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POLYPROPYLENE SYNTHETIC FIBERS IN CONCRETEROAD PAVEMENTS FOR TYPICAL ROAD CONSTRUCTION

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ABSTRACT
The Polypropylene Fiber reinforced concrete (PPFRC) contains randomly distributed short discrete Polypropylene fibers which act as internal reinforcements as to enhance the of the cementitious composite (concrete). The principal reason for incorporating short discrete fibers into a cement matrix is to reduce cracking in the elastic range, increase the tensile strength and deformation capacity and increase the toughness of the resultant composite. These properties of PPFRC primarily depend upon length and volume of propylene fibres (PPF) used in the concrete mixture. The polypropylene fibre reinforced concrete (PPFRC) has seen limited applications in several structures. The applications are primarily to inhibit the cracking. However due to the lack of awareness, design guide lines and construction specifications, its uses are limited by the local construction industr y. Therefore A combined experimental and analytical study was undertaken. For the study, fibrillated polypropylene fibres of two different lengths (lf) of 25mm (1.00in) and 38mm (1.50in) with 0.2%,0.4% and 0.8% volume fractions (Vf) of were used. The research reported in this study includes an experimental investigation for measurement of workability of PPFRC using two standard test methods to characterize consolidation and four methods for flow property of PPFRC, an experimental investigation to characterize selected mechanical properties of PPFRC and to study the effect of volume fraction of (PPF) and length of PPF on the mechanical properties and development to fan analytical model for predicting the stress-strain curves for PPFRC in compression. The comparison of the analytical model for compressive stress-strain curve of PPFRC with the experimental results is judged to be good.

INTRODUCTION
In a developing country such as India, road networks form the arteries of the nation. Apavement is the layered structure on which vehicles travel. It serves two purposes, namely, toprovide a comfortable and durable surf ace for vehicles and to reduce stresses on underlyingsoils. In India, the traditional system of bituminous pavements is widely used.Locally available cement concrete is a better substitute to bitumen which is the by product indistillation of imported petroleum crude. It is a known fact that petroleum and it's by- productsare dooming day by day. Whenever we think of a road construction in India it is taken forgranted that it would be a bituminous pavement and there are very rare

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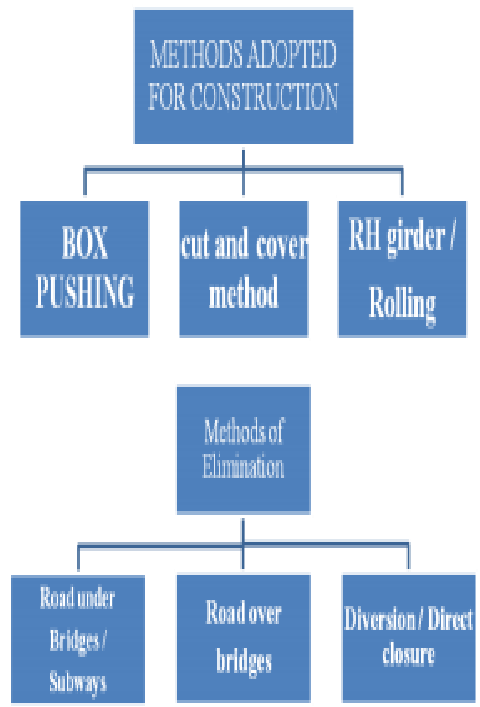
chances for thinking ofan alternative like concrete pavements. Within two to three decades bituminous pavementwould be a history and thus the need for an alternative is very essential.The perfect solutionwould be POLYMER FIBER REINFORCED CONCRETEPAVEMENTS, as it satisfies two of the much demanded requirements of pavement materialin India, economy and reduced pollution. It also has several other advantages like longer life,low maintenance cost, fuel efficiency, good riding quality, increased load carrying capacity andimpermeability to water over flexible pavements.

With the presentation of rapid prepares on a few courses and the plans of the Indian Railways to join the fast club without further ado, the security viewpoint/end of level intersections must be contemplated in detail since the speed of the moving toward prepare will be substantially higher thus will be the threat of mischance at LC`s, notwithstanding the way that a large portion of the mishaps at level intersections are because of the recklessness of the street clients, Railways must be all the more professional dynamic to enhance the wellbeing. With the ceaseless increment in the rail activity and also street movement, the interface amongst rail and street movement is bound to increase as we continue towards turning into a created country. Review separators i.e. Street over scaffolds/Road under extensions/trams, along these lines, might guarantee the best security benchmarks as well as should be savvy over the long haul. One of the measures started to lessen the quantity of level intersections is supplanting of level intersections with ROB`s/RUB`s and constrained tallness trams which takes out mischances at level intersections other than noteworthy change in operational advantages and improved wellbeing. Development of RUB`s offers astounding operational use both for Railways and Highways and offers win – win circumstance for all end clients i.e. person on foot movement , street activity and rail movement. It is the most secure techno – socio – monetary answer for the current issue at rail – street interface.

Methods of Elimination of Level Crossing`S



Methods of elimination of level crossings

FRP in the construction industry

In the USA the construction industry is the biggest user of plastic products at 34%, reinforced and un-reinforced, using similar quantities as transportation. See Figure 2.1 *(Rosato and Rosato, 2005)*. Currently FRP holds a 5% stake of the total materials used in the construction industry. However FRP’s real growth is expected to occur when their

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performance and advantages are fully understood by professionals and constructors, their properties included in widespread standards (Eurocode) and when their manufacturing price reaches reasonable levels on par with other conventional building materials such as steel and concrete.

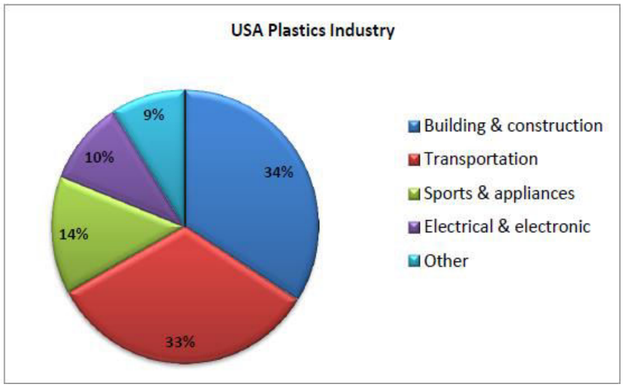


Figure USA plastics industry (reinforced & unreinforced)

Objectives of study

The objectives of the study are:

• An investigation of the mechanism of failure of IBS block work wall in laboratory and using software ETABS modeling to build a model to validate its mechanism of failure.

• To compare the results of modeling with actual laboratory test.

Scope of study

The scope of the study are to carry out an ETABS software analysis on IBS wall block work components and investigate the mechanism of failure due to applied external vertical loads. Stresses induced from early mentioned loads that will stream in components, resulting in crack and spelling of the whole system. The scope is to include the behavior and strength, deflection and pattern of failure of themodels.

[1] Munaf et al 2002

Had investigated on beam to beam connections of precast concrete elements under monotonic and cyclic loading. The aims of this research is to investigate the properties and behaviours of dry joint connection between beam elements of precast concrete Six samples consisted of two normal beams and four beams of precast concrete samples each had already been made. There were two types of precast concrete element, one of the types was beam with rectangular-section (type I) and another type was beam with I-section (type II). They used four holes in magnification of beam section as resisting of bar connection. The specimen test as simple beam support was done in two loading cases be monotonic and cyclic, with two point loads for models of pure bending condition. The test parameters were the behavior comparison among of normal beam and two types of precast concrete element as strength, rigidity, ductility, strength and rigidity degradation, and energy dissipation.

The results of this research indicated the strength of type I and type II, compared with normal beam be 100.25% and 105.51 %, respectively.

The maximum ductility's of type I and type II were 6 and 8, where normal beam achieving ductility 8. The strength of degradation of type I and type II, were 12.02% and 16.42%, whereas normal beam was 9.72%. The rigidity of degradation of type I and type II were 88.85% and 89.45%, with normal beam was 82.16%. The energy dissipation cumulative of type I and type II s normal beams were 85.92% and 83.86%, respectively. The indication of stress and strain phenomenon for precast concrete connection of type I was dowel mechanism but not in type II. On the two types of precast concrete element occurred stress concentration caused by differences of section.

[2] HasanHusnuKorkmaza et al (2005)
studied the performance of a precast concrete beam-to-beam connection subject to reversed cyclic loading simulating severe earthquake action. The result indicates that the connections were vulnerable to lateral loads. Connections were subjected to more shear and bending moments. Both of top steel connection alternatives namely, welding and longer and better lap splicing could be recommended but in bottom connections provided connectors were stronger than the bottom bars themselves and the connection plates were properly anchored. They concluded that welding connection, proper lap splicing, stronger connector than the bars and anchor length should be the future focus for connection of beam to beam when subjected to lateral loading. Earthquake resistant reinforced concrete buildings require the structure to resist the induced forces in a ductile manner. Ibis demands that the beam-to-column connections be designed as a ductile, moment-resistant connection. This has severely limited the use of precast concrete construction in seismic zones.

[3] Pillai and Kirk (1981)
developed a satisfactory ductile, moment resistant beam-to-column connection to be used in earthquake resistant buildings with precast reinforced concrete construction. A satisfactory design for such a connection enabled the performance of the connection to be investigated experimentally. A total of eleven tests were conducted on full scale beam-column connections, including two monolithic specimens for purposes of comparison. The test results have indicated that the proposed method of connection developed adequate strength, stiffness, and ductility tobe classified as a ductile, moment-resistant connection in the context of seismic design.

[4] Bhatt and Kirk (1985)
grouped moment-resisting connections used for joining precast beam to columns into three categories and carried out tests on the third category on an improved version of the joint detail tested by Pillai and Kirk (1981).Although the joints behaved satisfactorily in terms of ductility, most of the failures took place due to the failure of the weld between the bars and the plate in the column. They improved this position of the joint by increasing the length over which the plate and the bar can be welded. Results from the tests have shown that it is possible to achieve highly ductile behavior by using the joint detail adopted.

[5] Dolan and Pessiki (1989)
Demonstrated the feasibility of using models for testing precast concrete connections. Model studies have been examined as an alternative for obtaining basic information about the behavior of precast concrete connections. The advantages of model studies include lower cost, specimens that are more easily manufactured and handled a significant reduction in applied loading, and a corresponding reduction in test apparatus size. The PCI report allowed model studies to be compared with full scale tests. The results have shown that the behavior characteristics of a welded, monotonically loaded precast concrete connection can be

simulated using models. Good agreement has been found between the strength and the normalized moment rotation response of the model and full scale tests. The agreement has demonstrated that models can be used to study this type of precast concrete connection behavior. The effects of poor weld quality and design eccentricities have similar consequences in both the model and the full scale.

[7] Comair and Dardare (1992)

Carried -out a testing programmer on thread ridded connections with grouted sleeves. It was accepted that this connection system is usually viewed as more economical than other systems used in France. The model test specimen is a beam-to-column interior connection and assumed to be located in the first story of a three-story, two-bay moment resisting frame. Based on test data, it has been decided that the elastic moment is roughly estimated to be equal to 20% of the failure moment. Because the rotation was determined directly from the end deflection of the cantilevers, the relative rotation of the connection should have been separated from the curvature of the cantilevers.

[8] Fabio Biondini et al (2010)

made a parametric study aimed to validate the design method carried out by varying within the range of practical interest, the main design parameters such as the number of story's, mass over- stiffness ratios and the stiffness characteristics of columns. The results of dynamic modal analyses and non-linear static analyses showed

that the proposed method can safely be applied to ordinary multi-story concrete precast frames characterized by structural regularity and limited flexibility. Their results demonstrated that the design method can be safely applied to regular structures with first vibration period less than two second, under condition that a suitable partial safety factor is adopted. They observed that better proportioning of the columns and their connections to beams can be achieved with reference to the distribution of stresses provided by dynamic modal analyses. The use of finite element models has been greatly advanced by Liauw and Kwan(1983) during the 1980's with companion experiments, as a tool for understanding the behavior r of in filled frames. By introducing plasticity models for the infill and interface elements between frame and infill, they have identified new frame failure modes. They reported that crushing or softening of infill regions of high compressive stress, at the ends of a main diagonal strut, may significantly reduce lateral support to the column provided by the infill, resulting in a short-column effect.

METHODOLAGY

ETABS is a sophisticated, yet easy to use, special purpose analysis and design program developed specifically for building systems. ETABS features an intuitive and powerful graphical interface coupled with unmatched modeling, analytical, and design procedures, all integrated using a common database. Although quick and easy for simple structures, ETABS can also handle the largest and most complex building models, including a wide range of geometrical nonlinear behaviors, making it the tool of choice for structural engineers in the building industry *(Computers and structures Inc.2003)*.The accuracy of analytical modeling of complex Wall Systems has always been of concern to the Structural Engineer. The computer models of these systems are usually idealized as line elements instead of continuum elements. Single walls are modeled as cantilevers and walls with openings are modeled as pier and spandrel systems. For simple systems, where lines of stiffness can be defined, these models can give a reasonable result. However, it has always been recognized that a continuum model based upon the finite element method is more appropriate and desirable. Nevertheless this option has been impractical for the Structural Engineer to use in practice primarily because such models have traditionally been costly to create, but more importantly, they do not produce information that is directly useable by the Structural Engineer. However, new developments in ETABS using object based modeling of simple and complex wall systems, in an integrated single interface environment, has made it very practical for Structural Engineers to use finite element models routinely in their practice Wall is a vertical load-bearing member whose length exceeds four times itsthickness. Un-braced wall is designed to carry lateral loads (horizontal loads) inaddition to vertical loads. Braced wall does not carry any lateral loads (horizontalloads). All horizontal loads are carried by principal structural bracings or lateral supports. Reinforced wall contains at least the minimum quantities for reinforcement. Plain walls contain either no reinforcement or less than the minimum quantity of reinforcement. The wall which is investigated in this research is consisting of several separated blocks which are placed in such a way that they form an infill wall for IBS construction. Recently the application of precast components in construction of many structures is accelerating due to its simplicity for fabrication and saving in time and labor force of many construction projects. IBS is a construction technique where components are manufactured in a controlled environment (on or off site), transported, positioned and assembled into a structure with minimal additional site works *(CIDB, 2003).* IBS is the new way forward in the construction industry. In 2012, the Malaysian government mandated that any governmental project should comprise of 70% IBS Precast frame which is made by combining beam and column is not new, but block work system research must be check to ensure the safety and reliability of the system before put into use for industrialize housing Hence, many research centers and universities turned to contribute to this new born science field and consequently a thorough analyzing with ETABS is also necessary.

Figure Bukit Jail Sport Complex

Uses of bfrp polymers compared with other polymers

A bamboo fiber reinforced polymer (BFRP) was modeled and fabricated using a plain weave of bamboo fibers embedded in an epoxy matrix to present a new alternative to carbon fiber reinforced polymers (CFRP). A unit cell model of two sets of parallel fibers weaved perpendicularly in a matrix was used to represent the BFRP. The model was generated using TexGen and imported into ANSYS where a finite element (FE) analysis was performed in the form of a tensile test simulation. Periodic boundary conditions were applied to simplify results. Fabricated BFRP samples were tensile tested and compared to the simulations to verify results. Energy cost of production of BFRP was calculated to be 72 MJ/kg as compared to the energy cost of production of CFRP, being 380-420 MJ/kg. This value is substantially lower and is a main motivation for this project

RESULTS

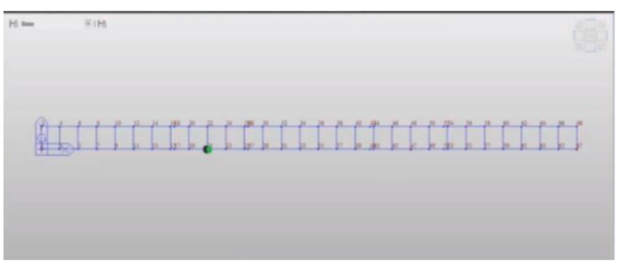


Fig 4.1 shows that plane surface

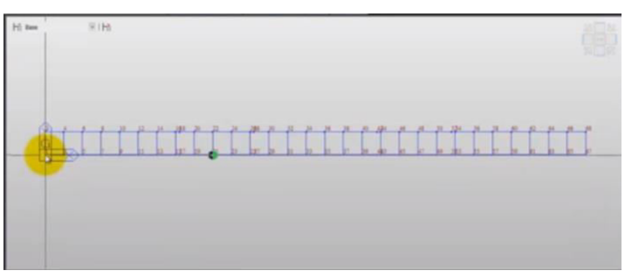


Fig 4.2 shows that initial point of the plan load

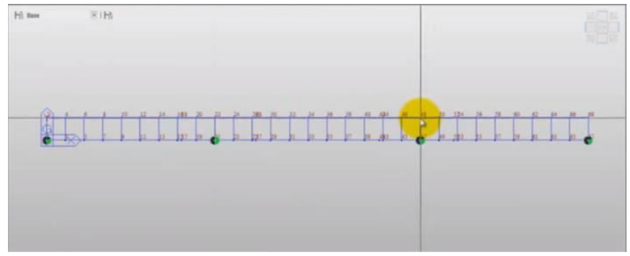


Fig 4.3 shows that third load of the plane surface

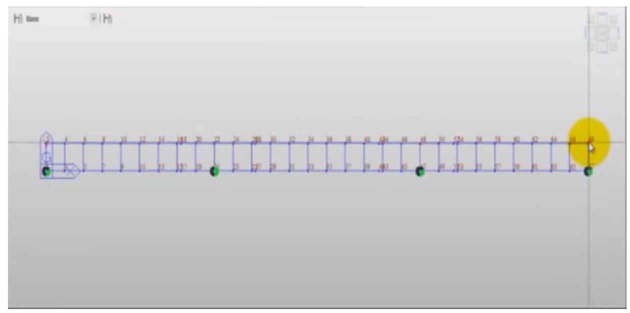


Fig 4.4 shows that final load of the plane surface

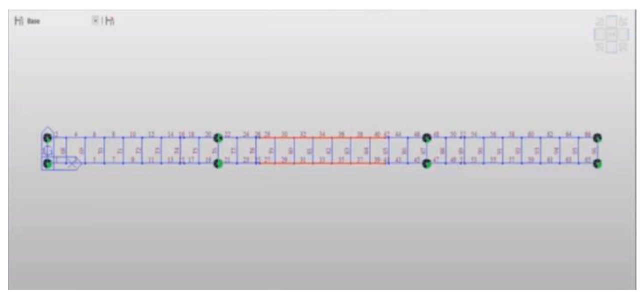


Fig 4.5 shows that load applied to the surface middle point

IN PUT LOADING DATA

TABLE 4.1 For the tutorial apply the pre and post composite loads by element beam loads refer to the table below

classification	Right grinder		Left grinder	
	VERTICAL LOAD (FZ)	TORSIONAL MOMENT	VERTICAL LOAD (FZ)	TORSIONAL MOMENT

Pre – composite Load DL(BC)	-38.96	-1.49	-38.96	1.49
Post-composite load DL(AC)	-18.69	19.69	-18.69	-19.69

Fig 4.15 shows that applied load of the beam base point

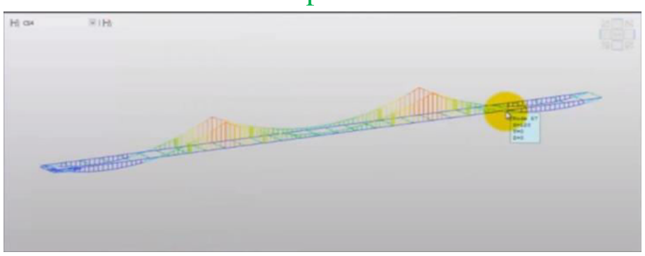
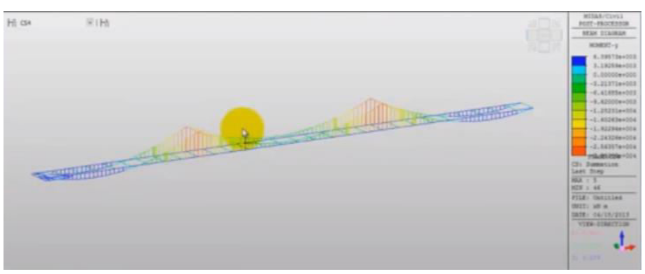
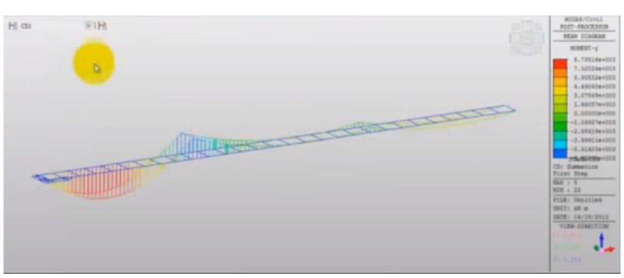


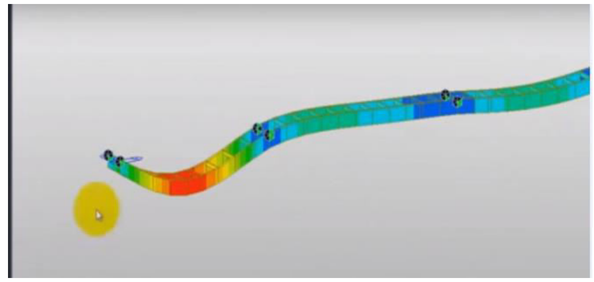
Fig 4.16 3D view of the ascending loads with two points



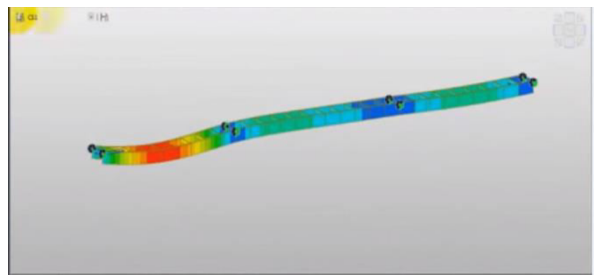
The fig 4.17 shows that load applied to middle point in 3D VIEW



The fig 4.18 shows that Applied to the load of initial 3D VIEW



The fig 4.21 shows that maximum initial load of that bending moment



The fig 4.22 shows that minimum initial load of that bending moment

CONCLUSION

Pushing work implies in any event mostly working in dazzle, so issues more often than not come up amid execution of work. Box pushing work requires close supervision and checking and regularly the dangerous conditions create at these destinations. Track must be observed consistently to see indications of hurling, settlement, misalignment and so on. LWR must be cut and site secluded amid box pushing. Work must be done under square security/alert arrange as it were.

The presented example illustrates the advantages of using FRP decks in bridge deck replacement projects instead of replacing the entire superstructure. This holds true in terms of both costs and environmental impact, when this option naturally fulfils the technical requirements. In addition, the social impact of the bridge with an FRP deck is reduced due to a shorter construction period, resulting in fewer traffic delays, less air pollution generated by traffic and construction equipment and a safer working zone. Quickconstruction also implies fewer social costs and carbon emissions due to traffic detours, as verified in this study.

It should be mentioned that, in this case study, there is some uncertainty about the unit values of embodied-material carbon emissions, especially for the FRP material and polymer concrete. This creates some degree of uncertainty in the results, which are very sensitive to these input data. In the case of FRP decks, polymer concrete material used as an overlay makes a major contribution to carbon emissions. If asphalt were considered as an overlay, a further reduction of 17% in total carbon footprint would be achieved for the deck replacement alternative. The analysis also confirms that the environmental impact is dependent on several factors (e.g. traffic diversions, transportation, and material) and the results are accordingly very sensitive to these parameters. This proves the need for life-cycle assessments for various bridge projects in order to identify the best solution since, in a sense, each bridge is unique.

It should also be noted that, in this study, the environmental impact is limited by addressing only the carbon emissions, which have a main impact on the global warming potential (GWP). Additional studies are required to assess other environmental impact categories such as: acidification potential (AP), eutrophication

Along with these conclusions, FRP decks will probably gain recognition due to improved social sustainability, potential cost savings over the life cycle of the bridge and promising results in terms of the environmental impact.

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