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A Report Comprises of the Consequence of Using Salt Water (Sea Water) Over Normal Water in Concrete Casting

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Abstract: In this research work, the effect of saline water on the compressive strength of concrete was investigated. This paper therefore gives a broader view on the result and findings of an experimental research on the effect of salt water on compressive strength of concrete. For this concrete cubes were cast using fresh water and salt water for a design mix of M-30 1:1.7:3.30 by weight of concrete, and 0.45 water- cement ratio. 50% of concrete cubes were cast and cured with fresh water and remaining 50% cubes were cast and cured with salt water. The concrete cubes were cured for 7,14 and 28 days respectively. The result of the average compressive strength of concrete obtained using fresh water ranges from 25.1- 37.3N/mm² and using salt water ranges from 28.40 – 40.34N/mm².

Keywords: concrete cubes, fresh water, salt water, compressive strength.

I. INTRODUCTION

Concrete is major building material used in construction. Concrete is used in large quantities due to its excellent structural performance and durability. Concrete is used for numerous purposes in construction such as construction of buildings, dams, foundations, highways, parking structures, pipes, and poles. Also, the use of concrete offshore drilling platforms and oil storage tanks is already on the increase. Concrete piers, decks, break-water, and retaining walls are widely used in the construction of harbors and docks. Floating offshore platforms made of concrete are also being considered for location of airports, power plants, and waste disposal facilities in order to relieve land from pressures of urban congestion and pollution. It is very tough to find an option for concrete in construction, which is durable and economic.

the durability of concrete is generally regarded as its ability to resist the effects and influences of the environment, while performing its desired function. concrete is a composite material composed mainly of water, aggregate, and cement. water is an important ingredient of concrete as it actively participates in chemical reaction with cement. proper curing of concrete structures is important to meet performance and durability requirements. in conventional curing this is achieved by external curing applied after mixing, placing and finishing.

II. LITERATURE SURVEY

- 1) *D Wijaya, R A Kusumadewi, A Wijayanti, R Hadisoebroto 2021:* This study tested multilevel distillation to desalinate artificial water, found that Distilled Water Volume can be affected by light intensity, water temperature, and glass temperature. Removal of parameters from desalination process hardness and salinity reaches 100% and Removal for ion Cl electric conductivity, and total dissolved solid about 98% and 99%, removal turbidity between 18.50% until 98.37%. This can be said that high removal.
- 2) *Jie Ren, Hongfang Sun, Kun Cao, Zhili Ren, Bo Zhou, Wenshen Wu, Feng Xing 2021:* A series of experiments were conducted to investigate the effect of seawater on the properties of alkali-activated slag (AAS) binders to seek further potentiality of these binders in marine environments. The experimental results show that on the one hand, seawater may lead to increased setting time, reduced compressive strength after 3 days and a less compact microstructure. On the other hand, however, it could also slightly improve the early age strength, flexural bending strength (after 28 and 56 days) and fractural toughness, and shows almost no impact on the fluidity of AAS binders. Moreover, with the formation of some new hydration products due to seawater mixing, the water absorption and volume of permeable voids had small decreases while the capillary sorptivity obtained a small increase.

3) *Ahmed I. Ghazal, Mohamed Y. El-Sheikh, Ahmed H. Abd El-Rahim 2021:* In this study another beneficial effect of seawater over tap water was concluded. Setting tests of cement paste mixed with seawater was determined using Vicat apparatus and compared to tap water. Compressive strength tests at the age of 28 days of Portland cement concretes with varied quantity of cement i.e. 300, 350, 400, 450, and 500 kg, and mixed with seawater was also performed and compared to tap water. The results show that seawater affects standard consistency of cement paste and two percent increase was required in order to attain the same

III. RESEARCH GAP

- 1) Fresh Water scarcity is increasing day by day.
- 2) Reverse osmosis process is majorly used in desalination industry for desalinating sea water but it is very costly and requires a large framework.
- 3) Most coastal areas like small islands and beach areas are the area that has a scarcity of freshwater.
- 4) Concrete made with desalinated water in not been studied.

IV. OBJECTIVE

To study the following properties of concrete using chemical desalinated water as mixing and curing is being studied:

- 1) Compressive strength of concrete
- 2) Flexure strength of concrete
- 3) Durability of concrete

V. MATERIALS



CEMENT



SEA SAND



RIVER SAND



COARSE AGGREGATE

- 1) Here we have used PPC cement collected from local market.
- 2) Sea sand is collected from chandrabhagha beach near konark.
- 3) River sand is collected from Daya river near Dhauli.
- 4) Coarse aggregate taken from locally available.

| Properties of cement. | |
|-----------------------|------------------------|
| Description | Properties of material |
| Initial Setting Time | 31 min |
| Final Setting Time | 560 min |
| Standard Consistency | 36.50% |
| Specific Gravity | 3.22 |
| Fineness | 3.7% |

| Properties of Fine Aggregate. | | |
|-------------------------------|------------------------|----------|
| Description | Properties of material | |
| | River-Sand | Sea Sand |
| Specific Gravity (Gs) | 2.62 | 2.73 |
| Fineness Modulus | 4.1 | 3.6 |
| Sieve Analysis | Zone I | Zone I |

VI. RESULT & DISCUSSION

Table Compressive Strength of cube cast with normal water

| Cube no. | Wt. of cube(kg) | C/S Area of Cube(mm ²) | Age | Failure Load(N) | Compressive Strength(Mpa) |
|---------------------------------------|-----------------|------------------------------------|-----|-----------------|---------------------------|
| 1 | 7.82 | 150*150 | 28 | 665200 | 29.6 |
| 2 | 8.113 | 150*150 | 28 | 704200 | 31.2 |
| 3 | 7.98 | 150*150 | 28 | 564500 | 25 |
| 4 | 8.204 | 150*150 | 28 | 665400 | 29.5 |
| 5 | 8.117 | 150*150 | 28 | 601000 | 26.7 |
| Avg. Compressive Strength(Mpa) | | | | | 28.4 |

The average compressive strength is 28.4MPa. In this compressive test casting was done with normal water and curing also with normal water.

Table Flexure Strength of cube cast with normal water

| Prism no. | Wt. of Prism(kg) | C/S Area of Prism(mm ²) | Age | Failure Load(N) | Flexral Strength(Mpa) |
|------------------------------------|------------------|-------------------------------------|-----|-----------------|-----------------------|
| 1 | 11.68 | 100*100*500 | 28 | 11680 | 4.67 |
| 2 | 11.73 | 100*100*500 | 28 | 11730 | 4.69 |
| 3 | 13.33 | 100*100*500 | 28 | 13330 | 5.33 |
| Avg. Flexural Strength(Mpa) | | | | | 4.897 |

The average flexure strength is 4.897MPa. In this compressive test casting was done with normal water and curing also with normal water.

5.2 Concrete cast and cured with saline water

Table Compressive Strength of cube cast with Saline water

| Cube no. | Wt. of cube(kg) | C/S Area of Cube(mm ²) | Age | Failure Load(N) | Compressive Strength(Mpa) |
|---------------------------------------|-----------------|------------------------------------|-----|-----------------|---------------------------|
| 1 | 8.168 | 152*152 | 28 | 689300 | 29.83 |
| 2 | 8.216 | 152*152 | 28 | 771200 | 33.37 |
| 3 | 8.317 | 152*152 | 28 | 854200 | 36.97 |
| 4 | 8.244 | 152*152 | 28 | 807400 | 34.94 |
| 5 | 8.367 | 152*152 | 28 | 608000 | 22.9 |
| Avg. Compressive Strength(Mpa) | | | | | 31.6 |

The average compressive strength is 31.6 MPa. In this compressive test casting was done with saline water and curing also with saline water.

Table Flexure Strength of cube cast with saline water

| Prism no. | Wt. of Prism(kg) | C/S Area of Prism(mm ²) | Age | Failure Load(N) | Flexral Strength(Mpa) |
|------------------------------------|------------------|-------------------------------------|-----|-----------------|-----------------------|
| 1 | 12.206 | 100*100*500 | 28 | 15210 | 6.09 |
| 2 | 12.101 | 100*100*500 | 28 | 13000 | 5.20 |
| 3 | 12.231 | 100*100*500 | 28 | 13980 | 5.59 |
| Avg. Flexural Strength(Mpa) | | | | | 5.62 |

The average flexure strength is 5.62 MPa. In this compressive test casting was done with saline water and curing with saline water.

5.3 Concrete cast with desalinated water and cured with normal water

Table Compressive Strength of cube cast with desalinated water

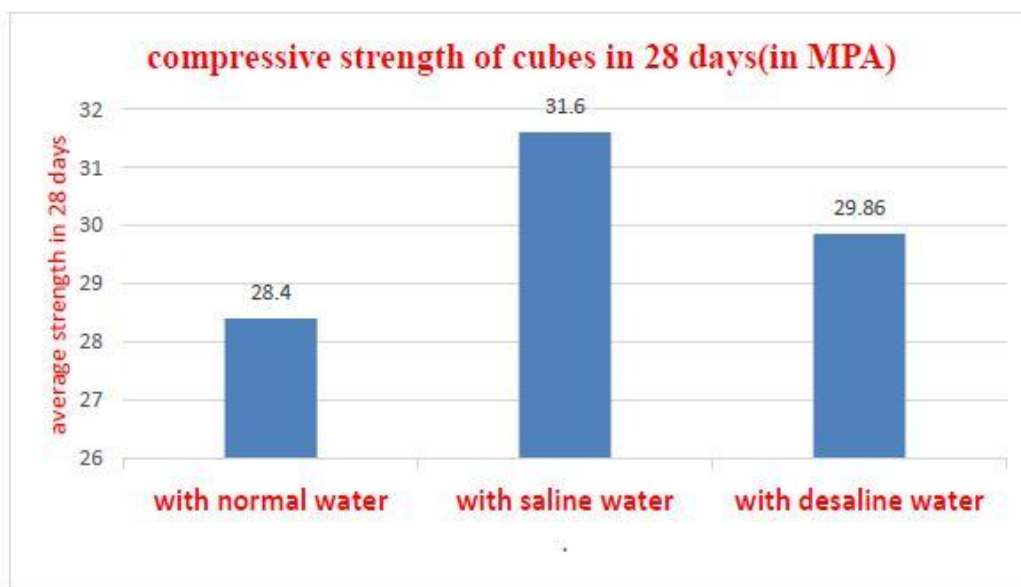
| Cube no. | Wt. of cube(kg) | C/S Area of Cube(mm ²) | Age | Failure Load(N) | Compressive Strength(Mpa) |
|---------------------------------------|-----------------|------------------------------------|-----|-----------------|---------------------------|
| 1 | 8.197 | 150*150 | 28 | 651400 | 28.9 |
| 2 | 8.287 | 150*150 | 28 | 701600 | 31.1 |
| 3 | 8.184 | 150*150 | 28 | 602300 | 26.7 |
| 4 | 8.329 | 150*150 | 28 | 686800 | 30.5 |
| 5 | 8.231 | 150*150 | 28 | 722400 | 32.1 |
| Avg. Compressive Strength(Mpa) | | | | | 29.86 |

The average compressive strength is 29.86 MPa. In this compressive test casting was done with desalinated water and curing also with normal water.

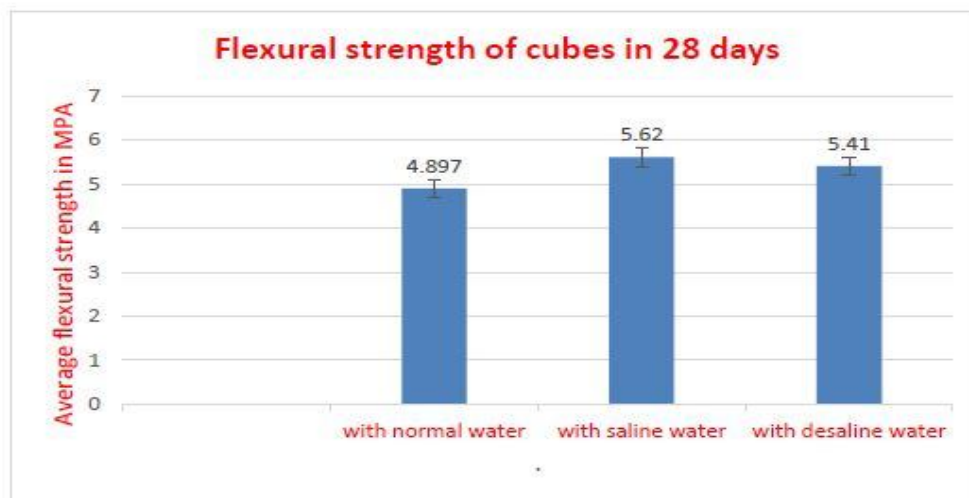
Table Flexure Strength of cube cast with desalinated water

| Prism no. | Wt. of Prism(kg) | C/S Area of Prism(mm ²) | Age | Failure Load(N) | Flexral Strength(Mpa) |
|------------------------------------|------------------|-------------------------------------|-----|-----------------|-----------------------|
| 1 | 12.193 | 100*100*500 | 28 | 16410 | 5.05 |
| 2 | 12.232 | 100*100*500 | 28 | 13380 | 6.01 |
| 3 | 12.315 | 100*100*500 | 28 | 13010 | 5.17 |
| Avg. Flexural Strength(Mpa) | | | | | 5.41 |

The average flexure strength is 5.41 MPa. In this compressive test casting was done with saline water and curing with saline water.



Graph showing the comparison between compressive strength of concrete with different waters



Graph showing the comparison between flexural strength of concrete with different waters

VII. CONCLUSION

On the basis of the results drawn from the comparative analysis of normal water concrete, salinated concrete and desalinated concrete, some important conclusions can be drawn which can prove helpful in establishing research. . A few of the important points are mentioned below:-

- 1) The average compressive strength of cubes and flexure strength of prism casted with saline water and cured with saline water is 31.6 MPa and 5.62 MPa
- 2) The average compressive strength of cubes and flexure strength of prism casted with desalinated water and cured with desalinated water is 29.86 MPa and 5.41MPa
- 3) 28-day compressive strength of saline water is greater than the 28-day compressive strength of desalinated water.
- 4) Flexural strength of saline water at 28 day is greater than the flexural strength of desalinated water at 28 day.

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