

Case Study on Latest Methods and Materials That Can Be Used For Construction of Juhu Aerodrome

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Abstract – There are large number of airports in India, of which some are not in service or in use. These airports can be repaired or reconstructed. These airports if got under rehabilitation then the burden on the running airports can be reduced. New paths or new ways can be found out and public transport and materials transport can be distinguished clearly. Management of crowd and cargos in overcrowded metropolitan cities like Mumbai, Delhi, Kolkata and Chennai can be done in more sophisticated manner. Hence, the obstructions under development of these cities can be reduced. So, in this case we have considered Mumbai city as an example of overcrowding and larger number of cargo of materials to be supplied. In CSI Airport, out of two only one runway is working therefore, number of flights per day are increased on that pavement increasing the probability of danger of accidents. So, to minimize the problems Juhu aerodrome in Mumbai can be rehabilitated. In this paper our aim is to find out and discuss the latest construction techniques, materials and methods like piezo-electric pavement for landing so that the construction of runway will become safer, faster, less costly and eco-friendly

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I. INTRODUCTION

Juhu aerodrome

Juhu aerodrome is situated in Juhu in coastal region and near suburb of Mumbai, India. It was founded in 1928 as India's first airport. It was used as the main airport of the city in and up to World War II. Today, all helicopter operations in Mumbai are being handled by this aerodrome. It has two operational runways and run by Airports Authorities India. It is used as heliport for private helicopters. In 1942 the CSI construction was done and the new airport was opened for the public service. After that environmental ministry and also due to Sardar Vallabhbhai Patel's notice the Juhu aerodrome was closed for public use.

Afterwards it was closed until the Indira government. In the Indira government the aerodrome was opened but not for public use. Only for the helicopters, Army use and materials transport (petroleum and natural gas).

Chhatrapati Shivaji International Airport

It is the currently running and the only Airport for public use and cargo in Mumbai. It has two operational runways of which one is closed and one is in service. According to the population history the number of landings per day are more than the ideal one's. So, the

loading conditions on the single runway are severe leading to increase in danger of accidents.

Juhu - Chhatrapati Shivaji International Airport relation.

Reopening Juhu aerodrome will facilitate the load reduction of CSI Airport and will give more chances to the aviation industries to develop efficiently and future scope of aviation in Mumbai will be increased.

Ohio Airport, Wilmington, USA

This airport in USA was been used during World War II and thereafter it was closed for any use . after that in 1999 it was reopened, rehabilitated and made public servant. The conditions while making this airport were severe. coastal region, wet/dry conditions, and metamorphic rock base.

Project Information

Airport: Airborne

Airpark Owner: Airborne Express/DHL

Airport Classification: Cargo

Climatic Region: Wet/dry

FAA Region: Great Lakes

Facility: Runway 4L-22R

Description of project: Partial runway reconstruction; addition of drainage system and filter fabric; total of 2,200 ft of runway replacement

Dates of construction: August 1999 to December 1999

Engineer/Designer: None (The Harper Company)

Project Manager/Construction Manager: ABX Air (Owner representative) Prime Contractor

Juhu-Ohio relation

Juhu aerodrome can be related to Ohio reconstruction project as the projects are same as compared to

1. Climatic conditions
2. Historical background
3. Geography

Hence, reconstruction of Juhu aerodrome can be done in similar ways of Ohio airport. But, with some additive technologies.

II. METHODOLOGY

A. Methods

Take shortcuts

It is very interesting to execute the plan than making it. It is more fulfilling to execution of work rather imagining it. But to execute in correct manner planning phase is very important, so it is the period where you can decide the shortest path and to save the project time.

The idea given is that to take a step forward in imagining the project time, material and cost relationships. So that the reduction in time of project can be done properly without sacrificing the project needs. It is more profitable to think the project in more than one way. They may take less effort making them very easy.

Automate manual tasks

Another way of speeding up the project in safer way is by automating the manual tasks. There are so many manual tasks which managers come across daily. Using the right software will help to automate them and to reduce the project time.

Some tasks are: getting daily data of your project; completing time spreadsheet and expense data;

finding out the project is on track or not; and making report on the project risks; inherent changes and issues in the project. These tasks can be automated and the time for these tasks can be minimized.

Using the project management software, the daily task execution can be set up to do the manual tasks more easily. Input just need to be given and that's all, all the work will be done by the software.

Manage Execution Carefully

Once you have checked your plan carefully and its sure that there is no mistake. Then its time to execution against your plan and don't deflect from it. If you don't follow the project plan properly then there is no profit of preparing it. If you put your hard work in the right direction then there is no difficulty in executing any project. Your team should also be adhering to the new changes according to which the whole work can be executed in better manner.

There are so many ways to still save your plan. For example, working with suppliers and dealer will be more profitable for execution by stopping any causable delays. Save time on non-critical activities and manage them according to work breakdown structure.

Double Up On Resources

Assigning the more resource will execute it faster, but budget of executing every project will not be like this. Taking up resources from non-crucial tasks and giving them upon the crucial tasks will help to execute them efficiently.

Tasks on the critical path can be focused more efficiently and the tasks from the secondary type can be delayed by some float. These secondary tasks can be executed later without deflecting the time of whole project.

Critical Tasks First

As discussed earlier the delaying the critical tasks will not be beneficial because it will delay the whole project. This leads us to focus the critical tasks first. so form the manager of project so that the critical tasks will execute properly without delay.

So it is important to sort the complex the tasks into simpler ones and to differentiate them into the primary and secondary ones so that finding the critical tasks will be more easy.

B. Materials

Criteria considered while selection of materials

- Soil and strata nature

- *Design philosophy*
- *Geographical conditions*
- *Period of execution*
- *Life of project*
- *Cost of project*
- *Importance and scope of project*

To reduce the period of execution we need to concentrate upon use of automations and faster working machines.

Design of runway

Excavation Soil stabilization

Rather than trench excavation use the seismic refraction and electrical deflection to check the strata below which will save tremendous time of the executer.

according to guideline 9157 of the ICAO to avoid that airplanes sink in more than 15 cm subgrade according to guideline 9157 of the ICAO to avoid that airplanes sink more than 15 cm we use *secugrid 30/30q1* as soil reinforcement at faster rate.

SECUGRID 30/30Q1

specifications

- It is a geogrid for soil reinforcement
- Requires gravel base course layer approx. 27 cm
- Requires top soil approx. 15 cm
- More than 500000 m² secugrid were installed as reinforcement geogrid due to its exceptional advantages

Advantages of Secugrid

- very high strength at low strains
- immediate interlocking effect
- high flexural strength and torsional stiffness
- high resistance against installation damage made from uniformly extruded solid pet or pp bars

- continuous homogeneous molecular structure
- high resistance against biological and chemical attack
- 4,75 m wide rolls quick and easy to install
- *Very low time of application*

ISO 9001 CERTIFIED AND CE MARKED

CARBOFOL

Advantages of carbofol

- versatile sealing applications possible
- excellent chemical resistance
- very high UV resistance
- complete quality control from the resin to the final product
- installation advantages with up to 9.40 m wide liner
- high melt flow index enables optimal panel welding
- durable product with 40 + yrs. of project use also available according to gm 13 and with bam and debt approval

ISO 9001 CERTIFIED AND CE MARKED

SECUTEX

Secutex is a needle punched staple fiber nonwoven geotextile used for separation and Drainage.

- Resistance against installation damage
- Flexible adaptable to uneven terrain
- Very good interface friction angles
- Long term filter efficiency with greater nonwoven material thickness
- High permeability
- High abrasion resistance up to 5.9m wide rolls

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Aggregate application

Polymer aggregate base course rather than crushed aggregate base course(CABC)

It will save time of

- mixing CABC
- spreading and compaction of CABC

Runway precast pavement rather than asphalt pavement

It will save time of

- prime coat site trials
- checking and setting time
- material movement
- line and level

And various tests such as

- test for skid resistance
- test for smoothness
- test for texture

It will save cost of

- Douglas mu meter continuous friction measuring equipment
- Sand patch test
- Douglas mu meter continuous friction measuring equipment
- Rolling straight edge

Auto ducts in precast rather than airfield and ground light ducts

It will save time of

- Excavate trench in cabc
- Concrete ducts
- Surface inset lights
- Airfield ground lights
- Core drill and insert lights
- Fit pot with jig
- IL's localizer and approach lights

- Guidance signs
- Concrete slip form paving

It will save cost of

- texturing machine
- slip-form machine
- placer spreader machine
- Drilling holes and dowels
- Milling and planning machine

Precast cables rather than cable laying

It will save time of

- horizontal direction drilling
- micro-tunneling
- fencing
- runway construction pavement details and mixes
- vibrating concrete
- airside constructions
- airplane wingtip clearance

Generation of static electricity by piezoelectric material modified for impact pressure

CONCEPT

Already this technique is used for pavers for pedestrians in railway stations at Delhi and Pune. It can be conceptualized in somewhat different manner that when the little pressure from the pedestrian can generate the huge amount of electricity, then if the piezoelectric crystals if modified for impact pressure coming from landing of airplane will generate tremendous amount of electricity.

Material

Quartz

Beryllonite

Sucrose

Roxhelle salt

Tourmaline group minerals

Lead titanate

Piezoelectric crystal

It is the crystal on which if the pressure is applied the electricity can be generated. The amount of electricity generated depends upon the size, number and intensity of crystals used.

Quartz is an inert material to most of the chemical components. It means that it will not react with the concrete at normal conditions. Quartz contains pure silicon dioxide which is inert and hence does not react with most other substances. For this reason the quartz aggregates are desirable for the concrete and also increase its hardness without affecting the other properties of concrete. But proper care should be taken for selecting the cementing material for concrete because if that material contains excess lime quartz will react with it and as a result the concrete will cause excessive swells and cracks within few decades.

DISCUSSION

While executing any project the philosophy says that it is better to be separated. So, we separate the methodology into two parts one of which is method of planning and method of selecting materials.

In the method of planning ideas of plan are mentioned i.e. how to plan what things you can do to manage execution, resources and the things to do which will help in not delaying the project.

Second, is the execution and materials. If plan is proper then the execution will not come in any difficulty. But the made plan should be executed by sticking to itself. Making this sure thing, then whole work comes to selecting the advanced materials and automated equipment will enable the executor to do the same task in minimum time.

Third, there is another thing to be developed in a futuristic and eco-friendly advanced technology. It will help to find out the new ways of generating electricity and will put another step in making this globe carbon neutral.

LIMITATIONS

Some limitations of the above things are

- It will increase the initial cost of project.
- Requires highest grade technicians to perform the same tasks with equipment.
- It will require more maintenance cost of the equipment

- New techniques are patented, so to use them more expense will be required.

Advantages

Some advantages of the above things are

- Less maintenance of advanced materials.
- Less labor required.
- Less time and indirect cost required.
- Self-electricity generation again lowers the cost.

RESULT/CONCLUSION

From this case it can be concluded that the construction of Juhu aerodrome can be done as per the authorized materials and techniques discussed above. The time of rehabilitation of one runway pavement will be minimized to 8hrs.

Using these techniques and materials will execute the project in minimum time and will enable the executor to concentrate upon the more important things.

As the Juhu aerodrome and Ohio aerodrome cases are too similar the execution of Juhu aerodrome can be done as the same way of Ohio case, but with more additive techniques like secugrid, piezo-electric runway pavements, etc.

These applied techniques are advanced in each manner from older techniques in case of saving time and cost and reducing the energy requirements of the project.

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