic motor grader / tractor dozer. The fill material will be watered to optimum moisture content to achieve the desired density and compacted by using vibratory rollers. The fill material will be laid in suitable layers and compacted to the required level of compaction mentioned in the specifications.

**SPREADING AND COMPACTION**

First one layer of cover soil in 2.0 meter width as defined earlier shall be laid and compacted to 200 mm thickness. Then another layer of cover soil shall be laid to form the cover layer of 2.0 meter width and loose layer thickness up to 400 mm thick, to ensure confinement of fly ash. Subsequently fly ash shall be laid inside the confining layers of cover soil. Clods in cover soil shall be broken to have a maximum size up to 50 mm or as permitted for earthen embankments. The cover soil and fly ash should be laid simultaneously before compaction to ensure proper confinement of fly ash.

The fill material shall preferably be spread by mechanical means. Manual spreading may be permitted by the Engineer-in-charge if the quantum of work is less. Vibratory roller of dead weight 80-100 KN. shall be used. In fly ash loose layer thickness maximum up to 400 mm shall be adopted if site trials show satisfactory compaction.

**REFERENCES**

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