

The Study of Nylon Reinforced Cement Sheet with Conventional Asbestos Sheet

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DOI: <http://doi.org/10.5281/zenodo.256095>

Abstract

This paper investigated the comparative study of Nylon Reinforced Cement Sheet with Conventional asbestos Sheet. Nylon has many unique properties that it makes suitable for combination with cement mortar. Nylon material is chemically inert and stable in alkaline environment of mortar, with a high melting point and low cost. In this, nylon reinforced cement sheets are casted and different tests are performed on it and results are compared with conventional asbestos sheets.

Keywords: *Nylon Net, Construction procedure of NRC, Nylon Reinforced Cement Sheet*

INTRODUCTION

Asbestos cement sheets and galvanized iron sheets in corrugated forms are being extensively used for roofing in housing, industrial sheds, godowns and other structures. The material 'asbestos' is used for the manufacturing of sheets and it is hazardous to human health. It causes diseases like asbestosis and lung cancer to the people who are working for the manufacturing of the sheets. Due to this

reason it has been banned in many countries such as USA, France, Russia, Canada, etc. In India also, asbestos sheets are banned but due to economy most of our citizens prefer it taking risk of health so, we thought of given our people a better alternative within their limits. Galvanized iron sheets are costly and require continuous maintenance. The main problem of G.I sheets is the corrosion. During summers area under these roofs

become very hot and unbearable. Repairing of these sheets is also very difficult as it has a tendency to break easily.

The Asbestos material required for the manufacturing of A.C. sheets is to be imported making it economically unviable. The community as a whole is indirectly affected as the same water may be used for drinking purpose, which falls on the asbestos sheets. Looking at the above disadvantages of the galvanized and asbestos sheets and reviewing the present scenario it is necessary to develop a better alternative. Nylon cement corrugated sheet made from nylon nets and cement mortar has emerged as replacement to asbestos roofing and galvanized roofing.

IDEA BEHIND THE USE OF NYLON NETS

Nylon is a non-decomposable material and has more tensile strength than plastic and fibers. Due to the higher tensile strength of the nylon nets it can be used in various construction applications. Nylon was first used in Puerto Rico for construction by Mr. Bill Bridshall in 1975 for the construction of his little house. When he used this type of nets for the construction of his house, he did not have any technological or research base to support

his cause nor did he further pursue the cause. The thought applied during the use of Nylon nets as a substitute for the iron or chicken mesh and is that it completely eliminates the basic problem of iron mesh that is of rusting and which prevents the concrete from any corrosion and any further deterioration. Nylon nets are generally used for fishing purpose. In fishing, the load of fishes is taken by these nets alone. These nets are also been used for soil stabilization in “Konkan Railways”. It is also been used for prevention of rock falls in mountainous area. It is also been used successfully in many countries for the construction of roads to avoid the cracking and unequal settling of road surface. Nylon is also used as gabions for coastal protection as barriers for preventing water overflow in the areas near the coasts and to prevent the back flow of soil. It is substitute for the asbestos material used in Asbestos cement sheet.

Nylon net features: -

- Stabilized for exposure to Ultraviolet rays hence long lasting.
- Excellent shape retention and strength
- Better abrasion resistance.
- Light weight and floats on water
- Better load bearing capacity at lower elongation.

- Unaffected by acid and alkalis.
- Suitable for hostile marine condition..

Nylon net qualities: -

- Good resistance to chemically active environments
- Low softening temperature (170oc) and melting temperature (215oc).
- Outstanding insulating properties.
- Wide range of colors.

Basic properties of Nylon Net: -

Nylon has many unique properties that make it suitable for combination with cement mortar. Nylon material is chemically inert and stable in alkaline environment of mortar, with a relatively high melting point and low cost. Nylon does not absorb water. Due to isotropic surface, which prevent any chemical adhesion with matrix. The disadvantage of nylon is that it is sensitive for fire and high temperature. It has low modulus of elasticity and bonds poorly with matrix. It has been found by different experiment that by using certain chemical or by mechanical treatment can increase the bond nylon and mortar.

The Typical properties of Nylon with approximate value: -

- Melting point: - 215oc to 230oc
- Moisture absorption: - 4 % to 5 %

- Thermal conductivity: - Low
- Electrical conductivity: -Nil
- Acid and Salt resistance: -Very High.

APPLICATION GUIDELINES:

Do's specify nylon net for: -

- The reduction of mortar cracking as a result of intrinsic stresses.
- A cost-effective alternative to crack control wire mesh.
- Greater impact, high abrasion and shatter resistance.
- Support and cohesiveness in mortar on steep inclines or slip formed placements.
- It improves durability.
- Placements where all materials must be non-metallic.
- Nylon is basically Alkali proof, Chemical resistance and Acid resistance.
- It has flexibility and versatility.
- Nylon net provide for surface confinement.

Don't specify nylon net for: -

- Replacement of structural steel reinforcement.
- Higher structural strength development.
- The elimination or reduction in curling or creep.
- The justification for reduction in the size of the support columns.
- Decreasing the thickness of slabs on ground.
- Increasing control joints spacing.
- Fire resistance structures.

CONSTRUCTION PROCEDURE:

1) Proportioning of material: -

Initially we decided the material to be used for casting of sheet, and accordingly we decided the proportion. The sand cement mortar ratio was decided as 1:2 and water cement ratio was also decided as 0.35. Then the size of Nylon was decided according to member size. The nylon of cut size was weighted by weighing equipment; it was 110 gm for 1.5 sq.m

2) Preparation of formwork: -

For casting corrugated sheet, we used Asbestos cement fully corrugated sheet as formwork from both the sides. The water was sprinkled on asbestos sheet to prevent the water absorption from the sheet. The polythene paper was laid on the asbestos

sheet for easy removal of casted sheet and also for providing good finishing.

3) Mixing of material:

All the material which was thoroughly weighed batched was transported by us to mixing area. Sand and cement were dry mixed thoroughly. Then the water was added slowly while mixing the mortar. Mortar mixed with help of shovel.

4) Placing of mortar:

Firstly, we placed Nylon net of 0.75mm dia. on Asbestos sheet, net was placed very loosely on to the sheet so to prevent tensioning of net after placing of concrete. Then we placed the mortar on corrugated sheet with uniform thickness of 8mm. Care was taken that the net under the mortar doesn't come out.

5) Vibration of sheet:

The sheet was kept on table vibrator the polythene paper was laid on mortar and then another sheet was laid on it. Then the vibration started and continued for 1min. Then the sheet at top was removed and thickness was measured with the help of gauge marker and finishing was also checked. The thickness was nearly 8mm. Again, the sheet was laid and vibration was continued for 2min. Again, the sheet

was removed and thickness was checked it was 8mm and was ok.

6) Finishing of casted sheet:

By using table vibrator and polythene paper the smooth finish was obtained on the surface, but the voids were seen at some part of sheet so we finished the voids with the help of trowel. The sheet was cut in size when the mortar was green with the help of trowel.

7) Curing of sheet:

We carried out Curing of sheet after 24 hours of casting the sheet. Spreading gunny bags on the sheets. By these the curing was done with less water and soil remained moist for long time.

TESTS CARRIED ON NYLON REINFORCED SHEETS:

1) Visual inspection test:

Uniformity of texture, Neatness and straightness of the trimmed edges
Squareness of the corners Rectangularity

2) Water absorption test:

From each of the sheets casted in accordance with the sampling, a specimen of 175mm x 175mm was taken. The absorption was calculated is 4.739 %.

3) Test for impermeability:

The specimen has passed the test, because for 24 hours water remained in the vertical transparent tube. Drops of water were not formed at the lower surface of the sheet but only traces of moistures at the lower surface were seen.

4) Acid resistance test:

The result was reported in terms of grams of acetic acid per square meter of area of the specimen & this value was calculated from the fall in concentration, assuming that 1ml of 0.5N sodium hydroxide solution hydroxide solution is equivalent to 0.030g of acetic acid as, Mass in gms of acetic used per m² is 0.145gms/m².

5) Load bearing capacity test:

Immediately prior to test, the specimen was completely immersed in water at 15 to 35 degree centigrade for a period of 24 hours. Each specimen was freely and evenly supported with its smooth side up on parallel rigid hardwood, cast iron or steel bearers 50mm wide and of a length at least as great as the width of the specimen, and set at right angles to the corrugations. The bearers were placed 1m from center to center. The sheet was loaded at the mid span by means of self-aligning rigid flat beam 230 + 5mm wide, parallel to the supports. Strips of felt or soft fiber about

10mm thick were interposed between the test piece and the supports and under the beam by which the load is applied. The load was applied at a rate not greater than 2000N/min.

ADVANTAGES OF NYLON REINFORCED CEMENT SHEETS:

1. Nylon cement sheet is economical than other roofing Substitutes.
2. It is non-hazardous for human health as well as for environment.
3. Material available in local market can be used for manufacturing of sheet.
4. Skilled labours are not required for manufacture of sheet.
5. It gives better strength.
6. No heavy machinery is required for casting sheet.
7. It fulfills the IS requirement.
8. When it obsolete it can be recycled.

9. It creates employment opportunity

CONCLUSION

Nylon nets being used for various applications thus, implemented and experiment uses nylon nets in casting sheets so as to explore the use of nylon nets. The use nylon nets in combination with cement mortar. It was attempted to replace the conventional asbestos cement sheets. Nylon Cement Sheet can replace A.C. Sheets. Nylon Cement Sheets can be locally manufactured on sites and can use for low cost housing, small cattle shades, industrial shades, godowns, storage houses etc.

Recommended spacing of the purlins for placing the sheets is up to 1.4m. Cost of Nylon Sheet is Rs.156.8/- for 1m² and that of the A. C. Sheet is Rs.175/- for 1m².

Table:-1 Load bearing capacity test

No of days	Load carried by sample (in kg)			Average (KG)	Result (N/mm)
	1	2	3		
7 days	44.58	48.54	52.15	48.42	11.34
14days	101.54	90.58	98.25	96.79	22.68
28 days	292.58	312.54	310.21	305.11	71.51

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Cite this Article

Megha P. Jadhav & Rushikesh P. Jadhav (2019). **The Study of Nylon Reinforced Cement Sheet with Conventional Asbestos Sheet** Journal of Ceramics and Concrete Technology, 4(1), 14- 20
<http://doi.org/10.5281/zenodo.256095>