

# ALLOY STEEL REINFORCED COLUMN

**K.S.PRIYADHARSHINI, D.SUBHAPRIYA,  
P.SHARMILA,P.SWATHI,**

Department of civil engineering,  
Sri Sairam engineering college,  
West Tambaram,  
Chennai -44 .

*Guided by*

**Ms.M.SIVARANJANI,**  
Assistant Professor,  
Department of civil engineering,  
Sri Sairam engineering college,  
West Tambaram,  
Chennai-44.

**Abstract** - In this project we introduced conducted experiments to determine the basic characteristics of alloy steel reinforcement on the example of the same diameter, but with a different number of rovings. We have established strength along M25 grade concrete the reinforcing AISI 4340 alloy steel and the corresponding class of the steel reinforcement. Reinforcing steel in highly exposed parts of concrete structures such as bridge decks, edge beams and parking house slabs could be exchanged with alternative reinforcement approaches with economical, practical and sustainability benefits. Alternative reinforcement methods could be combined with conventional where each method is used where best fit. And the comparison was made between Fe415 and AISI 4340 alloy steel reinforced concrete square column.

**Keywords** - Fe415 steel, AISI 4340 alloy steel, M25 grade concrete, square column.

## I. INTRODUCTION

The effective use of materials in infrastructure systems, especially for corrosion deterioration, must be based on the fundamental understanding of electrochemical thermodynamics and reaction kinetics. The usages of composite reinforcement can significantly reduce the weight of structures, increase to aggressive environments, expand architectural features, and reduce labor costs. Premature deterioration of concrete buildings and obsevere challenge, both technically and economically.

## II. PROPERTIES OF ALLOY STEEL

- **AISI 4340 steel** is a medium carbon, low alloy steel known for its toughness and strength in relatively large sections.
- The 4340 steel has good shock and impact resistance as well as wear and abrasion resistance in the hardened condition.

### **Reinforcement material properties:**

In all situations price is an important factor that must be considered. Nevertheless some generally required properties are stated here.

- High strength and modulus of elasticity
- Similar thermal expansion as concrete
- High corrosion resistance
- Low weight
- Durable
- Homogeneity
- Simple to design
- Simple to work with on site
- Insensitive during transport and execution
- Chemically inert
- Cheap
- Available
- Low energy manufacture and transport
- From a renewable or abundant source

**III. OBJECTIVES OF THE PROJECT**

- To use the alloy steel in square column
- To determine the strength properties of column with alloy steel reinforcements.
- To analyze the thermal properties and the bonding strength with the concrete.
- To increase the durability and service life of concrete structures exposed to corrosive environments

**IV. METHODOLOGY**

To achieve the objective of the study the following methodology has been adopted in this project.

IDENTIFICATION OF ADDITIVE FOR CONCRETE



COLLECTION OF ADDITIVE SAMPLE



MIX DESIGN



CASTING AND CURING



TESTING OF MOULD



ANALYSIS OF TEST RESULT



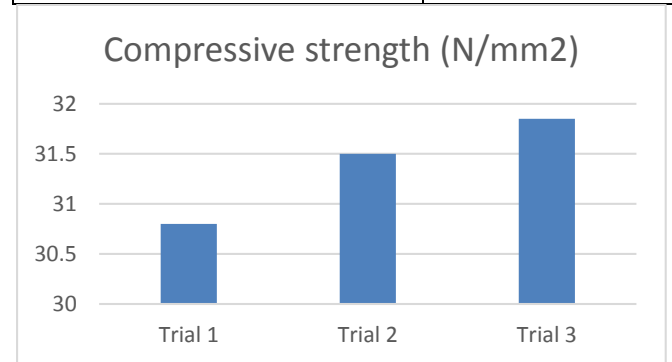
RESULT AND CONCLUSION

**V. COMPRESSION STRENGTH TEST**

The specimen is tested by compression test machine after 7 days, 14 days and 28 days curing. Load should be applied gradually at the rate of 140kg/cm<sup>2</sup> per minute till specimens fails.

**Compressive strength (28 days test results)**

Replacement Details	Compressive strength (N/mm <sup>2</sup> )
Trial 1	30.8
Trial 2	31.5
Trial 3	31.85

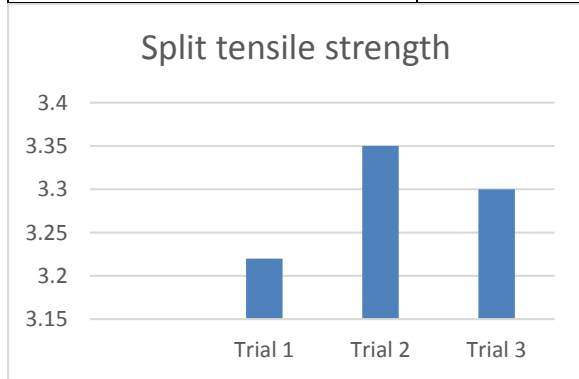


**VI. SPLIT TENSILE STRENGTH**

The tensile strength of concrete is one of the basic and important properties. Splitting tensile strength test on concrete cylinder is a method to determine the tensile strength of concrete.

**Split tensile strength (28 days test results)**

Replacement Details	Split tensile strength
Trial 1	3.22
Trial 2	3.35
Trial 3	3.3

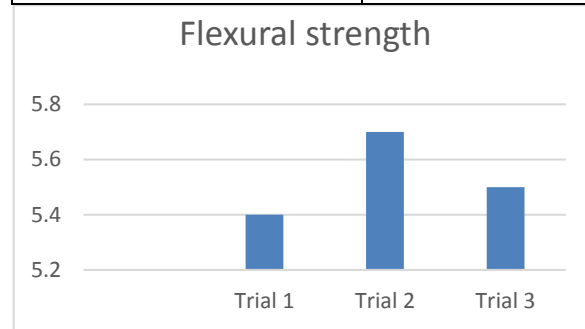


**VII. FLEXURAL TEST**

Flexural strength is one measure of the tensile strength of concrete. It is a measure of an unreinforced concrete beam or slab to resist failure in bending.

**Flexural strength (28 days test results)**

Replacement Details	Flexural strength
Trial 1	5.4
Trial 2	5.2
Trial 3	5.5



**VIII. TESTING AND RESULTS**

**Column with alloy steel reinforcements Test Results**

Test specimen	Ultimate load (kN)	Displacement at ultimate load (mm)		Axial displacement (mm)		
		Axial	Lateral	At yield	At 85% ultimate load	Maximum
Trial 1	2,076	4.45	2.25	3.11	5.07	9.90
Trial 2	2,296	4.76	2.44	3.19	8.30	15.94
Trial 3	2,269	4.48	2.11	3.18	11.17	14.95

**IX. CONCLUSION**

1. Alloy steel reinforcement column had a more significant effect on the maximum load of eccentrically loaded columns compared to concentrically loaded columns.
2. Minor significant increase in maximum load was obtained when the columns were with alloy steel.

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