Review on T-Beam Cost Optimization by Reducing Width

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Abstract- research optimum design of singly and double support beams with uniformly dispersed and concentrated load has been done by compromising exact self-weight beam. On the basis of steepest descent, flexible and malleable and back-propagation learning a technique, this design is skillful has also been composed of genetically optimized artificial neural network. With the use of limit state design, the initial solution has been achieved.

Keywords- BEAM,OPTIMIZATION,COST

I. INTRODUCTION

Reinforced Concrete Beam is a flexural load bearing element of the widely used Framed Structures for buildings and in other structural systems. With the scale of projects going higher due to advancement of construction technology, the cost reduction in the design process has become one of the most major objectives in the overall process. The techno – economic – feasibility of the overall structure is the basis of every project. With the development of technology, more and more researchers were able to develop innovative methods of optimization of structures.

In this paper we discuss on the different types of beams and their optimization. The Rest of the paper follows with related study.

Beam is a structural member which is ordinarily set horizontally. It gives resistance to bending when burdens are connected on it. Different types of materials, for example, wood, steel, aluminum, etc. are utilized for constructing beam. Most ordinarily utilized material for beam is RCC (Reinforced Cement Concrete). RCC beam can be different types relying upon different criteria. For example, contingent upon shape, beam can be rectangular, T-beam, etc. Contingent upon reinforcement placement, beam can be two fold strengthened beam, single fortified beam, etc.

II. TYPES OF BEAMS

a) Simple Beam
b) Continuous Beam
c) Semi-Continuous Beam

Simple Beam:Alludes to the beam having a solitary traverse bolstered at its end without a restriction at the support. Basic beam is now and then called as just bolstered beam. Restriction implies an unbending association or harbor at the support.

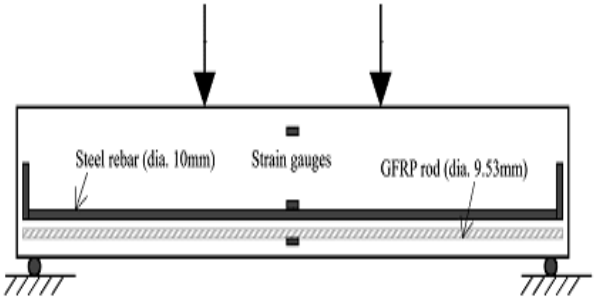

Fig.1: Simple Beams

Continuous Beam: Refers to a beam with two spans with or without restraint at the two extreme ends.

Fig.2: Continuous Beams

Cantilever Beam: It is supported on one end and the other end projecting beyond the support or wall.

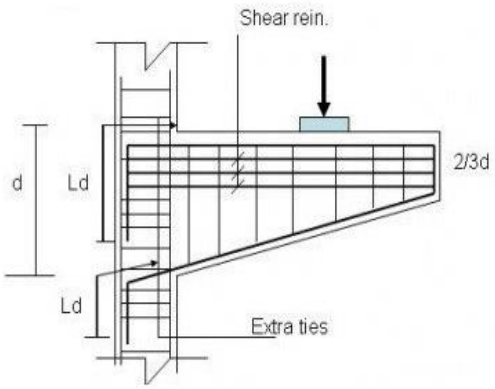

Fig.3: Cantilever Beams

T- Beam: When floor slabs and beams are poured simultaneously producing a monolithic structure where the portion of the slab at both sides of the beam serves as flanges of the T-Beam. The beam below the slab serves as the web member and is sometime called stem.

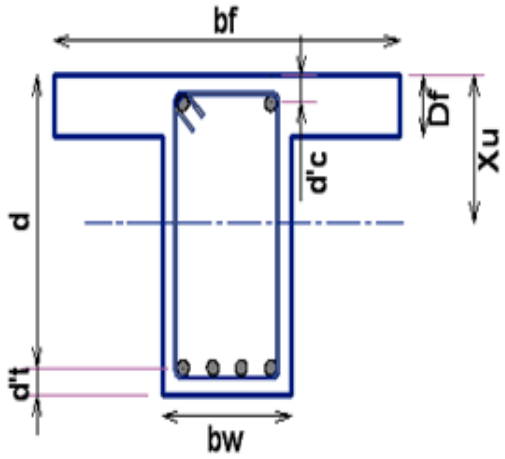

Fig.4: T-Beams

The Economic execution of a tangible structure reliant on the basic layout, the choice of materials and their optimum use. The feasibility depends on the proper analysis. Designs of Singly reinforced beam are designed by basically the following methods:

- The strain compatibility method
- The formulas method derived from the basic assumptions
- The design charts and tables method published by ISI in its publication SP 16

III. RELATED STUDY

This section of the paper presents the related study of the T-Beam optimization approaches and methods. Some of the work done in the optimization field has been discussed below.

Author's Name	Year	Method/technology/ Algorithm Used	Outcomes
Uz. Et al.	2018	Search Algorithm	• Proposed the charged system search algorithm. • This algorithm optimizes the constraints on static and dynamic equilibrium. • Cost function in this work reduces the cost in multi-span RC beams.
Mangaletal.	2018	Hybrid Genetic Algorithm	• Developed a automated building framework for optimization • Genetic algorithm is used for the optimization process. • Minimize the areaof steel reinforcement in RC Beams effectively.
Molina et al.	2017	Harmony Search Algorithm	• Harmony search algorithm is used for the optimization • Rules of thumbs are used to reduce the geometrical dimensions. • The cost is mainly depends on the type of material fill.
Chatterjee et al.	2017	Particle Swarm Optimization	• PSO algorithm is used for the optimization with neural network.

			• All the work is based on the weight vector which is calculated with root mean square error. • PSO selects the optimal weight for effective optimization. • This approach gives effective accuracy and precision of prediction.
Korouzhdeh et al.	2017	Ant colony Optimization Algorithm	• Reduce the cost of composite beam by using the cost objective function. • ACO has high convergence speed and it gives effective optimal solutions.
Sahab et al.	2017	Hybrid Genetic Algorithm	• The objective function for cost is based on the cost per unit area. • The design constraints are considered for optimization.
Nigdeli, et al.	2016	Flower Pollination Algorithm	• Discussed the detail working of FPA and its application in the structural engineering. • It is a meta- heuristic algorithm used for optimization and based on the concept of biological pollination of the flowers.
Akin et al.	2015	Harmony search Algorithm	• The objective function is based on the total cost of concrete used in the frame. • The size, diameter and spacing between bars are considered for optimization.

IV. CONCLUSION

Beam is a structural member which is ordinarily set horizontally. It gives resistance to bending when burdens are connected on it. Different types of materials, for example, wood, steel, aluminum, etc. are utilized for constructing beam. Most ordinarily utilized material for beam is RCC (Reinforced Cement Concrete). RCC beam can be different types relying upon different criteria. For example, contingent upon shape, beam can be rectangular, T-beam, etc. Contingent upon reinforcement placement, beam can be two fold strengthened beam, single fortified beam, etc.

V. REFERENCES

[1]. Uz, M. E., Sharafi, P., Askarian, M., Fu, W., & Zhang, C. (2018). Automated layout design of multi-span reinforced concrete beams using charged system search algorithm. *Engineering Computations*, *35*(3), 1402-1413.

[2]. Mangal, M., & Cheng, J. C. (2018). Automated optimization of steel reinforcement in RC building frames using building information modeling and hybrid genetic algorithm. *Automation in Construction*, *90*, 39-57.

[3]. Molina-Moreno, F., García-Segura, T., Martí, J. V., &Yepes, V. (2017). Optimization of buttressed earth-retaining walls using hybrid harmony search algorithms. *Engineering Structures*, *134*, 205-216.

[4]. Chatterjee, S., Sarkar, S., Hore, S., Dey, N., Ashour, A. S., &Balas, V. E. (2017). Particle swarm optimization trained neural network for structural failure prediction of multistoried RC buildings. *Neural Computing and Applications*, *28*(8), 2005-2016.

[5]. Korouzhdeh, T., Eskandari-Naddaf, H., &Gharouni-Nik, M. (2017). An improved ant colony model for cost optimization of composite beams. *Applied Artificial Intelligence*, *31*(1), 44-63.

[6]. Sahab, M. G., Toropov, V. V., &Gandomi, A. H. (2017). Optimum Design of Composite Concrete Floors Using a Hybrid Genetic Algorithm. In *Handbook of Neural Computation*(pp. 581-589).

[7]. Nigdeli, S. M., Bekdaş, G., & Yang, X. S. (2016). Application of the flower pollination algorithm in structural engineering. In *Metaheuristics and optimization in civil engineering* (pp. 25-42). Springer, Cham.

[8]. Akin, A., &Saka, M. P. (2015). Harmony search algorithm based optimum detailed design of reinforced concrete plane frames subject to ACI 318-05 provisions. *Computers & Structures*, *147*, 79-95.

[9]. SarvghadMoghadam, M., H. Arefi, and KhMafinezhad."New Design and Optimization of Capacitive MEMS Accelerometer." *International Journal of Simulation--Systems, Science & Technology* 14.1 (2013).

[10]. Lou, D. C., Wu, N. I., Wang, C. M., Lin, Z. H., & Tsai, C. S. (2010). A novel adaptive steganography based on local complexity and human vision sensitivity. *Journal of Systems and Software*, *83*(7), 1236-1248