A Review Paper on New Trend in Splicing For Beneficial Outputs

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***Abstract*- Splicing is used to join reinforcement bar to transfer the force from one bar to the joining bar. Any rebar longer than standard length will need to be spliced. Lapping of rebar has been consider long an effective, economical splicing method, but today builders are forced to consider alternative due to more demanding concrete design, the mechanical splice has become important area of interest because of it's monolithical behaviour and pace of execution .This paper shows difference between lap splicing and mechanical splicing and also focus use of mechanical splicing as primary alternative to lap splices .Tensile and flexural test are carried out on rebar and reinforcement beam respectively .In this project we are casting beam having lap splice and mechanical coupler for joining of two reinforcement bars. Beams were casted and flexural test along with tensile were carried out.**

I. INTRODUCTION

The reinforced concrete is widely used in civil engineering industry globally. Reinforcing steel bars are needed to be spliced to provide continuity in reinforced concrete structures. Bars can be spliced either through overlapping two adjoining reinforcement, "lap splicing" which is traditional, effective and economical method, or newly developed mechanical bar splices, which are commonly referred to as "couplers".

Lapping is not a appropriate means of connecting the reinforcement bars. The use of lapping requires more steel in terms design and installation and affects the steel to concrete ratio. Lapping of large diameter of steel reinforcement bars in concrete structure requires 15% more steel than that used as single bar. Lapping of large diameter bars is avoided due to congestion of reinforcement bars and economy. Due to rapid growth of construction industry there has been innovation in methods of splicing and 'Mechanical Coupler is one of this newly developed method mostly use in large infrastructure projects and multistoreed project.

The use mechanical coupler for connecting reinforcement bar is efficient and economical. Couplers are still developing in terms of shape, size and performance. Coupler has a global demand which comes with the diversification in design, practices and specification and testing of coupler performance is slow. The coupler can be classified as joints made between coupler and reinforcement steel.

With all coupler systems, the joint (or splice) is made either in the fabricator's works or on the construction site. Therefore there is a requirement for control of both the coupler manufacturing operation, and also the production of the splice itself, which will normally require some end preparation of the bar[3].

II.LITERATURE REVIEW

Dac Phuong NGUYEN and Hiroshi Mutsuyoshi says the Influence of Quality of Mechanical Splices on Behavior of Reinforced Concrete Member The mechanical properties of mechanical splices with insufficient steel bar insertion into the couplers were experimentally investigated along with the influence of such splices on the behavior of RC beams. The effectiveness of a corrective splice newly developed to improve such improperly installed splices was also studied. A mechanical splice in which the steel bars are insufficiently embedded into the coupler fails through slippage of the steel bars from the coupler. Such splices fail to reach the ultimate strength of the steel bar.

S.N.Harinkhede presents in his paper lap splicing is the conventional method for connecting the steel reinforcing bars since many years. Splicing the steel reinforcing bars by laping or welding have various imperfections such as inadequate length of laps, low quality welds, increase in labour cost, failure in joints, etc. To overcome the problems stated above new techniques for splicing steel reinforcing bars has come into practice. Present study is focused on investigation of new techniques for splicing steel reinforcing bars. The use and applicability of reinforcement couplers as an alternative to lap splices would overcome reinforcement congestion problem and increase strength of structure.

M. K. Hurd says in this paper there a comparison between the mostly used Lap Splicing and the new technology of Mechanical Splicing. Lapping of reinforcing bars has long been considered an effective, economical splicing method, but today's more demanding concrete designs are forcing builders to consider alternatives. The standard hooks required at the ends of reinforcing bars often produce steel congestion, making concrete placement difficult. In addition, space limitations may prevent the use of larger rebar because there simply isn't enough room for the long hook extensions and large bend diameters that codes require for these bars. One alternative to lapping is to splice bars by butting and welding, following Welding Society procedures. Welding is generally more expensive and is reliable only when weldability of the rebar is ensured by supplementary specifications for the chemistry of the rebar steel. Bars also can be butt-spliced by a variety of mechanical connections. Most of these connections are proprietary and consist of a sleeve to align the bars and hold them in position. For tension connections and some compression connections, the sleeve transfers the tension or compression.

Swami P. S. gives idea of mechanical splicing. The coupler splices are more reliable than lap splices because they do not depend on concrete for load transfer. Superior cyclic performance and greater structural integrity during manmade, seismic or other natural events are other advantages of mechanical butt splices. Mechanical splicing does away with the tedious calculations needed to determine proper lap lengths, and their potential errors. Because mechanical splices do not overlap, less rebar is used, reducing materials costs.

Aminul Islam Laskar tells us about a mix design procedure for high-performance concrete mixes has been presented in this paper. Since rheological parameters and compressive strength are fundamental properties of concrete in two different stages of production, the correlation between rheological parameters and compressive strength has been used instead of using water-cement ratio versus compressive strength relationship. Water-cement ratio and aggregate volume to paste volume ratio has also been determined from rheological behavior and used in the mix design. In the proposed method, the designer is able to estimate rheological parameters like yield stress and plastic viscosity at the design stage for a given target strength, in addition to ingredients of concrete.

Jerry M. Spiker in this paper gives idea about reinforcement used in concrete flexural members to resist flexural tension or to increase the flexural compression capacity of the member. The American Concrete Institute's Building Code Requirements for Structural Concrete (ACI 318-08) requires the calculated tension or compression in reinforcement at each section to be developed on either side of that section. The reinforcement may be developed by embedment length, hooks, mechanical anchorage devices, headed deformed reinforcement, or a combination of these methods.

David Zhao proposes revisions to the acceptance criteria for mechanical connector systems for steel reinforcing bars is described precisely. Also describes the ICC evaluation service, LLC, rules of procedure for the evaluation committee of which serves the purpose of the Evaluation Committee is to monitor the work of ICC-ES, in issuing evaluation reports; to evaluate and approve acceptance criteria on which evaluation reports may be based; and to sponsor related changes in the applicable codes. And has a section of Proposed revision to the acceptance criteria for mechanical connector splice system for steel reinforcing bars.

III.OBJECTIVES OF PROPOSED WORK

1. To study the new trend of splicing in construction industry and detail study of mechanical splicing.
2. To do a case study of different sites wherein the mechanical couplers are in use.
3. To study the use of mechanical splicing over lap splicing for RC beam with design.
4. To test RC beams under fixed loading condition of different splicing methods.

5. To compare the results of mechanical splicing and lap splicing.

IV.SCOPE OF THE PROJECT WORK

1. Mechanical coupler, a relatively new system, has proved to be technically superior to conventional techniques.
2. Increases the pace of execution of project.
3. Mechanical coupler is effective and economical than traditional lap splicing.

V. STUDY AND METHODOLOGY

The study is divided in different part such as Structural analysis, material and comparison between coupler and lap splicing.

1. Structural analysis

Lapping length and design of were determined from IS 456-2000

Tensile Strength- The tensile strength of the mechanical splice should not be less than 690 N/mm2.[3]

Percentage Elongation - The minimum percentage elongation at maximum force should be minimum 3% before the failure of test piece[3].

2. Material

Concrete	M45
Steel	Fe500
Bar	20mm
Coupler	20mm

3. Specification

Size of beam	
1. Length	1000mm
2. Width	200mm
3. Depth	200mm
Length of lap	36D

VI.RESULT

Observation and calculation

1)Beams with single bar with splicing

Sr no.	Type	Reading 1 Loading(kN)	Reading 2 Loading(kN)
1	Lapping	73	72.32
2	Mechanical splicing	88	64.33

2) Reinforced beams with splicing

Sr no.	Type	Loading(kN)
1	Lapping	132
2	Mechanical splicing	194

3)Tension test (On coupler)

Sr no.	Diameter of Bar (mm)	Ultimate Load (KN)	Ultimate Tensile (Stress N/mm^2)
1	20	220.350	701.75
2	20	221.400	705.10
3	20	221.700	706.05

Discussion

Size of beam-1000*200*200

No. of beams-6(3 beams having coupler & 3 having lap)

Coupler size -20mm having same diameter.

Length of lap-720mm

Sr no. 1,2,3 broken at threading.

Area of specimen is 314.00 mm2.

VII.CONCLUSION

Flexural test carried on beams shows that ultimate load taken by beams having coupler is greater than beams having lap splicing .Hence results were satisfactory.

Tension test performed on bars shows that ultimate tensile stress is above 690 N/mm2

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