



Academy of
Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Granite Waste Reclamation: A study in concrete mixtures

B. Tech. Capstone Project Report

SUBMITTED BY

Sr.No	Name	Exam Seat No.
1	Shreyas Kale	B233002

GUIDED BY – Mr. Khushal Kanade Sir

SCHOOL OF CIVIL ENGINEERING

MIT ACADEMY OF ENGINEERING, ALANDI(D), PUNE-412105



Academy of
Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Granite Waste Reclamation: A study in concrete mixtures

B. Tech. Capstone Project Report

*Submitted in partial fulfillment of the
Requirements for the award of the degree*

Of

Bachelor of Technology

in

ENGINEERING

BY

Shreyas Kale

SCHOOL OF CIVIL ENGINEERING

MIT ACADEMY OF ENGINEERING, ALANDI(D), PUNE-412105



Academy of
Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

CERTIFICATE

It is here by certified that the work which is being presented in the B. Tech. Project Report entitled **“Granite Waste Reclamation: A study in concrete mixtures”**, in partial fulfillment of the requirements for the award of the Bachelor of Technology in Civil Engineering and submitted to the School of Civil Engineering of MIT Academy of Engineering, Alandi (D), Pune, Affiliated to Savitribai Phule, Pune University (SPPU), Pune is an authentic record of work carried out during an Academic Year 2023-2024, under the supervision of Prof. Khushal Kanade Sir , School of Civil Engineering.

Sr.No

Name

Exam Seat No.

1

Shreyas kale

B233002

Mr. Khushal Kanade Sir
Project Advisor

Mrs. Anagha Galgali
Project Coordinator

Dr. Shyam Shukla
Dean SMCE

Signature of Internal examiner/s

Prof. PQR

Affiliation

Signature of External examiner/s

Name.....

Affiliation.....

ACKNOWLEDGEMENT

Thank all them who have helped in our project.....

We want to express our gratitude towards our respected project guide **Mr. Khushal Kanade** for his constant encouragement and valuable guidance during the completion of this project work. We also want to express our gratitude towards respected School Dean Prof. Shyam Shukla for his continuous encouragement.

We would be failing in our duty if we do not thank all the other staff and faculty members for their experienced advice and evergreen co-operation.

1. Shreyas Kale

ABSTRACT

In the world of the construction industrial era, the waste generated from the stone industries cause environmental problems. At the same time, Construction industries face many problems not only at the end of the life cycle of the products but also at the beginning of it. It is also significant to develop low-cost building material by the waste produced by stone industry. Therefore, the reuse of Granite fine waste material in the construction industry can be emphasized to produce low-cost concrete. This Project aims at innovative use of Granite Fine waste in concrete by replacing the fine aggregate which is the other alternative that can be used in conventional concrete. The proposed work is investigated for a concrete mix of M20 grade with 0%,10%,20% of Granite Fine waste used as the replacement of fine aggregate. A series of 6 cubes are cast and tested after 7 and 14 days for the compressive strength. The result appears that the compressive strength of concrete increases up to 10% after the replacement of fine aggregate with Granite fine waste and further, it decreases as the percentage of granite increases.

CONTENTS

Sr. No.	NAME OF CHAPTER	Page No.
1	Acknowledgements	i
2	Abstract	ii
3	1. Introduction	1
4	1.1 Motivation for the project	2
5	1.2 Problem Statement	2
6	1.3 Objectives and Scope	2
7	2. Literature Survey	3 - 4
8	3. Methodology	5
9	4. Implementation	6 - 9
10	4.1 Result	10
11	5. Conclusion	12
12	5.1 Future Scope	12
13	6. References	13

CHAPTER 1

INTRODUCTION

Granite is an important structural and ornamental stone and it also has high compressive strength and durability, it is used extensively for massive structural work. Fine-grained granite that takes and preserves good polish is employed for ornamental and monumental works and also for inscription purposes. The word granite is derived from the Latin word 'granum', which is a grain. Solid waste is produced mainly from industrial processing, mining, and agriculture, and is disposed of inefficiently. The waste produced at the time of mining, processing, and finishing of rocks such as granite, marble, sandstones, consists of a large quantum of the total solid waste. Since there is an increase in population day by day is resulting in demand for building of infrastructure has increased constantly. Concrete is the most widely used manmade construction material in the world whereas the most ingredient in concrete is cement, fine aggregate, and coarse aggregate. For construction purposes river sand is used as fine aggregate in concrete. Recently in India many states like Rajasthan, Tamil Nadu have imposed restrictions on sand removal from the river beds due to unsafe impacts threatening and has forced the search of feasible alternative materials. The complete and proper disposal of this waste is not possible, and the only way to minimize the damages caused by it is its complete utilization. This waste, although with no proper method of disposal, has a potential for usage as a partial or complete replacement of aggregates in cement mortar, or can be used as a Fine aggregate substitute in concrete.

1.1 Motivations

The project "**Granite Waste Reclamation: A study in concrete mixtures**" is motivated by the need to address critical environmental and industrial challenges: The rapid accumulation of granite-waste poses severe environmental and health risks. This project aims to recycle granite-waste in an environmentally friendly manner. By using granite-waste as a partial replacement for natural coarse aggregates, the project seeks to reduce the environmental impact of the construction industry and conserve natural resources. The project promotes a circular economy by repurposing waste materials, thereby minimizing waste and maximizing resource efficiency. Integrating granite-waste into concrete production can reduce costs and environmental degradation, providing a dual advantage.

1.2 Problem Statement

The construction industry grapples with excessive granite waste disposal and a missed opportunity for sustainable practices. Despite the environmental urgency, there is a significant gap in utilizing granite waste in concrete mix design. This project aims to tackle this dual challenge by exploring the underutilized potential of granite waste, offering a solution for both waste management and resource optimization in construction.

1.3 Objectives

- To evaluate the environmental benefits of utilizing granite waste in concrete production, comparing it to traditional methods.
- To explore the feasibility and benefits of incorporating granite waste into concrete mix design.

CHAPTER 2

LITERATURE REVIEW

1) The influences of granite industry waste on concrete properties with different strength grades

Author: Sawekchai Tangaramvong, et al.

Summary:

The use of granite industry waste as a mixing material of concrete reduces not only the natural aggregate consumption, but also the solid waste disposal problems. This paper addresses the influences of recycled granite aggregate on the concrete properties. Both the low- (20 MPa) and high- (50 MPa) strength concretes were investigated for various sand replacing proportions with granite particles (namely up to 50 % by weight).

2) Use of Granite Waste as Partial Substitute to Cement in Concrete

Author: Y. Yaswanth Kumar , et al.

Summary:

With the ever increasing cost of construction materials there is a need to curtail the same by using cheaper substitutes. In this investigation Granite Slurry (GS) was used as partial substitute in proportions varying from 5% to 20% by weight to cement in concrete and tested for compressive strength, tensile strength and flexure strength. It was observed that substitution of 10% of cement by weight with GS in concrete resulted in an increase in compressive strength to 48 N/mm² compared to 35 N/mm² of conventional concrete.

3) Experimental Investigation By Use Of Granite Fine Waste In Concrete

Author: Sahil Sanjeev Salvi , et al.

Summary:

In the world of the construction industrial era, the waste generated from the stone industries cause environmental problems. At the same time, Construction industries face many problems not only at the end of the life cycle of the products but also at the beginning of it. It is also significant to develop low-cost building material by the waste produced by stone industry. Therefore, the reuse of Granite fine waste material in the construction industry can be emphasized to produce low-cost concrete. This Project aims at innovative use of Granite Fine waste in concrete by replacing the fine aggregate which is the other alternative that can be used in conventional concrete.

4) Study on utilisation of granite powder waste in concrete

Author: Karthik Thipparthi , et al.

Summary:

Granite industry cuts the granite rock to slabs based on the requirement of the client, using metal saws, and the fine powder is produced during cutting is considered as solid waste and is being collected. Granite mine industry generates huge amount of waste, during the process of sawing. The granite saw dust comprises of calcium and iron which has the compatibility to acid soils. Use of granite waste found to be effective in the production of concrete for civil construction. In this project work, Granite waste was used as partial substitute in fine aggregate proportions varying from 20% to 40% by weight to cement in concrete.

CHAPTER 3

METHODOLOGY

A series of 6 cubes specimens and 3 conventional concrete cubes are cast and tested for compressive strength. To achieve the aim and objectives, a methodology developed is as follows:

1. Casting of the cube and check for Compressive Strength with conventional concrete for mix M20 is carried out.
2. The Casting of the cube with replacement of Fine Aggregate with Granite fines for mix M20 with varying percentage is done.
3. Testing of the above said cube at 7 and 14 days for compressive strength is done respectively.
4. Compressive Strength result tests are compared with that of the conventional concrete strength.

CHAPTER 4

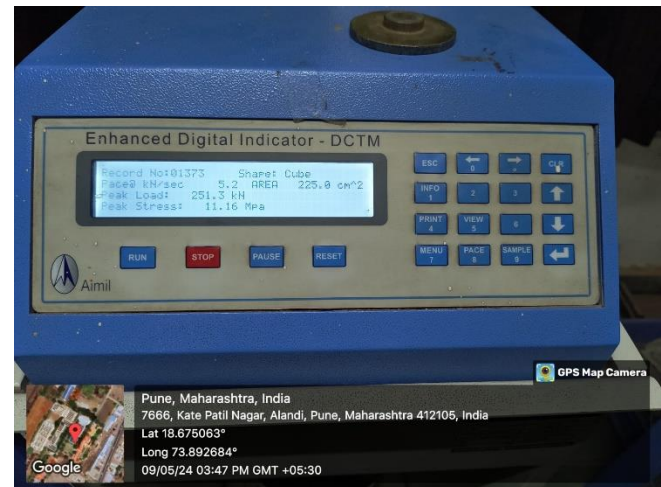
IMPLEMENTATON

- I have visited to RMC Plant for Project Related Work.
- I have Casted Concrete Cubes in RMC Plant for Project purpose under the guidance of Plant manager.
- At last I have tested the Concrete Cubes in MITAOE Laboratory.









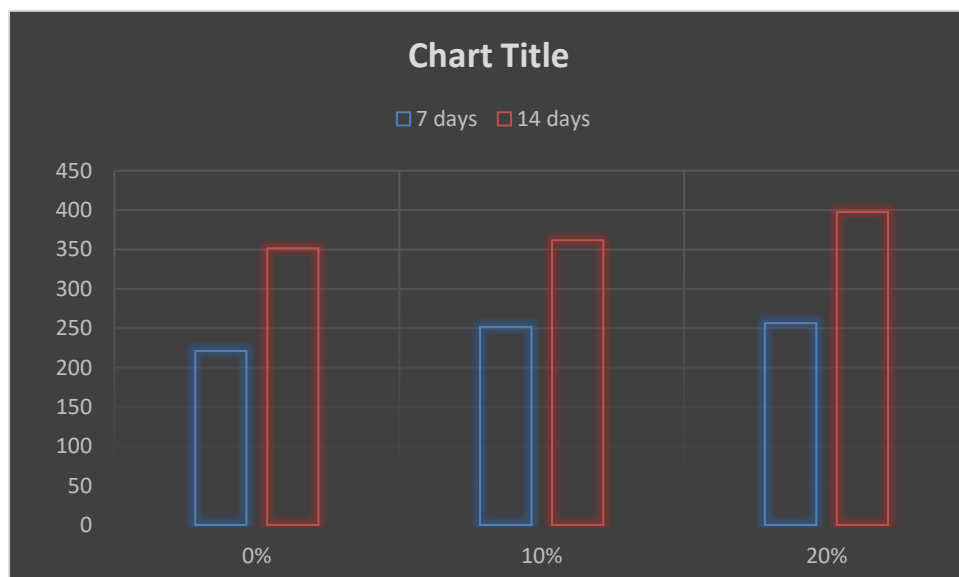
4.1 Result

- An analysis was made on the strength characteristics by conducting the tests on granite-waste Concrete with granite-waste and the results revealed that up to 20% replacement granite-waste for coarse aggregate in concrete shows in compressive strength.

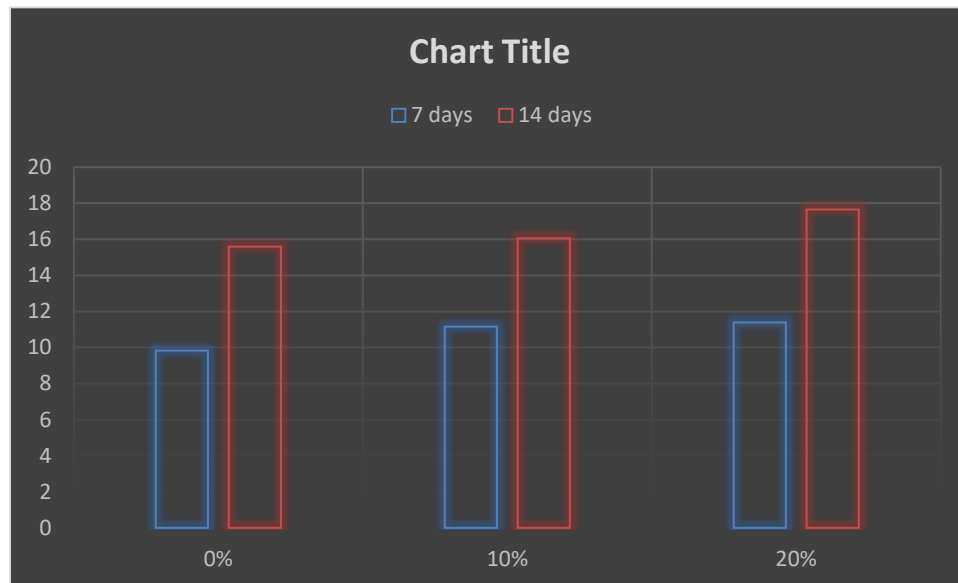
Compressive Strength :

Results of Compressive strength for M20 grade of concrete on cube specimen with 0%, 10% and 20% with Granite Fine replacement of Fine aggregate in concrete are shown in the table.

Sr. no.	% Of Granite Powder	Test Sample 1 in KN (7days)	Test Sample 2 in KN (14days)
1	0%	221.0	351.5
2	10%	251.3	361.6
3	20%	256.2	397.4



Sr. no.	% Of Granite Powder	Test Sample 1 in Mpa (7days)	Test Sample 2 in Mpa (14days)
1	0%	9.82	15.6
2	10%	11.16	16.05
3	20%	11.38	17.65



CHAPTER 4

CONCLUSION

Following conclusions can be obtained from the present experimental work on the effects of the varying percentage of Granite Fines Compressive strength. The use of Granite Fine waste in partial replacement of Fine Aggregate in concrete showed an increase in Compressive strength. Compressive Strength shows an increasing trend till 10% of replacement of Granite and further, it decreases which is nearly equal to the strength of conventional concrete. The use of Granite Fine waste in the replacement of fine aggregate shows a 40% increase in Compressive Strength when it is replaced by 10% as compared to conventional concrete. The comparative increase in compressive strength as compared with conventional concrete at 10% and 20% of Granite fine waste content are 24% and 4% Respectively for M20 mix of concrete.

REFERENCES

- ▶ P.Krishna Prasanna, M.Kanta Rao, “Strength Variations in Concrete by Using E-Waste as Coarse Aggregate”, International Journal of Education and Applied Research, Volume 4, Issue Spl 2, 82-84, June 2014.
- ▶ Pramila S., Fulekar M.H., Bhawana P., E-Waste- A Challenge for Tomorrow Research Journal of Recent Sciences ,1(3), 86-93, 2012.
- ▶ Toxic Links. 2004. E-Waste in India: System failure imminent - take action NOW! Available at www.toxiclink.org/docs/06040_repsumry.pdf. Last accessed on 20th August 2012
- ▶ Tomas U. Ganiron Jr “Effect of Thermoplastic as Fine Aggregate to Concrete Mixture” International Journal of Advanced Science and Technology, 2014.
- ▶ A. Arivumangai T. Felixkala (2014), “Strength and Durability Properties of Granite Powder Concrete” (Journal of Civil Engineering Research, 4(2A): 1-6)
- ▶ Abhishek Jain, Rajesh Gupta, Sandeep Chaudhary (2019), “Performance of self compacting concrete comprising granite cutting waste as fine aggregate, Construction and Building Materials” Volume 221,2019, Pages 539-552, ISSN 0950-0618
- ▶ Allam M. E., Bakhoun E. S., Garas G. L., and Ezz H., “Durability of Green Concrete Containing Granite Waste Powder” (Allam M. E. et al. / International Journal of Engineering and Technology (IJET)).
- ▶ Anandhu Ramesh, Sravanan.S, Kanesh Pandian.M, Charles Raja P., “Experimental Study on Granite Powder as Replacement of Fine Aggregate in Concrete” (IJARIIE- ISSN(O)-2395-439

