

PERFORMANCE OF MASONRY PREPARED WITH NATURAL RUBBER LATEX AND NATURAL RESINS IN MORTAR AND CONCRETE BLOCK

Project Reference No.: 45S_BE_3884

College : Coorg Institute of Technology, Kodagu
Branch : Department of Civil Engineering
Guide(s) : Prof. Pramukh Ganapathy C
Student(S) : Mr. Karthik K N
 Mr. Deekshith B L
 Ms. Yashaswini A S

Key words:

Natural rubber latex (NRL), Natural resin.

Introduction:

Natural rubber latex and Synthetic rubber latex provides enhancement in mechanical properties of concrete in a long run. It substantially increases the compressive strengths, Flexural strengths with a normal concrete.

Objectives:

1. To improvise the mechanical properties of concrete masonry block, cement mortar and masonry as whole by utilizing the Natural rubber latex & natural resin in concrete block and cement mortar.
2. To assess the feasibility and to make comparative study of concrete block and mortar prepared with natural rubber latex & natural resin in context of microstructure and mechanical performance.

Methodology:

Natural Rubber Latex

1. Collection of natural rubber latex with 0.2% ammonium sulphate from the rubber plantation.
2. Characterization of materials.
3. Preparation of mix design for M20 grade of concrete using IS 10262.
4. Casting of M20 grade conventional concrete block.
5. Casting of M20 grade of concrete blocks with varying proportion of natural rubber latex by weight of cement in the proportion 0.2%, 0.4%, 0.6% 0.8% and 1%.
6. Testing for compressive strength of concrete block for 7, 14 and 28days of curing to

determine the optimum dosage of natural rubber latex.

7. Preparation of 1:3 cement mortar cube.
8. Casting of 1:3 cement mortar cube by adding the optimum percentage of natural rubber latex by weight of cement obtained from the compressive strength test of concrete block.
9. The stack bonded masonry triplet is constructed with 1:3 cement – rubber mortar and concrete block having optimum dosage of natural rubber latex and with 1:3 conventional mortar and conventional concrete block.
10. The masonry triplet will be tested for compression bond strength and shear bond strength.
11. SEM analysis will be done on the concrete block with optimum dosage.

Natural Resin:

1. Collection of natural resin from silver oak tree plantation.
2. Casting of M20 grade of concrete blocks with varying proportion of natural resin by weight of cement in the proportion 0%, 1%, 2% and 3%.
3. Testing for compressive strength of concrete block for 7, 14 and 28days of curing to determine the optimum dosage of natural resin.
4. Casting of 1:3 cement mortar cube by adding the optimum percentage of natural resin by weight of cement obtained from the compressive strength test of concrete block.
5. The stack bonded masonry triplet is constructed with 1:3 cement – resin mortar and concrete block having optimum dosage of natural resin.
6. The masonry triplet will be tested for compression bond strength and shear bond strength.
7. SEM analysis will be done on the concrete block with optimum dosage.

Results And Conclusion:

This chapter represents the compressive strength and shear strength results of concrete blocks and mortar cubes at different percentages of natural rubber latex and natural resin used.

From the experimental work carried out the following conclusions were drawn with respect to the determination of optimum dosage natural rubber latex and synthetic rubber latex.

1. Compaction factor: Workability of the concrete mixes decreases with increase in the percentage of natural rubber latex.
2. The compressive strength for 0, 0.2, 0.4, 0.6, 0.8 and 1.0% of natural rubber latex in concrete blocks observed are tabulated as below:

Table 1: Compressive Strength Results Of Concrete Block With Natural Rubber Latex

% of NRL	Compressive strength in MPa			% of ammonium Sulphate
	7 days	14 days	28days	
0	21.3	29.07	32.50	0
0.2	26.5	31.23	36.02	0.2
0.4	28.5	33.8	38.7	0.3
0.6	32.3	36.5	42.01	0.4
0.8	18.5	23.77	28.32	0.6
1	14	20.44	22.09	0.7

From the results obtained we can conclude that Natural rubber latex gives maximum compressive strength in concrete block at a dosage of 0.6% and then after decreases with increasing rubber latex content.

1. The compressive strength of concrete blocks with 0, 1, 2 and 3% of natural resin are tabulated as below:

Table 2: Compressive Strength Results Of Concrete Block With Natural Resin

% of natural resin	Compressive strength in MPa		
	7 days	14 days	28 days
0	21.3	29.07	32.50
1	27.69	38.37	42.23
2	19.17	26.12	29.3
3	15.97	21.81	24.4

2. From the results we can conclude that Natural resin gives maximum compressive strength in concrete block at a dosage of 1.0% and then after decreases with increasing resin content.

90% of floatability obtained for optimum dosage of natural rubber latex and natural resin and their compressive strength test results are tabulated as shown below:

Table 3: Comparison Of Compressive Strength Between Conventional Mortar And Natural Rubber Latex Mortar Block

Type of mortar	% of natural rubber latex	w/c ratio	% of Ammonium Sulphate	Compressive strength in MPa		
				7 days	14 days	28 days
Conventional	0	0.75	–	13.24	19.55	22.59
NRL	0.6	0.75	0.5	18.12	26.81	29.50

Table 4: Comparison Of Compressive Strength Between Conventional Mortar And Natural Resin Mortar Block

Types of mortar	% of natural resin	w/c ratio	Compressive strength in MPa		
			7days	14 days	28 days
Conventional	0	0.75	13.24	19.55	22.59
Natural resin	1	0.75	9.93	14.66	16.94

TEST ON MASONRY PRISM:

3. Compressive Bond Strength of Masonry Prism

The compressive strength of the masonry prism was studied to understand the influence of natural rubber latex and natural resin in concrete block and mortar.

Table 5: Compressive Bond Strength Of Mortar Prism

Masonry Prism	Compressive strength in MPa
Normal Concrete block + Normal mortar	21.125
Concrete block with 0.6% NRL + 1:3 cement mortar with 0.6% NRL	27.306

4. Shear Bond strength of Masonry Prism

The bond between the concrete blocks and mortar is said to have great impaction on the strength of masonry. Hence, stack bonded masonry prism is enhanced in this study for every masonry triplet using natural rubber latex and Natural Resin.

Table 6: Shear Bond Strength Of Mortar Prism

Masonry Prism	Shear Bond Strength in MPa
Normal Concrete block + Normal mortar	0.40
Concrete block with 0.6% NRL + 1:3 cement mortar with 0.6% NRL	0.424 & 0.525

Scope for future work:

1. Study of masonry prepared with concrete blocks and cement mortar prepared with synthetic rubber latex
2. Study of masonry prepared with concrete blocks and cement mortar prepared with

rubber latex and fibers

3. Study of masonry prepared with concrete blocks and cement mortar prepared with other natural resins