Feasibility Study OfSustainable Material For Retrofitting-Case Study NashikCity

[1]Mohan B Kale, [2]S. M. Waysal

[1]P.G. Student, [2]Assistant Professor
[1]Civil Engineering Department NDMVP COE Nashik,
[1]NDMVP Samaj's KBT College of Engineering Nashik, Nashik-13, Maharashtra, India

Abstract *:As the urban population and incomes increase, demand for every key service such as water, transportation, sewage treatment, low income housing will increase five- to sevenfold in cities of every size and type. The government has now realized the need for cities that can cope with the challenges of urban living and also be magnets for investment. The announcement of '100 smart cities' falls in line with this vision. There are many problems like parking, Congested traffic, adequate water supply, and improper sanitary system. And the deterioration of buildings also takes place.*

The strategic components of development are city improvement by retrofitting. These problems can be solved by proper methods of retrofitting. Need of Study is to retrofit Nasik city. To Improve the quality of life for Nasik with the objectives to be find out problem.To identify the area of retrofitting in Nasik city, to study the concept of retrofitting, to study the methods & sustainable material used for retrofitting. Also heritage conservation of the city has to be preserve. To achieve these objectives a methodology is adopted towards the retrofitting management, understanding the need of retrofitting.

IndexTerms–Smart city, retrofitting, heritage, sustainable, Nashik.

I. INTRODUCTION

As the urban population and incomes increase, demand for every key service such as water, transportation, sewage treatment, housing will increases. There are many problems like parking, adequate water supply, improper sanitary system,light and ventilation at KalidasKalamandir, Nashik. These problems can be solved by proper methods of rehabilitation. To improve the quality, use of sustainable material and different methods of rehabilitation are used. As cost of retrofitting is less than the reconstruction cost, the retrofitting is adopted, this shall also require less working time and much less dislocation

There is limited use of retrofitting for the preservation of heritage structure, situated in the pilgrimage city of Nashik. The Kalidas Kala Mandir situated in the heart of Nashik city for more than forty years, is deteriorated and on the verge of becoming obsolete. Little research has been done on the use of sustainable material for retrofitting for such structures.

In the smart city Nasik, the Gaothan area like Panchvati,RavivarKaranja,YashvantMandai,SitaGunfa are the old area of city.There are many problems like parking,Congested traffic, adequate water supply, improper sanitary system. And the deterioration of buildings also takes place. These problems can be solved by proper methods of retrofitting.

The applications of retrofitting include different types of buildings, industrial structures, bridges, urban transport structures, sanitation, and water treatment. The benefits of retrofitting include the reduction in the loss of lives and damage of the essential facilities, and functional continuity of the life line structures. For an existing structure of good condition, the cost of retrofitting tends to be smaller than the replacement cost. Thus, the retrofitting of structures is an essential component of long term disaster mitigation.

II. METHODOLOGY

In India the governments launch the smart city program, in which the various sector of smart city. In this the one of sector of smart city is to preservation of heritage of given smart city.In this investigation to identify the area of retrofitting in Nashikcity.Nashik city are one of historical and devotional city, therefore the various old structure are situated in city. This structure preserve in smart city are one of challenge, therefore to preserve this structure to find the solution. The retrofitting is one of best solution for preservation of this structure.

In this investigation to find one of the case studies of Nashik. The Kalidas Kala Mandirare one of this structure and to preserve this structure.In this research to find the various method of retrofitting using sustainable material. To study the Kalidas Kala Mandir tender and to developed this structure using sustainable material. In this research the various sustainable material find and to study this material properties and there environmental benefit for development of sustainable retrofitting structure.

Concept of retrofitting-

Retrofitting is technical interventions in structural system of a building that improve the resistance to earthquake by optimizing the strength, ductility and earthquake loads.Retrofitting is needed when the assessment of structural capacity results in insufficient capacity to resist the forces of expected intensity and acceptable limit of damages.

Retrofitting Process-

The retrofitting of a structure involves improving its performance under loadings through one or more of these following measures:-

1. Columns
2. Beams
3. Bracings
4. Walls
5. Foundation
6. Horizontal diaphragms
7. Joints between structural elements
8. Masses
9. Period of vibrations

Various Techniques on Retrofitting:-

1. Inserting structural elements
2. Implementing horizontal and vertical belts (iron wire mesh) in masonry building
3. Jacketing of structural elements for RC elements (Beam and Column)
4. Strengthening roof trusses and roof diaphragms
5. Strengthening Concrete Diaphragm
6. Strengthening techniques for continuous or strip wall footings
7. Decreasing Demand on Existing Building
8. Retrofitting of Non-Structural Components

III. SUSTAINABLE MATERIAL AND TECHNIQUES

A) Sustainable material-

Fly ash brick-

Fly ash brick (FAB) is a building material, specifically masonry units, containing class C or class F fly ash and water.The manufacturing method saves energy, reduces mercury pollution, and costs 20% less than traditional clay brick manufacturing.

Table No -1 The raw materials

Sr no	Material	Mass
1	Fly ash	60%
2	Sand/stone dust	30%
3	Ordinary Portland Cement/(Lime+Gypsum)	10%
4	Total materials	100%

Cellulose insulation-

Cellulose insulation is plant fiber used in wall and roof cavities to insulate draught proof and reduce noise.Cellulose is among the oldest types of building insulation material. Many types of cellulosic materials have been used, including newspaper, cardboard, cotton, straw, sawdust, hemp and corncob.

Sustainable Concrete-

Waste and supplementary cementing materials such as fly ash, blast furnace slag, silica fume, rice husk ash and metakaolin can be used as partial replacementsfor Portland cement. These materials can improve concrete durability, reduce the risk of thermal cracking in mass concrete and are less energy-and CO2-intensive than cement.The use of high volumes of fly ash and other supplementarycementitious materials to produce more sustainable and durable concrete.

A significant proportion of concrete produced today contains Supplementary cementitious Materials (SCMs) as part of the total cementitious component or binder.

Recycle Steel-

Steel is one of the most sustainable building materials in the world. The steel industry hasembraced a common sense approach that reducing its impact on the environment is not only the right thing to do, but it also makes economic sense.

The steel industry has made being a green builder nearly effortless. Sustainability, that term you hear so much these days, is one of the hallmarks of steel construction. Steel is the only material used in construction today that can be 100% recycled and re-used.

Triple glazed windows-

Triple glazed windows consist of three sheets of glass, each separated by an air gap. The air gaps provide the insulating layers that slow down the heat loss and reduce the opportunity for condensation to form. Triple glazing is a very popular choice in home improvement and is marketed as an environmental solution.

Autoclaved aerated concrete (AAC)-

Autoclaved aerated concrete (AAC), also known as autoclavedcellular concrete (ACC), autoclaved lightweight concrete (ALC), autoclaved concrete, cellular concrete, porous concrete, Aircrete, Hebel Block. It is porous, non-toxic, reusable, renewable and recyclable. ACE blocks and panels are manufactured using fly ash mixed with cement, lime, water and an aerating agent.

Properties of AAC-

- Lightweight
- Thermal Insulation
- Fire Resistant
- Termite Resistance
- Sound Absorption
- High Strength to weight Ratio
- Earthquake resistant
- Enviro-friendly
- Green Building Material
- High dimension accuracy and uniform surface
- Water penetration
- High Workability
- Economical
- Energy Efficient.

FlyoPlast (Ready Mix Plaster):-

FLYO PLAST is a Ready Mix Cement base plaster with high quality polymer additives. It can be used on inner and outer walls. It can also be used efficiently on brick, block, stone walls as well as concrete surface. FLYO PLAST gives even surface on which tiling also can be done faster and efficiently.

Technical Specifications-

Color: Grayish granular powder
Binder: Cement
Additives: workability, bond strength improving polymers.
Aggregates: silica confirming to IS.
Bulk Density: 1.2 to 1.6 Kg/liter unit
Thickness of layer: 6-12 mm
Coverage: 15-20 sq.ft./40 kg bags.

B) Sustainable Techniques

On Grid Solar Power Generation-

Solar power has been increasingly exploited as a sustainable construction technology. In green construction, it is utilized in two ways. One pertains to active solar power and the other is passive solar power. Active solar power is the use of functional solar systems that absorb the sun's radiation to cater for heating and electricity provision. It reduces the need for the use of electricity or gas.

The upfront installation costs are higher but in the long-term it saves on energy bills and aids in reducing greenhouse gas emissions from non-renewable energy sources like fossil fuels. On the other hand, passive solar power is a design that uses the sun's rays to warm homes through the strategic placement of windows and the use of heat-absorbing surfaces. The windows let in energy and the heat absorbed reduces the need for warming the house during cold periods such as winter.

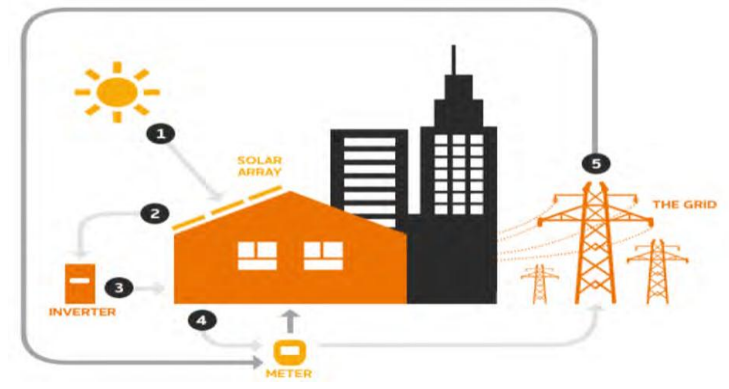

Figure No.-1 System of On Grid Solar Power

IV. RATE ANALYSIS

Cost Analysis for bricks works-

Table No-2 Unit Rate Analysis

Sr. No	Description of Material	Unit	Total Quantity bricks work in tender	Pre Cum Quantity	Total quantity (number)	Unit Rate	Total Amount
1	Conventional bricks	Cum	32.842	500	16421	4.50	73894
2	AAC	Cum	32.842	64	2102	47.65	100160
3	Fly ash bricks	Cum	32.842	500	16421	4.20	68968

CONCLUSION-

From the above study by using various retrofitting techniques we can preserve the historical monument and heritage structure in the city.

By studying various sustainable material used for retrofitting environmental sustainability can maintained.

From above research by using sustainable material cost can be controlled and can achieve economy of structure.

By using recycled material in construction we can control the emission of greenhouse gases in environment.

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