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PLANNING AND SCHEDULING FOR STRENGTHENING OF STRUCTURE BY JACKETING OF MESHED REINFORCEMENT IN BEAM USING EXPERIMENTAL AND NUMERICAL APPROACH

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Abstract — To increase its overall strength, steel rods, wires, mesh or cables can are embedded in concrete beam before it sets. This reinforcement, often known as rebar, resists tensile forces, In Present Investigation with concrete beam with different square mesh shaped reinforcement was made with gap of 10mm, 30mm, 40mm and 50mm these reinforcement are attached in longitudinal surface of beam sample the curing of 7, 14 and 21 days was done in beam samples, A load of 310, 330 and 410 KN was applied in each sample of beam and compressive strength of beam was analyzed, it is found that reinforcement mesh size of 55mm exhibits higher strength compared to existing configuration of reinforcement meshes in M20 grade of design, further STAAD – Pro analysis is done in G+5 building with comparison in their cost estimation. The scheduling and planning of present proposed structure was also done to analyze the reduction in no. of days in construction, further IS 15988: 2013 considered in jacketing of column.

Keywords— Concrete beam, Reinforcement mesh, Aggregate, Compressive Strength, Planning, Scheduling, Cost Estimation.

I. INTRODUCTION

Strengthened concrete (SC), additionally called reinforced cement concrete (RCC), is a composite cloth in which concrete's particularly low tensile power and ductility are compensated for with the aid of the inclusion of reinforcement having higher tensile strength or ductility. The reinforcement is usually, although now not necessarily, metallic bars (rebar) and is normally embedded passively in the concrete before the concrete sets.

II. Key characteristics of reinforcement

The coefficient of thermal expansion of concrete is much like that of metal, casting off massive internal stresses due to variations in thermal enlargement or contraction. While the cement paste within the concrete hardens, this conforms to the floor information of the metallic, allowing any strain to be transmitted efficiently among the different materials. Typically metal bars are roughened or corrugated to similarly improve the bond or concord among the concrete and metallic. The alkaline chemical environment supplied by means of the alkali reserve (KOH, NaOH) and the portlandite (calcium hydroxide) contained inside the hardened cement paste reasons a passivating movie to form on the floor of the steel, making it a whole lot greater resistant to corrosion than it might be in neutral or acidic situations. When the cement paste is uncovered to the air and meteoric water reacts with the atmospheric CO2, portlandite and the calcium silicate hydrate (CSH) of the hardened cement paste come to be steadily carbonated and the high p H gradually decreases from 13.5 – 12.5 to 8.5, the pH of water in equilibrium with calcite (calcium carbonate) and the metal is no longer passivated.

III. Planning

Planning is a trendy time period that sets a clear road map that must be followed to reach a destination. The term, therefore, has been used at specific levels to mean exceptional matters. Planning includes the breakdown of the task into definable, measurable,

and identifiable responsibilities/activities, and then establishes the logical interdependences among them. In creation, for example, plans may additionally exist at numerous stages: corporate strategic plans, pre-gentle plans, pre-contract plans, quick-term production plans, and long-time period creation plans. These plans are special from each other; but, all these plans contain 4 major steps:

- Performing breakdown of work items involved in the project into activities.
- Identifying the proper sequence by which the activities should be executed.
- Activities representation.
- Estimating the resources, time, and cost of individual activities.

IV. Literature Survey

Numerous studies were done on the possibilities of reusing the copper slag and cow dung ash inside the construction areas. The findings of the earlier researches with the findings are summarized in tabular form for the descriptive knowledge.

Mattias Blomfors et al. [1] Broken bond houses and closure of cracks inside the compressive sector have been diagnosed as possibly reasons. Furthermore, the selection of shear retention used for the weakened factors was proven to noticeably have an effect on the predicted potential and ductility. In end, the weakened-elements approach turned into the most sincere to enforce. It become much less time-consuming and caused better settlement with experimental effects, compared to the discrete-crack technique. Primarily based in this have a look at, the weakened-factors method is regarded as a promising method for the structural tests of the future.

Justas Slaitas et al. [2] In order to use full capability of the FRP it have to be pretensioned, this way reducing crack widths and deflections. In most cases in exercise strengthening will be completed for structures uncovered to outside load with initial cracks and deflection. However, there's the dearth of experimental and theoretical studies of such phenomena while RC structure is reinforced with prestressed FRP reinforcements beneath outside load movement.

Jianan Qi et al. [3] in this study a look at aims to analyze the put up-cracking shear behaviour of EPC beams. To this stop, nine EPC beams with extraordinary layout parameters had been tested to failure. The investigated parameters covered the prestressing circumstance, shear span to depth ratio, shear reinforcement ratio, and bend angle of external tendons. In contrast to bolstered concrete beams, the EPC beams proven shear tension sliding with concrete spalling failure.

Hongru Zhang et al. [4] it investigates discovered that the cracking resulting from masses and steel corrosion can have an effect on every different jointly. Regardless of the perfect resistance towards the load-brought about cracking of the RAC beams in phrases of the crack width manage, this paper indicates that RAC's structural use in chloride environments should be fascinated by outstanding warning, thinking about the critical corrosion cracking damages underneath masses coupled with chloride ingress.

Rajai Z et al. [5] in this study an progressive application became applied wherein CFRP strips have been included as external shear reinforcement for reinforced concrete (RC) beams by means of using the groove approach. The motive became to assess the CFRP strips' contribution to the shear electricity and therefore compare the effectiveness of the usage of them as important or supplemental shear reinforcement earlier than and after publicity to expanded temperature.

Hassan Falah Hassan et al. [6] in this study, the feasibility of using particle photograph Velocimetry (PIV) to come across cracks set up in strengthened concrete beams had been discovered in order that a practical effect may be counseled. The PIV approach has been sensible for reading the floor subject motion and stress. The take a look at consequences located that the crack sizes and imperative deflection were extensively decreased by increasing the reinforcement ratio and number of CFRP layers, results characterized that due to its decrease value and robust capability to have a look at cracking performance, PIV technique may be used as a substitute for traditional measuring strategies all through particular structural checks, exclusively in bending tests.

Mohamed A. Abu Maraq et al. [7] on this observe, the flexural potential, ductility, stiffness, crack width and deflection also are clarified. Primarily based on accomplished take a look at consequences, all strengthened beams are designed to fail in a ductile way. The first organization of strengthened beams restored on common 110% of the unique manipulate beams load capability, while the second one bolstered group resorted to 163% on average. Furthermore, it's miles discovered that the reinforced beams acted in the identical manner of the monolithic manage beams and acted as a single unit.

Sultan A. Daud et al. [8] this paper presents the impact of non-uniform reinforcement ratio along the beam length at the flexural behaviour experimentally and numerically. In the test, 4 bolstered concrete beams every system had a unique reinforcement ratio.

Christoph Betschoga et al. [9] the experimental results display brilliant variations with regard to the region of the critical shear crack and the shear resistance in the tested specimens. Based totally on this proof and experimental observations from to be had shear assessments of FRP concrete members amassed from the literature, an extension of a shear version that become firstly evolved for metal bolstered concrete contributors become made. The proposed technique can be efficiently used to estimate the shear resistance of a huge to be had test dataset and enables researchers to account for maximum cross-sectional parameters as well they have an effect on of boundary and loading conditions.

Zhenming Li et al. [10] the stresses in AAS and AASF concrete are calculated based totally on the experimental outcomes even as taking into consideration the have an impact on added by means of creep and rest. It's miles located that AAS and AASF concrete showed lower autogenous shrinkage-caused pressure and later cracking in comparison to everyday Portland cement (OPC) primarily based concrete with comparable compressive power, no matter the higher autogenous shrinkage of AAS and AASF concrete. The low autogenous shrinkage-induced pressure in the AAC is particularly attributed to the said pressure relaxation.

V. Result Analysis and Discussion:

Table 1: Results of compressive strength test at 310KN.

Compressive Load (310 KN)			
Stress (N/mm^2)			
Reinforcement Mesh size	**7 days**	**14 days**	**21 days**
10 mm	18.3	18.9	19.1
30 mm	17.8	18.2	19.6
40 mm	17.4	17.7	19.3
55 mm	16.9	17.1	19.8

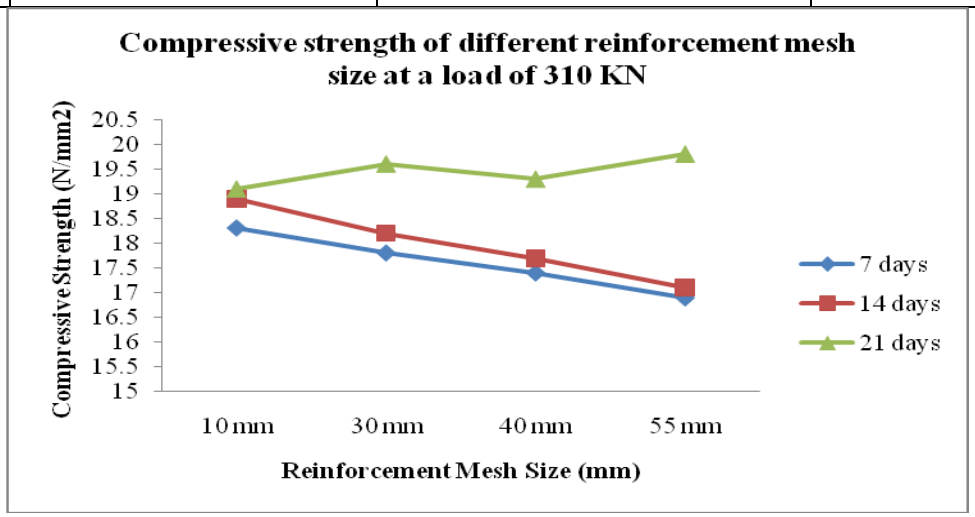

Figure 1: Graph shows results of compressive strength test

Table 2: Results of compressive strength test at 335KN.

Compressive Load (335 KN)			
Stress (N/mm^2)			
Reinforcement Mesh size	**7 days**	**14 days**	**21days**
10 mm	18.8	19.3	19.7
30 mm	18.3	19	19.8
40 mm	17.6	18.4	19.6
55 mm	17.2	17.9	20.5

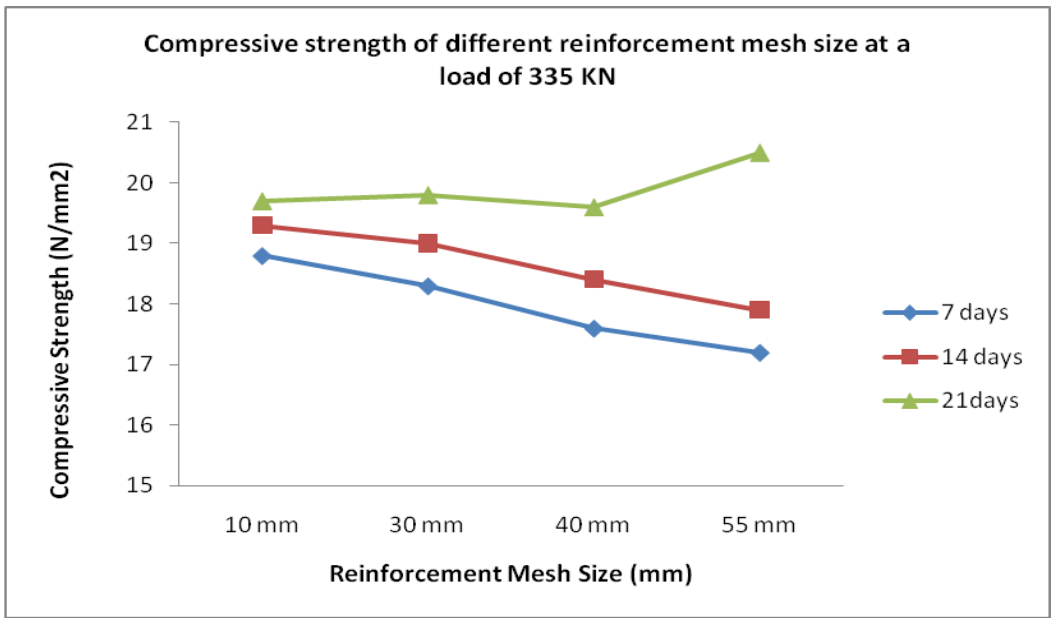

Figure 2: Graph shows results of compressive strength test

Table 3: Results of compressive strength test at 410 KN.

Compressive Load (410 KN)			
Stress (N/mm^2)			
Reinforcement Mesh size	7 days	14 days	21days
10 mm	19.8	20.8	23.3
30 mm	19.2	20.4	22.9
40 mm	18.9	19.9	22.5
55 mm	18.3	21.6	23.6

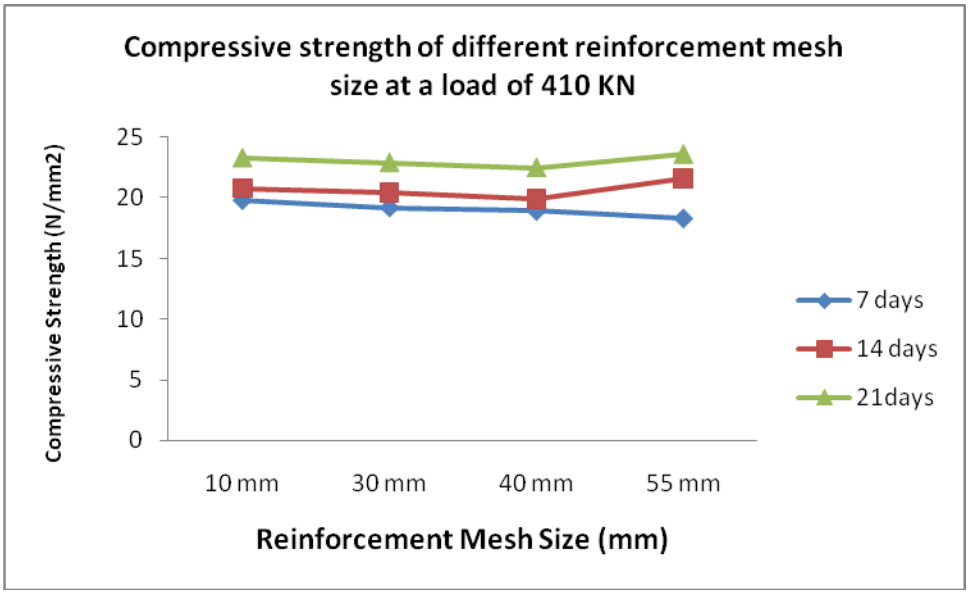

Figure 3: Graph shows results of compressive strength test

Table 4: Cost Estimation of G+5 Building after experimental and numerical analysis.

	Cost Estimate								
	Project :- G+5 Building								
	Plot Area :- 110 Sqm. Total Builtup Area :- G+5 Floor = 110 Sqm . Total Builtup Area 660 Sqm								
S.No.	**ITEM/ DESCRIPTION**	**NO.**	**L**	**B**	**D**	**QTY**	**UNIT**	**Munciple/ RATE**	**AMOUNT**
1	Eart work in **Excavation by mechanical** means (hydrolic ecavator)/ manual means in foundation trenches or drain including dressing of sides and remming of bottoms, the excavated soil and disposal the surplus excavated soil ,								
	Excavation for Building foundation	1	10.0	11	2.3	253			
				Total		**253**	**cum**	**260**	**65780**
2	**Murrum/ Hard Copra filling**								
	filling for Building foundation	1	9.0	10	2	180			
				Total		**180**	**cum**	**670**	**120600**
3	**cement concrete 1:4:8 in foundation with 40mm sgraded meta l/c cost of cement,**								
	columns base,	9	1.2	1.2	0.15	1.944			
	Ground Floor	1	11.0	10	0.1	11			

				Total		**12.944**	**cum**	**5200**	**67309**
4	**RCC.work M20 in columns.beams fair finished excluding steel reinforcement and itsbending but excluding centering and shuttering**								
	Plinth beam For Building,pb1	3	10.0	0.3	0.35	3.15			
	Plinth beam For Building,pb2	3	11.00	0.3	0.35	3.465			
	Column For Building	9	21.00	0.3	0.5	28.35			
	Roof beam of GF ,1ST,2ND,3RD,4RT,B1	45	5.0	0.3	0.35	23.625			
	Roof beam of GF ,1ST,2ND,3RD,4RT,B2	15	6.00	0.3	0.35	9.45			
	Deducting Of Beam	-1	5.00	0.3	0.35	-0.525			
	Deducting Of Column	-1	3.00	0.3	0.5	-0.45			
	Roof beam of 5TH FLOOR,B3	9	5.0	0.3	0.3	4.05			
	Roof beam of 5TH FLOOR,B4	3	6.0	0.3	0.3	1.62			
				Total		**72.74**	**cum**	**7100**	**516419**
5	**Mild steel TMT including bendind in reinforcement in RCC taking average reinforcement**			**Total**		**8000.85**	**kg**	**77**	**616065**
					Total				**1386173**
									1386173
	In Words (Rs). Thirteen lacs Eighty Thousand One Hundred Seventy Three Only.								

Conclusion

Concrete beam with larger size gap of reinforcement mesh posses higher strength i.e with increase in size of larger gap mesh the beam compressive strength is increased. The compressive strength of the concrete beam with dense mesh reinforcement decreases in all sizes of dense mesh in curing of 7, 14 and 21 days. The reduction in strength cannot be avoided. However, this is due to increased weight. The high compressive strength is observed in 55 mm of mesh reinforcement compared to all sizes of mesh in concrete beam in each day of cured samples. The inclusion of external mesh reinforcement in concrete beam that would help to control deflection, another advantage is that shrinkage and hence cracking is reduced. The calculated cost is less after jacketing of column and beam due to minimum use of concrete in structure. Total no. of days in planning and scheduling found minimum after

optimization in structure. The weight and strength is optimized by including reinforcement mesh of different gaps. STAAD – Pro results were analyzed to evaluate the normal concrete beam strength and deflection.

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