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Strength Modifier of M30 and M40Concrete Partial Replacements with Rock Dust as Fine Aggregate

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Abstract *The Quarry Rock Dust Can Be An Economic Alternative To The River Sand. Quarry Rock Dust Can Be Defined As Residue, Tailing Or Other Non-Voluble Waste Material After The Extraction And Processing Of Rocks To Form Fine Particles Less Than 4.75mm.Usually,Quarry Rock Dust Is Used In Large Scale In The High Ways As A Surface Finishing Material And Also Used For Manufacturing Of Hollow Blocks And Light Weight Concrete Prefabricated Elements.This Project Presents The Feasibility Of The Usage Of Quarry Rock Dust As Hundred Percent Substitutes For Natural Sand In Concrete. Design Mix For M30 And M40 Has Been Calculated Using Is 10262-2009 For Both Conventional Concrete And Quarry Dust Concrete. Tests Were Conducted On Cubes, Cylinders And Beams To Study The Strength Of Concrete By Using Quarry Rock Dust And The Results Were Compared With The Natural Sand Concrete.Cement Motor Ratios Of 1:3 And 1:6 Are Prepared And Observe The Percentage Of Water Absorption In Both Quarry Rock Dust And Natural Sand For Plastering.*

Key Words: *Compressive Strength, Flexural Strength, Split Tensile Strength*.

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I. Introduction

Concrete Is An Artificial Mixture Of Portland Cement, Water, Fine And Coarse Aggregates. The Mixture Of The Materials Results In A Chemical Reaction Called Hydration And A Change In The Mixture From Plastic To A Solid State Occurs Over A Period Of Time. The Cost Of Concrete Can Be Reduced By Reducing Cost Alternative Material, Instead Of Conventional Materials.

To Overcome The Stress And Demand For River Fine Aggregate, Research And Practitioners In The Construction Industries Have Identified Some A lternative Materials Such As Fly Ash, Slag, Limestone Powder And Siliceous Stone Powder. In India Attempts Have Been Made To Replace River Sand WithQuarry Dust.

The Successful Utilization Of Quarry Dust As Fine Aggregate Would Turn This Was Material That Causes Disposal Problem In To A Valuable Resource.The Utilization Will Also Reduce The Strain On Supply Of Natural Fine Aggregate, Which Will Also Reduce The Cost Of Concrete.

II. Materils Used

3.1 Cement: Cement Is A Binder, A Substance That Sets And Hardens Independently, And Can Bind Other Materials Together. The Most Common Use For Portland Cement Is In The Production Of Concrete.

Physical Properties Of Cement (Opc 53 Grade) (Is 8112-1989)

1. Specific Gravity – 3.12
2. Fineness Of Cement – 2.5
3. Standard Consistency – 31%
4. Initial And Final Setting Time Of Cement – 140min And 260 Min
5. Compressive Strength – 3 Days -27 Mpa, 7days – 37 Mpa, 28days – 53 Mpa

3.2 Aggregates: Aggregates Are The Important Constituents In Concrete. They Give Body To The Concrete, Reduce Shrinkage And Effect Economy. One Of The Most Important Factors For Producing Workable Concrete Is Good Gradation Of Aggregates.

3.2.1. Coarse Aggregate: The Material Which Is Retained On Is Sieve 4.75mm Is Termed As Coarse Aggregate. The Broken Stone Is Generally Used As A Stone Aggregate.

3.3.2. Fine Aggregate: The Material Which Passes Through Is Sieve 4.75mm Is Termed As Fine Aggregate Usually Natural Sand Is Used As A Fine Aggregate The Sand Used For The Experimental Works Was Locally

Procured And Confirmed To Grading Zone Ii, Sieve Analysis Of The Fine Aggregate Was Carried Out In The Laboratory As Per Is 383-1970 And Results Are Provided.

3.3.1.Physical Properties Of Aggregates:

S.No	Type Of Aggregates	Specific Gravity	Fineness Modulus
1	Coarse Aggregate	2.85	6.65
2	Coarse Aggregate	2.59	2.24
3	Crusher Dust	2.57	2.75

3.4 Concrete: Concrete Is An Artificial Material In Which The Aggregates Both Fine And Coarse Are Bonded Together By The Cement When Mixed With Water.M30 And M40 Grades Are Used.

3.5 Quarry Rock Dust: Quarry Rock Dust Collected From The Quarry Of S.S Rocks Which Is Located At Anakapalli; Visakhapatnam Is Used As A Fine Aggregate Replacement Material In Concrete. The Physical And Chemical Properties Of Quarry Rock Dust Is Satisfied The Requirements Of Code Provision In Properties Studies.

III. Objectives:

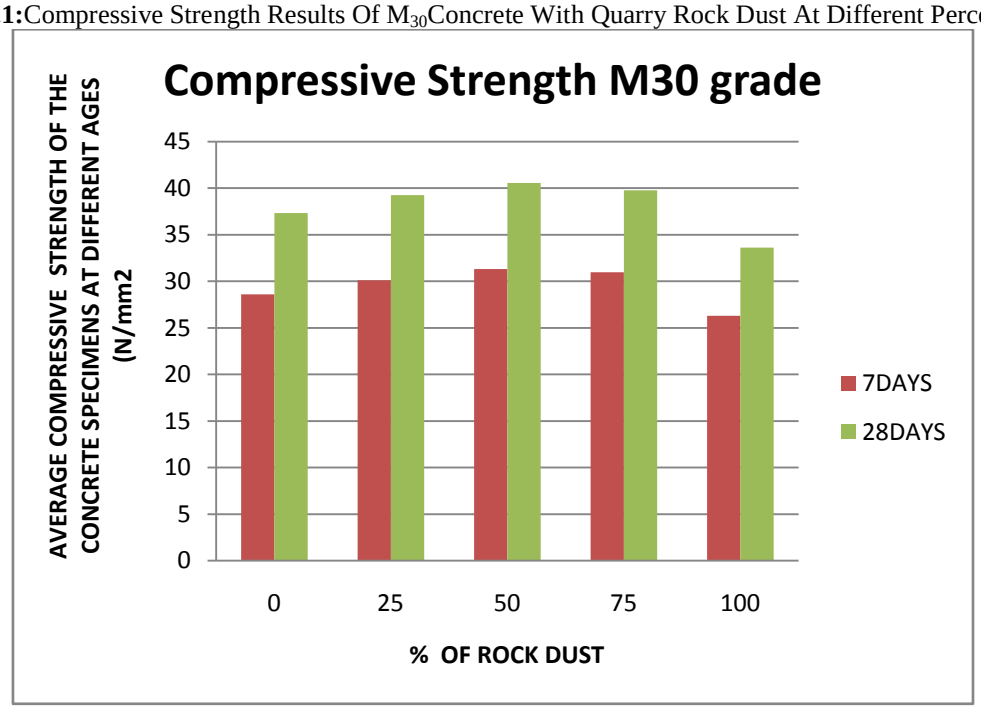
1. To Fine Aggregate Replaced With Quarry Rock Dust In Concrete As It Directly Influences Economy In Construction.
2. To Evaluate The Compressive Strengths At 7 And 28 Days By Replacing Fine Aggregate With Quarry Rock Dust In Proportions Of 0%, 50%, 75% And 100%.
3. To Evaluate The Split Tensile Strengths At 7 And 28 Days By Replacing Fine Aggregate With Quarry Rock Dust In Proportions Of 0%, 50%, 75% And 100%.
4. To Evaluate The Flexural Strengths At7 And 28 Days By Replacing Fine Aggregate With Quarry Rock Dust In Proportions Of 0%, 50%, 75% And 100%.
5. To Evaluate % Of Water Absorption For Use Of Plastering In Both Quarry Rock Dust And Natural Sand.

IV. Strength Studies On Concrete

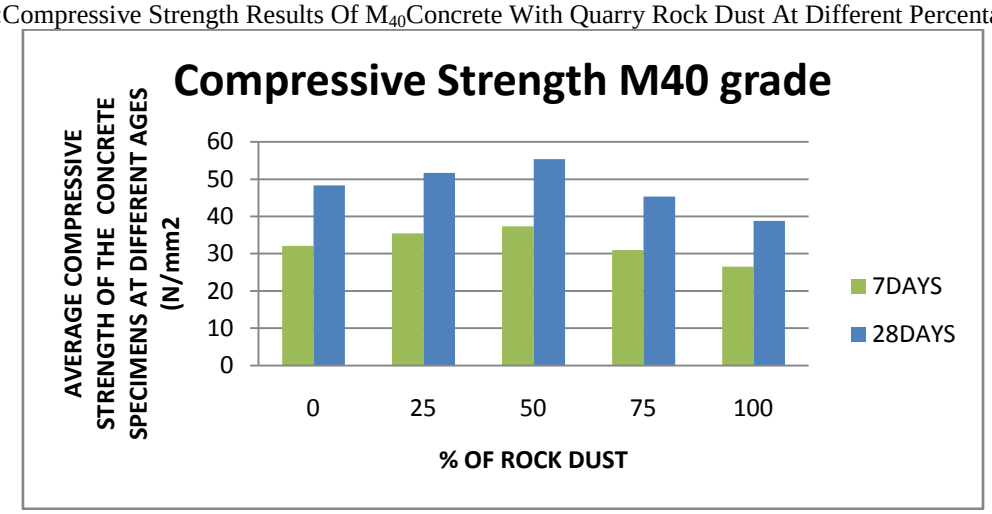
5.1. Compressive Strength Test According To Is 516-1959

The Test Setup For Conducting Cube Compressive Strength Test Is Depicted In Plate No. Compression Test On The Cubes Is Conducted On The 300t Compression Testing Machine. The Cube Was Placed In The Compression Testing Machine And The Load On The Cube Is Applied At A Constant Rate Up To The Failure Of The Specimen And The Ultimate Load Is Noted.The Cube Compressive Strength Of The Concrete Mix Is Then Computed.. This Test Has Been Carried Out On Cube Specimens At 7 And 28 Days Age. The Values Are Presented In Below.

Graph.1: Compressive Strength Results Of M_{30}Concrete With Quarry Rock Dust At Different Percentages.



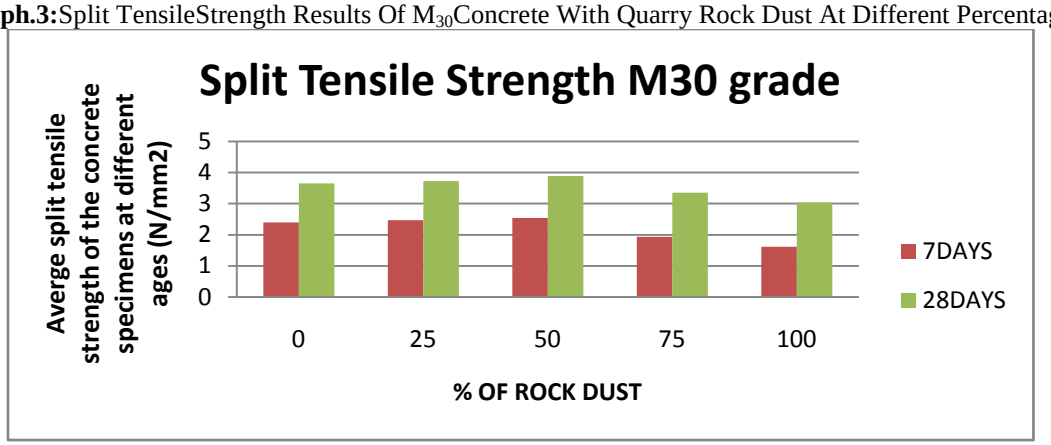
Graph.2:Compressive Strength Results Of M_{40}Concrete With Quarry Rock Dust At Different Percentages.



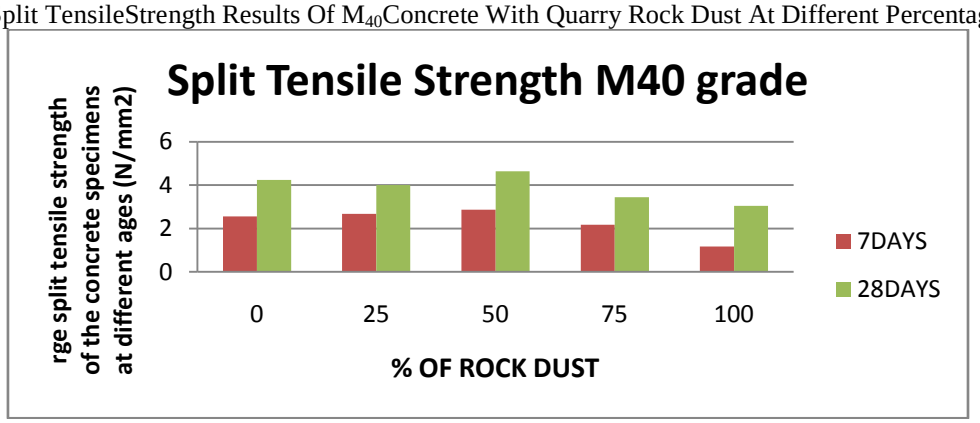
5.2 Split Tensile Strength According To Is 5816-1999

This Test Is Conducted On 300t Compression Testing Machine. The Cylinders Prepared For Testing Are 150mm In Diameter And 300mm Height. In The Present Work, This Test Has Been Conducted On Cylinder Specimens After 7 And 28 Days Of Curing. The Values Are Tabulated In Above Tables For M30 And M40 Grade Concrete Respectively.

Graph.3: Split TensileStrength Results Of M_{30}Concrete With Quarry Rock Dust At Different Percentages



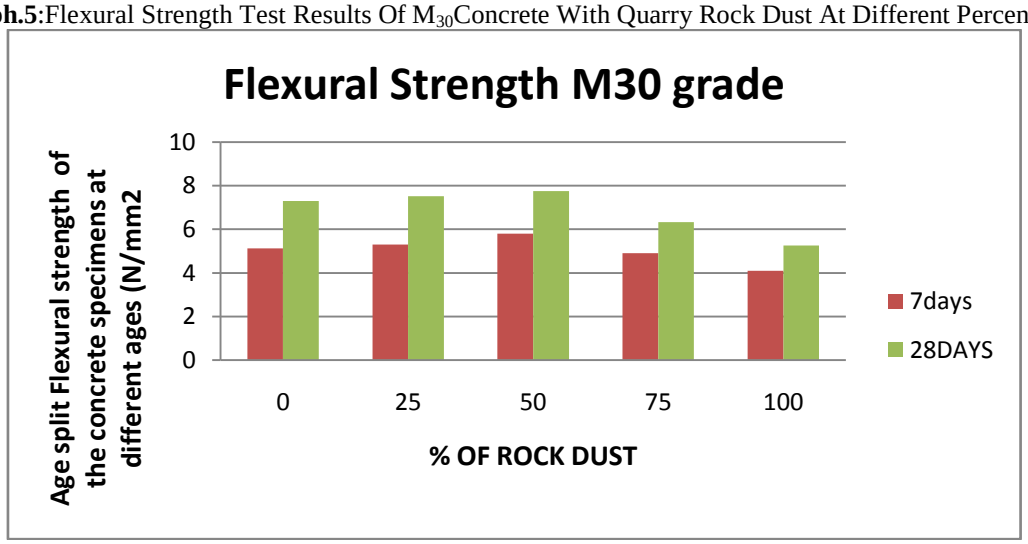
Graph.3:Split TensileStrength Results Of M_{40}Concrete With Quarry Rock Dust At Different Percentages



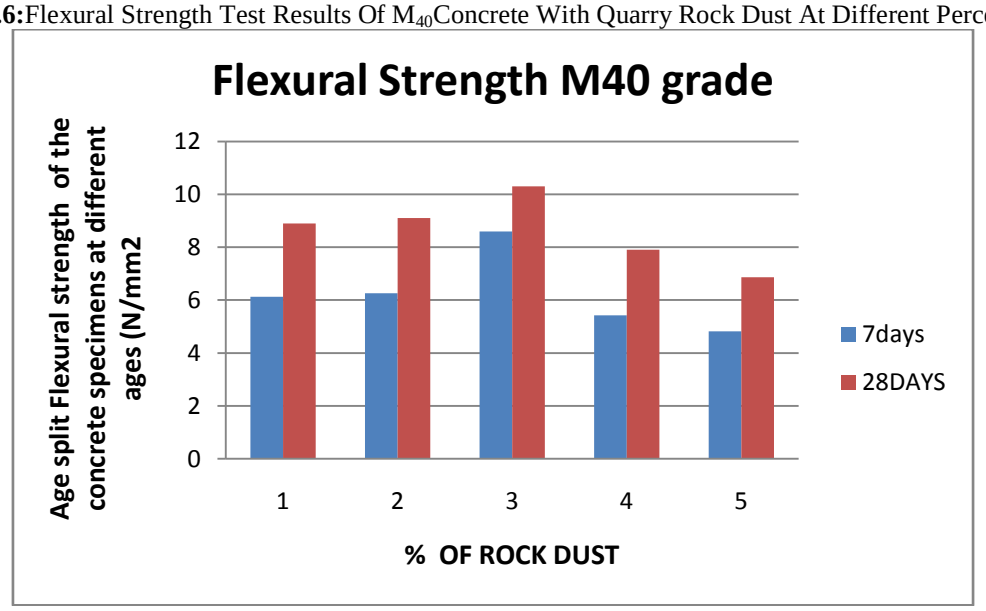
5.3 Flexural Strength Test According To Is 516-1959

The Prism Specimens Of Size 500x 100x 100 Mm Were Used For The Determination Of The Flexural Strength. The Average Flexural Strength Of Concrete With Quarry Rock Dust Is Given In Below.

Graph.5:Flexural Strength Test Results Of M_{30}Concrete With Quarry Rock Dust At Different Percentages



Graph.6: Flexural Strength Test Results Of M_{40}Concrete With Quarry Rock Dust At Different Percentages



5.4 Percentage Of Water Absorption In Plastering

In Our Present Thesis We Had Taken 1:3 And 1:6 Cement Motor Proportions.

% Of Water Absorption Mixes Of (1:3): Normal Sand = 5.11, Quarry Rock Dust = 13.35

% Of Water Absorption Mixes Of (1:6) Normal Sand = 4.77, Quarry Rock Dust = 10.67

V. Conclusion

- Based On This Experimental Investigation It Is Found That Quarry Rock Dust As An Alternative Material To The Natural Sand.
- The Physical And Chemical Properties Of Quarry Rock Dust Are Satisfied The Requirements Of Fine Aggregate.
- If Quarry Rock Dust Is Replaced 50% Of Natural Sand From The Quarry Has Obtained Higher Results Then The Normal Conventional Concrete.
- The Strength Of The Quarry Rock Dust Concrete Is Comparatively 8-12% More Than That Of Similar Mix Of Conventional Concrete.
- The Waste Usage Of Quarry Dust Decrease The Cost Of Fine Aggregate And Also Increases The Strength.

References

A) Technical Papers

[1] R. Ilangovana, N. Mahendranaand K. Nagamanib. Strength And Durability Properties Of Concrete Containing Quarry Rock Dust As A Fine Aggregate., Aprn Journal Of Engineering And Applied Sciences, Vol 3, No. 5, October 2008.Issn 1819-6608.

[2] SivakumarAndPrakash M. Characteristic Studies On The Mechanical Properties Of Quarry Dust Addition In Conventional Concrete. In The Journal Of Civil Engineering And Construction Technology Vol. 2(10),Pp. 218-235.

[3] Anithaselva Sofia S.D., Gayathri R., Swathig. Prince Arulraj G. Experimental Investigation On Quarry Dust Concrete With Chemical Admixture. International Journal Of Latest Research In Science And Technology, Volume 2,Issue 2 :Page No.91-94, March - April (2013). Issn (Online):2278-5299.

[4] Chandanasukesh,Katakambala Krishna, P.SrilakshmiSaiTeja, S.KanakambaraRao. Partial Replacement Of Sand With Quarry Dust In Concrete, International Journal Of Innovative Technology And Exploring Engineering (Ijitee) Issn: 2278-3075, Volume-2, Issue-6, May 2013.

[5] Lohani T.K., Padhi M., Dash K.P., Jena S. Optimum Utilization Of Quarry Dust As Partial Replacement Of Sand In Concrete..Int. Journal Of Applied Sciences And Engineering Research, Vol. 1, No. 2, 2012. Issn 2277 – 9442.

[6] Prof. M. Devi, Prof. V. Rajkumardr. K. Kannan. Inhibitive Effect Of Organic Inhibitors In Concrete Containing Quarry Rock Dust As A Fine Aggregate. . International Journal Of Advances In Engineering Sciences Vol.2, Issue 1, Jan, 2012.

B) Is Codes

[1] Is: 383:1970 Indian Standard Institution, Specifications Of Coarse And Fine Aggregates From Natural Sources Of Concrete.

[2] Is: 456:2007 Plain And Reinforced Concrete Code Of Practice

[3] Is: 516:1959, Method Of Tests For Strength Of Concrete

[4] Is: 1199-1959. Indian Standard Methods Of Sampling And Analysis Of Concrete.

[5] Is: 2386-1963 Part 1 To Viii. Indian Standard Methods Of Test For Aggregate For Concrete.

[6] Is: 10262-2009 Concrete Mix Proportioning - Guidelines

[7] Is 650:1991 Standard Sand For Testing Cement – Specification.

[8] Is: 1200 (Part Xii) - 1976method Of Measurement Of Building And Civil Engineering Works. Part Xii Plastering And Pointing.

[9] Is 1542:1992 Sand For Plaster – Specification.

[10] Is: 4031 (Part 4) - 1988 Methods Of Physical Tests For Hydraulic Cement Part 4 Determination Of Consistency Of Standard Cement Paste.

C) Bibilography

[1] Shetty, M. S., "Concrete Technology," Chand S. And Co.Ltd, India (2009).

[2] Nevelli," Properties Of Concrete" Longman Publications, New Delhi, Reprint 2010.

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