

Recron 3 S Improving Floorings and Foundations

Rajiv Gauri

Fibre Reinforced Concrete is next generation technology being used by Construction Industry to upgrade performance of Concrete. Concrete is an excellent material for construction as it can be casted in shape desired and gives strength and durability superior to any other known material. Plus the advantage is that base of Concrete is natural materials which are cheap and makes it more affordable.

Concrete when casted has tendency to assume similar properties of rock as rock is the best defined material which is durable and has limited cracks and pores. Concrete commonly used lacks in following characteristics:

- Crack Prone Due to Plastic, Drying and Temperature Variations
- Brittle
- Long Term durability
- Lacks Ductility
- Heterogeneous Mix Leading to Bleeding & Segregation
- Inadequate Abrasion Resistance
- Inadequate Impact resistance

It is therefore desired to have concrete with betterment on above all deficiencies.

INTRODUCTION

FRC-Concrete with Secondary Reinforced helps in mitigating above deficiencies and improves overall strength properties which results into improved durability. FRC further improves the resistance against Early Age Cracking in Concrete due to Plastic and Drying Shrinkage Stresses.

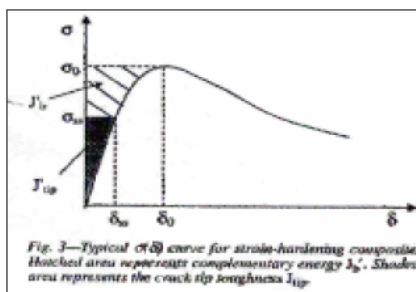


Fig 1.

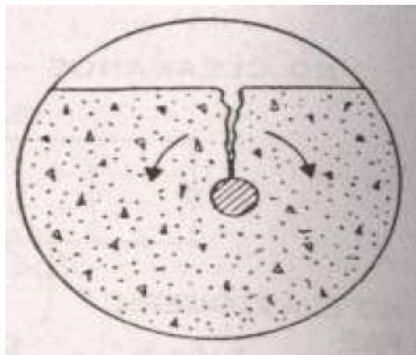


Fig 2.

Secondary Reinforcement with micro Fibres help in reducing shrinkage

* Reliance Industries Ltd., Reliance Centre,
Ballard Estate, West
19, Walchand Hirachand Marg, Mumbai-400 038

stresses which is result of stresses induced due to Heat of Hydration in cement wherein Silicates present in cement react with water to give heat by exothermic reaction as shown in following figure:

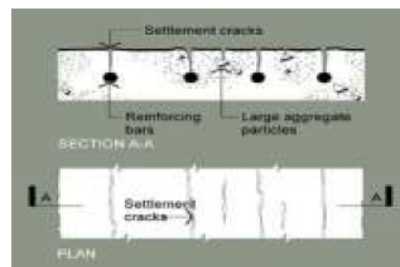


Fig 3.



Fig 21. Restraint to drying shrinkage is the most common cause of concrete cracking. (A5271)

Fig 4.

Recron 3 S-Wonder Fibre promoted by Reliance Industries Limited is being widely used in construction for various applications. It makes concrete improve the following properties:

- First Crack Strength
- Crack propagation Mitigation.
- More Homogeneous Mix.

- Reduction in Permeability.
- Improved Abrasion resistance
- Improved Shatter Resistance
- Improved Flexural Fatigue Fracture Energy
- Improved Post Peak Ductility or Energy Absorption Capability.
- Improved Fatigue and Creep Resistance.

Recron 3 S can be used in Concrete and Mortar Applications widely as the first and foremost aspect is reduction in shrinkage stresses which leads to reduction in micro cracks. Micro Cracks determine Long Term durability of Concrete.

Investigation/Experiment Done

Recron 3 s was tested by leading laboratories India to simulate on field results on concrete the investigation was done with Control Samples ie without Recron 3 S and compared with Concrete with Recron 3 S. the comprehensive test Report has been obtained for various properties like:

- Compressive Strength
- Flexural Strength
- Abrasion resistance
- Water Permeability
- Drying Shrinkage

Have been carried out. These properties are crucial for Durability of Concrete. With this it is proved that Secondary

Reinforcement of Micro matrix of Concrete is as important as macro Strength Properties.

These results are seen on 28 days strength as the necessary concrete samples are cured for 28 days within which cement gains approximately 60% of ultimate strength during the lifetime of the building or construction. the test can also be done in accelerated conditions for durability for various type of abuse that a construction is subjected to.

Results

Consolidated results as achieved in various investigation/experiments are tabulated as given below:

S.No.	Institution	Type of Test	Control(W/o R3S)	With 0.25 % R3 S	Gains
1	CRRI, Delhi	Compressive Strength	496 Kg/cm ²	562 Kg/cm ²	12.5 %
2	CRRI, Delhi	Drying Shrinkage	0.062%	0.030%	52 %
3	CRRI, Delhi	Abrasion Loss	0.20 %	0.15 %	25 %
4	CRRI, Delhi	Flexural Strength	46 Kg/cm ²	50 Kg/cm ²	8.7 %
5	IIT, Delhi	Drying Shrinkage	0.042 %	0.030 %	28 %
6	IIT, Delhi	Co-efficient Permeability Under Stress	155 %	96 %	60 %
7	GERI	Percolation of water in 5 minutes	37 ml	8 ml	78.4 %

Secondary Reinforcement in Floorings & Foundations-Back Bone of Industrial Building

SLAB ON GRADE
TYPICAL SLAB ON GRADE STRESS ANALYSIS

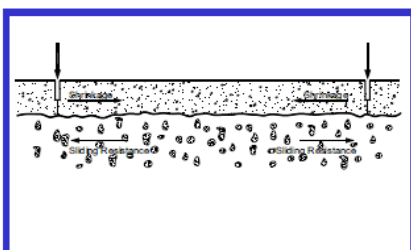


Fig 5(Sliding Resistance vs. Shrinkage Stresses)

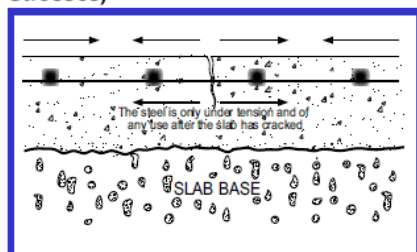


Fig 6. (Flooring with WWF)

Recron 3 S usage helps in having controlled cracking due to energy absorption characteristic. By use of Recron 3 S the crack width in early stage can be reduced to 60 microns as against 200 microns that is observed in normal concrete. These cracks play very important role in durability as:

- Water Permeability is 3rd Power of Crack Width.
- Chloride Permeability scales exponentially with Crack Width.
- Abrasion Resistance decreases with increase in Crack Width.

Also as is evident from above Fig 5. In Slab on Grade the Sliding Resistance of Sub Grade is in opposite direction to Plastic Restrained Shrinkage. These

forces in opposite direction impart unbalance load on concrete which results into stresses leading to cracks.

Conventional use of Steel wire mesh as shown in Fig. 6. is inadequate as the mesh works in two dimensions and is not able to impart crack resistance to concrete.

Recron 3 S usage helps in containing and improving following properties:

1. First Crack Strength is enhanced by 30%.
2. Crack Propagation is reduced.
3. Above properties help to reduce permeability by 40 %
4. Abrasion resistance is improved by 25-40 %.
5. Impact Strength is improved by 100%
6. Flexural Fatigue Failure Load is improved by 15-20 %.

The above data is corroborated by

Studies done at IIT, Chennai and Central Road Research Institute, New Delhi.

Recron 3 S has been used in Slab on Grade Application in various Industrial and Commercial Floorings All Over India.

FOUNDATIONS

Foundations as the name suggests is the basic load bearing Concrete in any Structure or even in Machine Foundations. Foundations are influenced by following loads :

- Static Load
- Vibrational Load
- Fatigue and Creep Loading.

Other than the loads Foundations are generally in contact with sub soil and need protection against permeability for outer cover as water seeping in can play havoc with durability of Structure as also will induce Crack Propagation further in concrete. This can adversely affect Load Carrying Capacities for Static and other loads.

Recron 3 S helps in following characteristics of Concrete in Foundations:

- Reduced Shrinkage Stresses.
- Reduced Permeability of Concrete.
- Improved Creep and Fatigue Resistance.
- Improved Resistance to Vibrational Loads.
- Improved Resistance to Impact and Shatter Resistance.
- Improved Post Peak Ductility.

The basic cement used in Foundations needs to have Non Shrink Capabilities and by use of Recron 3 S the concrete has better resistance to shrinkage characteristics.

Conclusions

Other than applications listed above other prominent applications in Industrial Civil Constructions are following :

- Effluent Treatment Plants.
- Water Storage Tanks
- Concrete Roads within Premises.
- Mortars and Plasters.
- RCC Slabs.

- Columns and Beams.

Recron 3 S is widely used Fibre in construction with 7 State PWD's approving the product in addition to Leading national Bodies which have approved/used Recron 3 S in various applications:

1. Military Engineering Services
2. DG Married Accommodation Project

3. Airport Authority of India-Domestic & International
4. Defense Airfields
5. CPWD
6. BMTPC

Recron 3 S is now changing the face of construction State of art Manufacturing Facility at IPCL Hoshiarpur.

References

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