IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 5, May 2024

An Experimental Study on Light Weight Concrete using AAC Block Waste as Coarse Aggregate

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Abstract: *The study on light weight structural concrete using AAC block wastage is replaced in normal M-25 grade concrete as per IS-10262-2019. The AAC block wastage has been replaced with coarse aggregate of size 20mm pass and 12.5mm retain with volumetric change*

Keywords: AAC, Autoclaved aerated concrete, concrete, light weight concrete

I. INTRODUCTION

When any structure fails or demolished the wastage of that structure can be used in concrete and also the demolished structure materials can be recycled to make artificial light weight aggregates.The AAC blocks which have been used in different multistorey buildings for partition walls produces significant amount of wastage also which is used as filler material in different civil engineering purposes.

Air entrained concrete has the lowest thermal conductivity and strength. It can be cut, nailed and sawn like wood, but it won't break. Here the same AAC block wastage is used by making it in size of 20mm pass from sieve and 12.5 mm retain as a replacement of natural coarse aggregates. The replacement is carried out in volumetric change in terms of percentage.

1.1 Aim of study

To find the optimum percentage of replacement of AAC block waste with coarse aggregates.To reduce the use of natural available aggregate form nature and can reuse waste materials.To study the hardened properties of concrete like compressive strength at 7 and 28 days, flexural strength at 28 days.

Replacing the AAC block waste with coarse aggregate at 0%, 20%, 30%, 40% and 50% in M-25 grade light weight concrete.

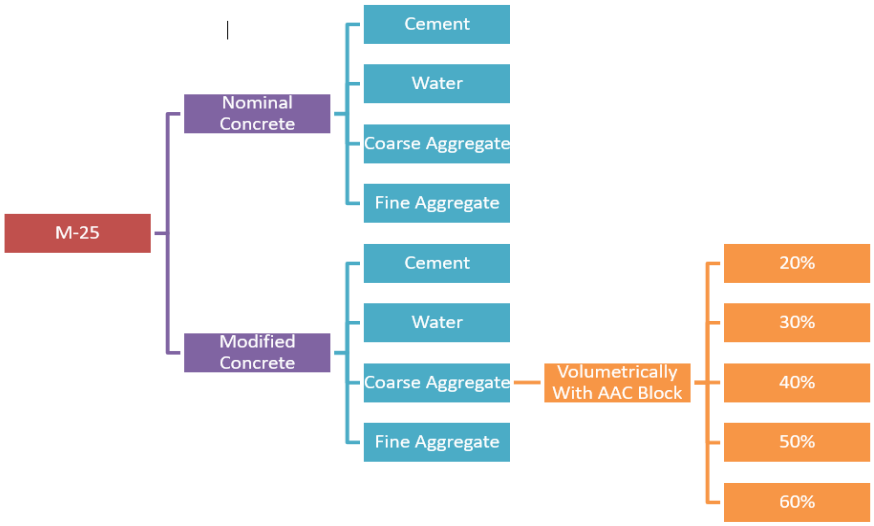

Figure 1 Work flow chart

DOI: 10.48175/IJARSCT-18496

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II. METHODOLOGY AND DATA ANALYSIS

Table 1 Properties of material used in concrete mix.

Type of cement	: OPC 53 grade confirming IS:12269
Maximum nominal size of aggregate	: 12.5 mm
Minimum water cement ratio	: 0.50
Workability	: 100mm
Exposure condition	: Mild
Method of concrete placing	: By machine
Specific gravity of Cement	: 3.15
Specific gravity of Coarse Aggregate	: 2.74
Specific gravity of Fine Aggregate	: 2.62 (Zone-II)
AAC block waste specific gravity	: 0.87
Water absorption of coarse aggregate	:0.45 %
Water absorption of fine aggregate	:1.3 %
Water absorption of AAC block waste	:0.94%

2.1 Slump test

The slump test is used for the measurement of a property of fresh concrete as per is: 1199 - 1959.From the test, it was observed that replacement with AAC block waste in concrete the slump was decreases.

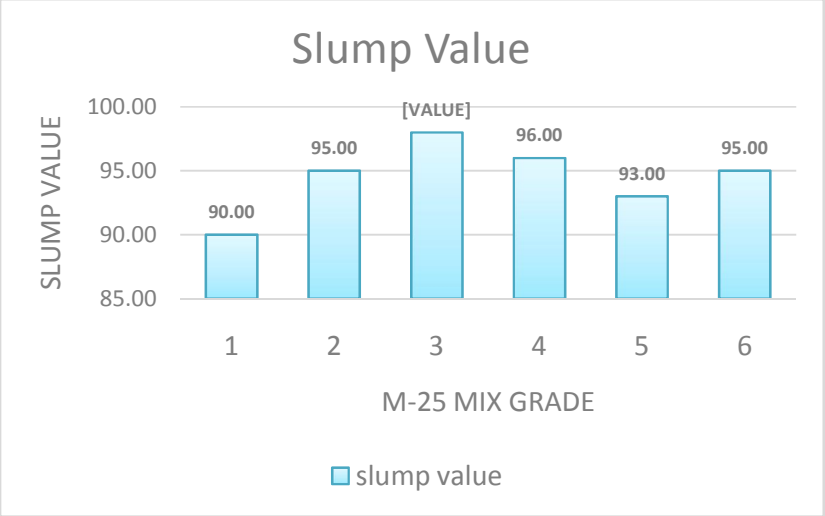

Table 2 Slump test graph

Table 3Slump test

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Compressive strength

After adding AAC block waste in M-25 mix design in the replacement of coarse aggregate in volumetric proportion of 20%, 30%, 40%, 50%, 60%. The strength got reduced up to -13.04%, -22.73%, -48.75%, -60.94%, -75.32% respectively.

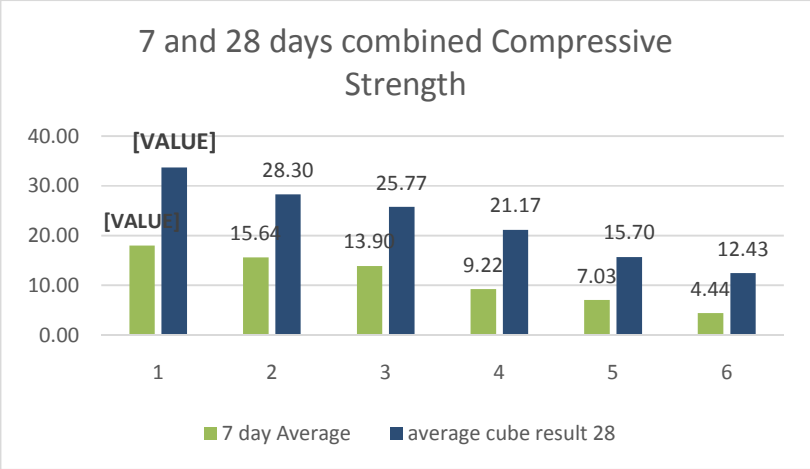

Figure 2 Compression test graph

Figure 3 Testing of concrete

After adding AAC block waste in M-25 mix design in the replacement of coarse aggregate in volumetric proportion of 20%, 30%, 40%, 50%, 60%. The strength got reduced up to 0.00%, -16.02%, -23.53%, -37.19%, -53.41%, -63.11% respectively.

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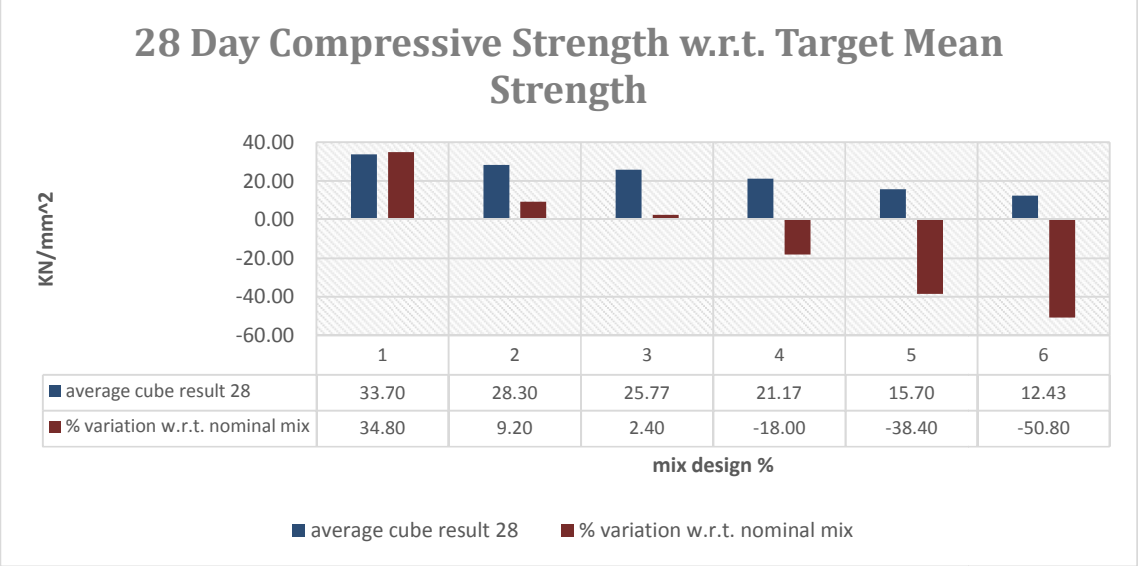

Figure 4 28 DAYS COMPRESSIVE STRENGTH WITH RESPECT TO TARGET MEAN STRENGTH

Results of 7 and 28 days compressive strength of M 25 concrete with AAC block waste.

- Strength reduced continuously after adding AAC block waste.
- But up to 30% AAC block waste replacement the nominal strength is achieved.
- In 7 day (early) strength is not achieved much but, at 28 days it achieved nominal strength.
- Later strength is achieved, so after 56 days strength may be gained even more.
- Strength is drastically reduced after increasing AAC block waste to 40%, 50%, 60%.

Flexural strength.

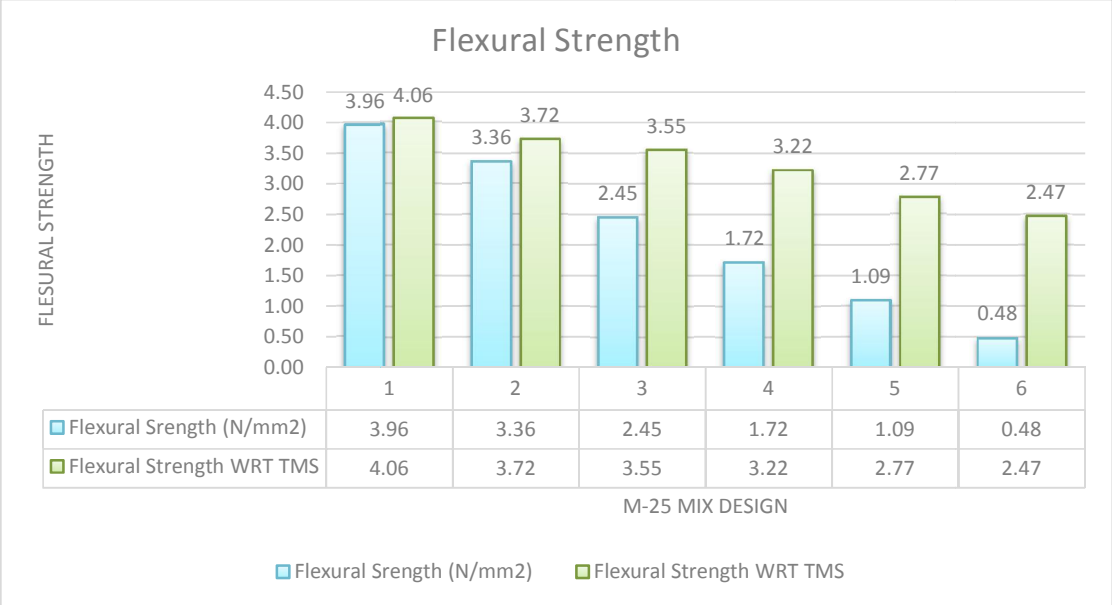

Figure 5 Flexural strength of concrete

- Due to AAC block replacement having low density the flexural strength reduced very much
- Major reduction of flexural strength observed in Mix-2 and Mix-3 total 11.77%. After that
- At 60% replacement of AAC block the strength reduced directly to 56% of the nominal mix.

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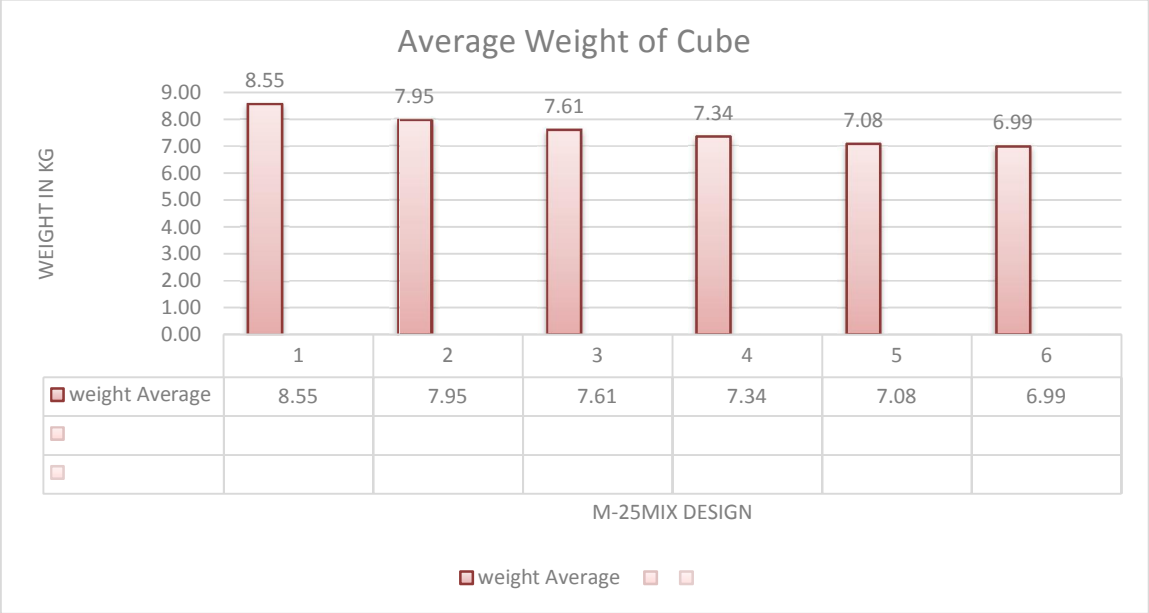
- Total 19% of reduction in flexural has been measured by adding AAC block waste



- The Weight of cube and beam reduced up to Mix-3 after that the reduction rate started showing negative sign
- Up to 30% replacement in AAC block reduces the weight of concrete up to 8%.
- There is no major impact on flexural strength of concrete if it is compared in percentage with target mean strength.
- Hence, the 30% replacement of AAC block is desirable for M-25 grade concrete as per IS-10262-2019.

III. CONCLUSION

From the readings it is suggested that the AAC block waste with 30% replacement with coarse aggregate reduces density up to 30% but the strength is achieved up to nominal mix.

Target mean strength has not been achieved due to lower density of AAC block then also the nominal strength is achieved at 30% replacement of AAC block.

Hence, by adding 30% AAC block waste strength is not reduced below nominal mix design and also the 8% of density and the flexural strength is reduced up to 19%.

ACKNOWLEDGMENT

Thanks to the Department of civil engineering, Darshan University Rajkot for providing a suitable laboratory to perform required tests, guidance under Prof. Chetan Solanki, Head of the department prof. Dipak Jivani.

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