International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 5, August 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

To Study the Behaviour of use Bituminous Pavement Wastes in Cement Concrete

Gulshan[1], Nitin Thakur[2]

[1]M. Tech Student, [2]Assistant Professor
[1,2]Om Institute of Technology and Management, Hisar, Haryana, India

How to cite this paper: Gulshan | Nitin Thakur "To Study the Behaviour of use Bituminous Pavement Wastes in Cement Concrete" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-5, August 2019, pp.2584-2587, **https://doi.org/10.31142/ijtsrd28042**

IJTSRD28042

ABSTRACT

Generally, aggregate prepare 60% to 75 % of total concrete amount, therefore the aggregate choice is crucial, and additionally they regulate concrete qualities. Aggregate offer wear resistance as well as strength. So, the aggregate selection, as well as proportioning, must need more attention. The aggregate is usually crushed rocks for example limestone, coarse gravel, maybe granite as well as good aggregate like sand or maybe stone dust. Aggregate formed Bulk pavement structure. This research paper represents a review on the utilization of bituminous pavement wastes. This can assist in obtaining economic climate in construction of road along with preserving environment friendly degradation in term of decreased amount of pollution as well as mining.

INTRODUCTION

Concrete is basically a composite construction substance made up of water, cement, and aggregate. Generally aggregate prepare 60 % to 75 % of total concrete amount, therefore the choice is crucial, additionally they regulate concrete qualities, Aggregate offer bulk, power as well as put on resistance. So, the aggregate selection, as well as proportioning,must need more attention. The aggregate is usually crushed rocks such as limestone, coarse gravel, maybe granite as well as good aggregate like sand or maybe stone dust. Aggregate formed Bulk pavement structure.

The Pavement has feature to transmit wheel load to the sub-quality. The mechanism of load transfer, aggregates need to bear stresses that occur because of wheel lodes on the pavement as well as on the outside program, additionally, they have to withstand wear because of abrasive activity of visitors. Consequently the aggregate properties are of extensive important to civil engineers. The aggregate is classified according to their size, gradation, texture, and shape. The aggregate acts as reinforcement that provides more Strength to composite materials. Aggregates can also be utilized as base material below railroads, roads, and foundations.

RAP (Recycled asphalt pavement) is basically eliminated as well as reprocessed pavement substance with aggregate and asphalt. The recycled asphalt pavement utilize in the new construction, warm mix asphalt pavements. But the little investigation is done to examining the possibility of incorporating RAP into cement concrete. The current study shows that physical properties as well as the physical of cement concrete containing RAP, in proportions that are different, are examined by experiments of lab. Recycled asphalt pavement utilized in the current study is from the trash of dismantled asphalt road.

IMPORTANCE OF RESEARCH TOPIC

The subject "Use of bituminous pavement trash in cement concrete" was preferred for the current research work to analyze the actual mechanical as well as physical properties of RAP that incorporated with especially cement concrete.

The main focus of current research is determining the strength attribute of RAP for application in higher strength concrete that is going to give a clear understanding of the attributes of concrete with RAP as an alternate component to fresh coarse aggregate of concrete. This can assist in obtaining economic climate in construction of road along with preserving environmentally friendly degradation in term of decreased a reduced amount of pollution as well as mining. RAP will help to conserves landfill space resources and can produce benefit for the recyclers.

SCOPE OF THE STUDY

This study consist of a mixture of M30 quality of cement concrete which is created for 0.45 water-cement ratio utilizing for virgin coarse aggregate (CA). To learn the possibility of RAP in the mix design of M30 grade cement concrete, diverse proportion of RAP aggregate are utilized in mixing with coarse aggregate as well as their corresponding flexural and compressive strength are examined. 5 batches are believed to be in that the portion of RAP along with FCA are given as:

1 100% and 0% CA
2 75% RAP and 25% CA
3 50% RAP and 50% CA
4 25% RAP and75% CA
5 0% RAP and 100% CA

All 5 batches have water-cement ratio fixed as 0.45.

OBJECTIVE OF THE STUDY

The main objective of this research work is developing as well as to characterize eco-friendly concrete that is appropriate for transportation applications. The goals of this research work includes:

1. Collection of study material.
2. To examine the different properties of some materials such as water absorption, impact value, crushing value, specific gravity along with gradation to find out the suitability for high strength concrete.
3. Mix Design of M30 grade cement concrete is basically based on IRC:44-2008 as well as IS code.
4. Flexural strength along with compressive strength checked regularly
5. Comparison study between the followings:

   i. Fresh coarse aggregate along with RAP aggregate
   ii. Recycled asphalt pavement concrete along with Fresh aggregate concrete

EXPERIMENTAL WORK

COMPRESSIVE STRENGHT TEST

Compressive strength of concrete is important for resistance to compressive stresses.

Cubical specimens of size 150mm were cast for conducting compressive strength test for each mix (A to E). The compressive strength test is carried out by using compressive strength testing machine as shown Figure 6.1. The cubical specimen of size 150 mm is placed in compressive testing machine and the load is applied without shock and increased continuously at a rate of approximately 16 N/mm2 per minute until the resistance of the specimen to the increasing load breaks down.

Compressive Testing Machine

Result of compressive strength test on concrete cube after 7 days of curing

Serial no	Mix design	Weight of concrete cube (Kg)	Compressive strength after 7 days (N/mm^2)		Percentage variation with respect to mix design Mix M30	Remarks
			Individual specimen	Average of three cubes		
1	Mix A (0% RAP)	8.294	28.35	26.95	-	Decrease
2		8.147	26.89			
3		8.188	25.61			
4	Mix B (25% RAP)	8.088	25.22	24.14	10.43%	
5		8.070	23.00			
6		7.935	24.21			
7	Mix C (50% RAP)	7.991	14.62	17.03	36.81%	
8		7.843	17.53			
9		8.137	18.93			
10	Mix D (75% RAP)	7.997	13.34	16.60	38.40%	
11		7.771	18.67			
12		8.068	17.78			
13	Mix E (100% RAP)	8.083	17.78	16.30	39.51%	
14		7.946	14.23			
15		8.095	16.90			

FLEXURAL TENSILE STRENGTH

Flexural strength of concrete is important for resistance to tension and cracking. Beam specimens of size 500mm * 100mm* 100mm (length*width*height) are cast for conducting flexural strength testing for each mix. The flexural test is carried out by using flexural strength testing machine as shown in figure 6.2(a.) The beam specimen is placed in the flexural strength testing machine as shows in such a manner that the load is applied to the uppermost surface as cast in the mould, along two line spaced 16.7cm apart (L/3=50/3=16.7cm) as show in figure 6.2(b). The axis of the specimen is carefully aligned with the axis of the loading device. The load is applied without shock and increasing continuously at a rate such that the extreme fibre stress increases at approximately 7kg/cm2 per minute until the specimen fail.

Results of Flexural tensile strength test on concrete Beam

Serial no	Mix Design	Weight of concrete cube (Kg)	Compressive strength After 7 days (N/mm^2)		Percentage variation with respect to mix design Mix M30	Remarks
			Individual Specimen	Average of three cubes		
1	Mix A (0% RAP)	12.10	6.953	6.32	-	Decrease
2		11.80	6.008			
3		11.90	6.008			
4	Mix B (25% RAP)	11.75	5.636	6.06	4.12%	
5		12.00	6.548			
6		11.80	6.008			
7	Mix C (50% RAP)	11.65	5.936	5.80	8.23%	
8		11.90	6.548			
9		11.50	4.928			
10	Mix D (75% RAP)	12.00	4.928	5.12	18.98%	
11		11.50	4.928			
12		11.75	5.498			
13	Mix E (100% RAP)	11.90	5.143	4.48	29.11%	
14		11.70	4.928			
15		11.40	3.375			

CONCLUSIONS

The research work on the topic "Recycling of Bituminous Aggregate in Cement Concrete – An Experimental Study" has been selected to examine the RAP mechanical along with physical properties that are used as coarse aggregate in cement concrete. This project consists of various tests on aggregate (both virgin and RAP) are carried out in laboratory to calculate the mechanical as well as physical properties of aggregates. flexural tensile strength along with Compressive strength tests are done on the concrete mixes, made up of a virgin and RAP aggregates in different proportion (mix A to E) conclusion of this research work is mention as:

Based on the Properties of aggregates

1 Currently, RAP aggregate is viewed as waste substance as well as it is efficient as compared to fresh aggregate. Thus RAP aggregate concrete will organically be affordable.

2 From table 4.6, is it observed that fresh aggregate's specific gravity varies between 2.69 to 2.68 as well as2.49 value is for RAP that is less than 8.2% to the fresh aggregate?

3 From table 4.6, it's found the fresh aggregate's water absorption is 0.5 which of RAP is 1.3. This shows the concrete mixture workability is going to reduce at the very same water-cement ratio, as the portion of RAP aggregate in cement concrete rises.

4 From table 4.9, it's found the gradation of recycled asphalt pavement aggregate up to the mark preferred gradation requirement identified by IS code: 383 1970. The new coarse aggregate of dimension 20mm, as well as 10mm, is fully/partially changed by recycled asphalt pavement aggregate.

5 From table 4.6, it's found the RAP crushing value along with fresh aggregate is 17.36 % along with 17.09 % respectively. Indicating in no major difference between the 2.

6 From table 4.6, it's additionally found the importance of all of the attributes of RAP aggregate except bitumen material, doesn't go over on the allowable limits for blend models specified by IS code: 383 1970. Hence the recycled asphalt pavement aggregate utilized in the current study is ideal for concrete mix models.

Based on the Compressive strength of concrete

7 From table 6.1, it's found the compressive power of the recycled asphalt pavement concrete mixes that is mix E, mix D, mix C, and mix B as compared to fresh concrete mix M30 (mix A), after 7day, is laser by 10.4 %, 38.4 %, 36.8 % along with 39.5 %. This suggests that there's a gradual decrease in the compressive strength of concrete mix (M30) as percentage of RAP content rises. It's additionally discovered the least compressive power of the concrete blend (M30) made of a RAP aggregate following seven days is around 60 % to which of the fresh aggregate concrete mix (M30).

8 Table 6.2 shows that, recycled asphalt pavement concrete's compressive strength mixes that is mix E, mix D, mix C, and also mix B as compared to fresh concrete mix M30 (mix A), following twenty-eight days is smaller by 23.9 %, 18.1%,6.9 %, along with 32.8 %. This suggests that there's a gradual decrease in the compressive strength of concrete mix (M30) (after twenty-eight days) as percentage of RAP content increases. It's additionally discovered the least compressive power of the concrete blend (M30) comprised of RAP aggregate following twenty-eight days is around 67 % to which of the fresh concrete mix (M30).

9 From table 6.3, it's found that RAP mixture decreases the gain rate of compressive power as in comparison to fresh aggregate.

THE SCOPE FOR FURTHER STUDY

1. The study can be extended on cement concrete mixes with RAP in following directions Effect of water-cement ratio,
2. Effect of admixtures and
3. Post 28 days strength characteristics can also be studied

REFERENCE

[1] IS : 383-1970, specification of coarse and fine aggregate from natural sources for concrete

[2] IS : 2386 (part 3)-1963, for specific gravity and water absorption

[3] IS : 2386 (part 4)-1963, for crushing strength and impact test

[4] IRC :44-2008, for mix design

[5] ASTM 2127, for determining the bitumen content

[6] IS: 516-1959, for testing strength of concrete

[7] MORTH specification, for checking gradation of aggregate

[8] Murshed delwar, F. Mostafa and R Taha (1997), "Use of reclaimed asphalt pavement as an aggregate in Portland cement concrete", ACI material journal, vol94 (3)251-256

[9] Baoshan huang, Xiang Shu, Guoqiang Li(2005),"Laboratory investigation of Portland cement concrete containing RAP", cement and concrete research,58(5):313-320

[10] Salim al-oraimin, Hossam F. Hassan and Abdulwahid Hago (2007), "Recycling of reclaimed asphalt pavement in Portland cement concrete", the journal of engineering research,vol 6 no-1 (2009) 37-45

[11] Fields o.okafor (2010), "Performance of recycled asphalt pavement as coarse aggregate in concrete ",Leanardo electronic journal of practice and technologies ISSN 1583-1078, p47-58

[12] Kelly, T.D. (1998), the substitution of crushed cement concrete for construction aggregate : us geological survey circular 1177,15p. http://greenworld .cr.usgs.gov/pub/circular/c1177

[13] Concrete book by M L Gambir

[14] http://Wikipedi .com

[15] Building Innovation & Construction Technology (1999), "Recycling hits new high in urban infrastructure first". http://www.cmit.csiro.au/innovation/1999-02/recyclestreet.htm

[16] Environmental council of concrete organizations, "recycling concrete saves resources, eliminates dumping". http://www.ecco.org/pdfs/ev15.pdf

[17] Kajima Corporation, annual report (2002), "Research and development page 16".

[18] Kawano, H., 1995. The state of reuse of demolished concrete in Japan, Integrated design and environmental issues in concrete technology. Proceedings of the International Workshop 'Rational Design of Concrete Structures under severe Conditions' Hakodate, japan, 7-9 August 1995, 243-249.

[19] Market development study for recycled aggregate product, report to waste reduction advisory committee, may (2001) file 15-14-96