"Behavior and Retrofitting of Beam using FRP Powder and FRP Sheet"

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Abstract— This project represents evaluation of the Behavior and Retrofitting of beam using FRP powder and FRP sheet. Beam of size 700 mm × 150 mm × 150 mm is used. In this study, a total of 18 specimens were casted. The volumes of FRP Powder added are 5%, 10%, 15%, 20%, 25% of weight of cement and sheet thickness is 2-3 mm. Flexural test is done and results are designed by using FRP Powder and retrofitting is to be done with FRP sheets. The behavior of beam is to be standard for conventional and retrofitting.

Key words: FRP Powder, FRP Sheet, Retrofitting

I. INTRODUCTION

The introduction of novel lightweight Fiber Reinforced Polymer (FRP) composite constructions in theinternational maritime industry was made possible in 2002, when the fire safety chapter of SOLAS openedup for performance-based design. Such a design must be at least as safe as a design achieving all theprescriptive requirements, shown through a fire risk assessment. SP Fire Technology in Borascoordinatedsuch an assessment for a ship with a large FRP composite superstructure. A need to investigateimplications for firefighting efforts on board these ships was identified in the process.

It aims to investigate the novel design's implications for firefighting efforts on boardlarge scale cruise ships. In order to achieve light weight, Fiber Reinforced and start to lose its load-bearingcapabilities. The temperature at which this happens depends on what type of resin is used. Polyester or aphenolic polymer mix are commonly used resins and they will have lost their bonding capabilities ataround 130°C and 200°C As the construction gets heated further.In orderto provide sufficient protection from fire, all interior FRP composite surfaces will be insulated.

Fiber reinforced concrete is a relatively new structural material developed throughextensive research and development during the last three decades. It has already found a wide range of practical application and has proved a reliable structural material having superior performance characteristics compared to conventional concrete. Due to this benefit, the use of FRC has steadily increased during the last two decades and its current field of application includes: airport and highway pavements, earthquake-resistant and explosive-resistant structures, mine and tunnel linings, bridge deck overlays, hydraulic structures, etc. Concrete is one of the most versatile building materials. It can be cast tofit any structural application. It is readily available in urban areas at relatively low cost.

Concrete is strong under compression yet weak low maintenance and long service life. Several earthquakes in recent years throughout the world have prompted the structural engineering community to pursue considerableresearch on the behavior of structures under seismic loading. One area of research hasbeen to improve the design of conventional reinforced concrete for better performance under seismic shaking. Another potentialarea of research, believed by many structural engineers as more appropriate is to develop innovative composite materials with improved seismic performance. One such new structural material is the fiber reinforced concrete (FRC).

II. OBJECTIVE

- To study compressive strength and tensile strength of a beam with conventional and FRP powder
- To Study the flexural strength for the conventional beam
- To study the flexural strength of the beam with FRP powder varying of 5%, 10%, 15%, 20%, 25% with respect to lot of the cement.
- To study the behaviors of retrofitting beam and compare with convention beam.
- To compare load carrying capacity of conventional beam, conventional beam with varying FRP Powder and FRP Sheets.

III. METHODOLOGY & MATERIAL

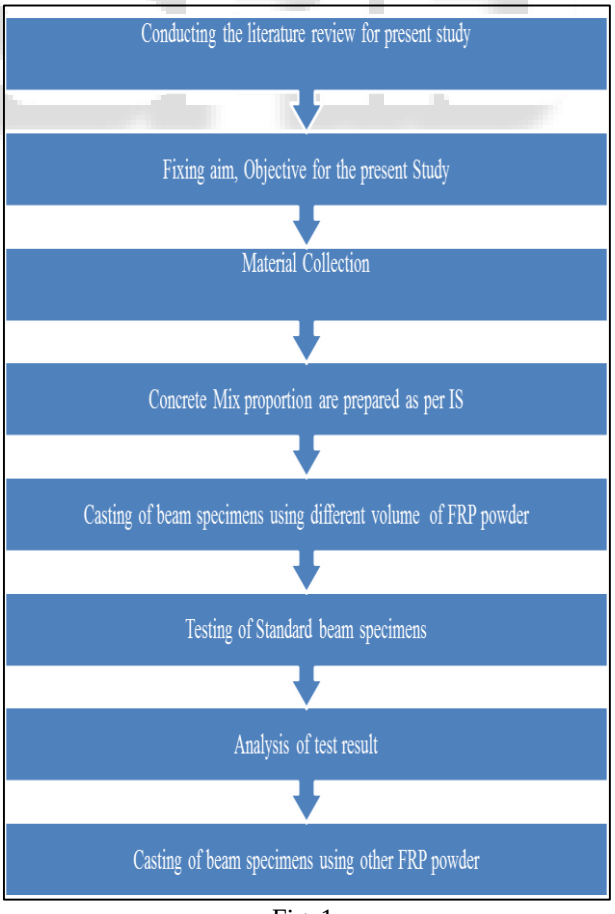

Fig. 1:

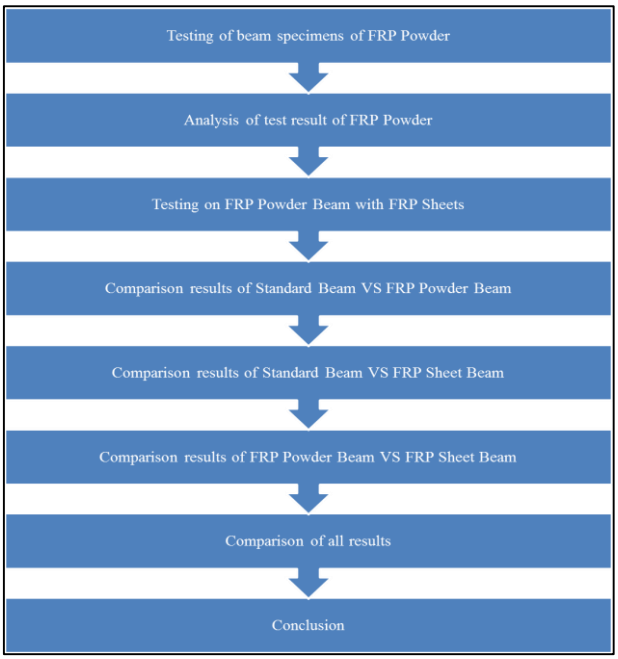

Fig. 2:

A. Cement

- The cement used for this investigation was OPC 53 grade Binani cement. The specific Gravity of the cement was found 3.15 and it is conforming to IS 12269-1987.

B. Fine Aggregate

- The fine aggregate used for all the specimens was complying with IS 383-1970. The specific gravity of fine aggregate was 2.63, sieve analyses were conducted and it was found that the sand used was conforming to Zone II grading. The fineness modulus of fine aggregate was 2.82.

C. Water

- Portable water available in the laboratory was used for casting all the specimens in this investigation. The quality of water was found to satisfy the requirements of IS 456-2000.

D. FRP Powder

- The fiber powder used is for a strength of a concrete beam of the structures.

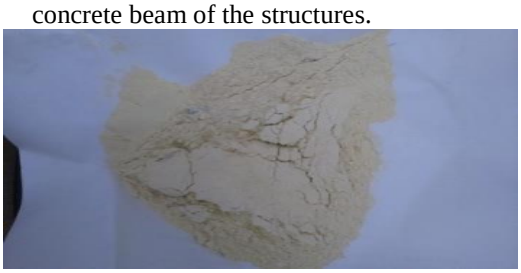

Fig. 2: FRP Powder

E. Confects

- Fiber Row in glass with resin heat at 200°c

F. FRP Sheet

- The fiber sheet is used for a strength of a cracked or tested or as a retrofitting beam of the structures.

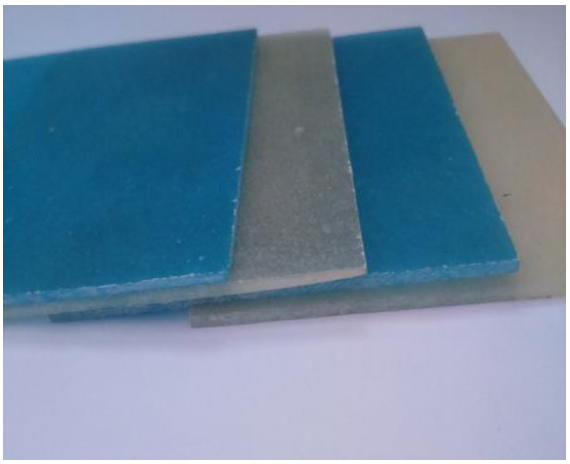

Fig. 3: Frp Sheet

G. Confects

- Fiber glass with polymer resin heat at 200°c and compress with its mechanically as per thickness.

H. Test Perform

- Slump Test
- Compression Test
- Split Tensile Test
- Two Point(Flexural) Loading Test

IV. RESULT ANALYSIS

Note: (X Axis: Load In Kn, Y Axis Deflection In Mm)

A. Frp Powder Having No Sheet As A Retrofitting

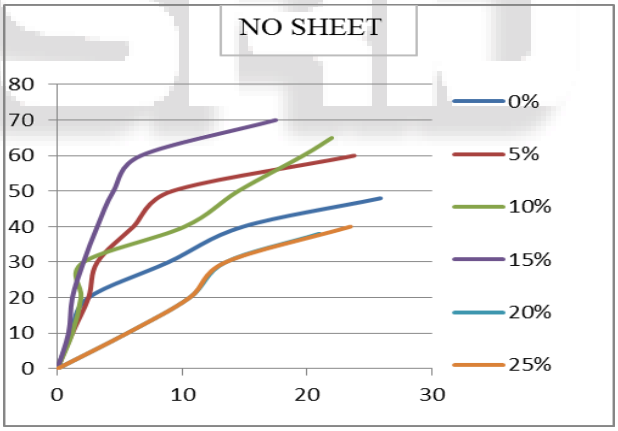

Fig. 4: Frp Powder Having No Sheet As A Retrofitting

B. Frp Powder Having One Sheet As A Retrofitting

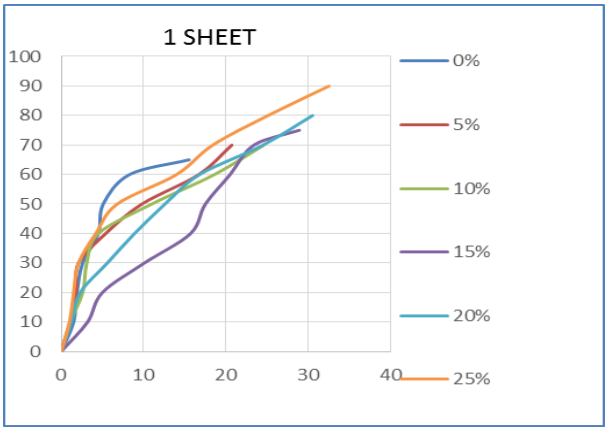

Fig. 5: Frp Powder Having One Sheet As A Retrofitting

C. Frp Powder Having Two Sheet As A Retrofitting

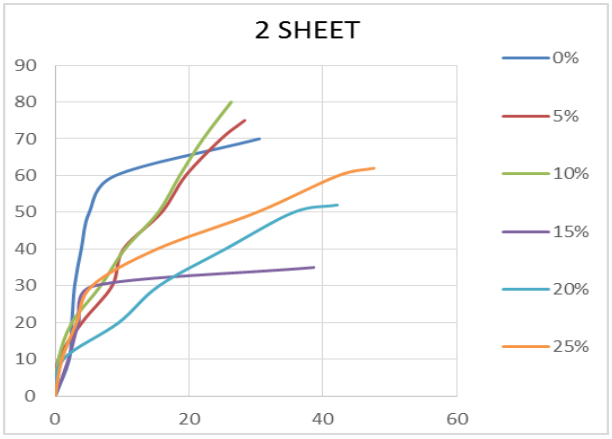

Fig. 6: Frp Powder Having Two Sheet As A Retrofitting

D. Cube Analysis

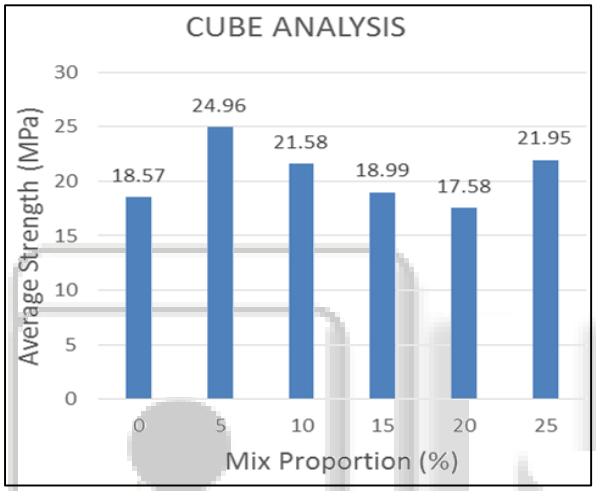

Fig. 7: Cube Analysis

E. Cylinder Analysis

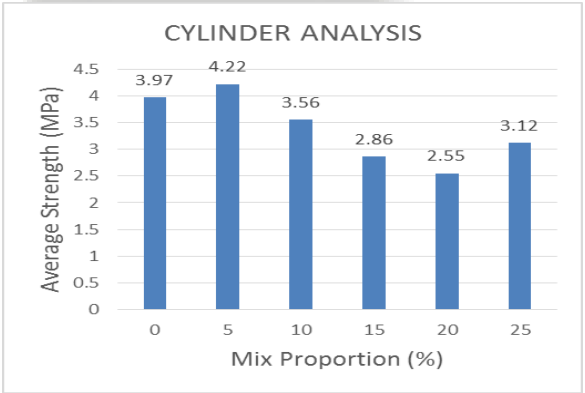

Fig. 8: Cylinder Analysis

V. CONCLUSION

- For the conventional beam the ultimate load caring capacity capacity increase with increase FRP Powder up to 15% in variation of cement further increase increase in FRP Powder load is decrease in the load caring capacity.
- Single layer of FRP Sheet if the beam found 25% (FRP Powder + FRP Sheet) is more capable to resist the load, but as load increase the deflection is also increase.
- For two layer FRP Sheet with 25% of FRP Powder is found ineffective with one layer of FRP Sheet and 25% of FRP Powder, So providing two layer of FRP Sheet is ineffective.
- For cube analysis the proportion of mixture of cement with FRP Powder is 5% having a good compression strength.
- For cylinder analysis having 5% of mixture cement and FRP Powder having a good strength.

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