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UNLEASHING THE POWER OF BLAST FURNACE SLAG: REVOLUTIONIZING PAVER BLOCK MANUFACTURING

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Abstract: Paver blocks have emerged as a sought-after choice, lauded for their myriad benefits. As a versatile pavement surfacing option, they come in various materials such as concrete, clay, and recycled plastic. The installation of paver blocks has become commonplace, offering not only aesthetic appeal but also value enhancement for properties, driveways, and more. However, cost reduction remains a significant challenge in the current landscape, necessitating the exploration of affordable materials for paver block production. In a developing country like India, where construction of roadways and buildings holds immense importance, the demand for paver blocks continues to soar. These blocks, comprising semi-dry concrete mixes with minimal slump and smaller stone chips compared to conventional concrete, find extensive applications in outdoor settings, streets, and various construction projects. To further enhance the strength and performance of paver blocks, this project focuses on the utilization of Ground Granulated Blast Furnace Slag (GGBS). By partially replacing cement and fine aggregates with GGBS in M30 and M50 grade concrete, the compressive strength, flexural strength, and water absorption of the paver blocks are evaluated. The findings reveal that the strength values, including compressive and splitting tensile strength, are notably higher when GGBFS is substituted at a 40% level in both M30 and M50 grade concrete paver blocks. The primary objective of this project is to tap into the potential of GGBS, a waste product, for eco-friendly paver block production. By harnessing this resource, we aim to contribute to the construction industry while promoting sustainable practices. This research paves the way for the utilization of GGBS in the manufacturing process, ensuring a greener and more efficient approach to paver block production. In conclusion, this project seeks to revolutionize paver block manufacturing by embracing the advantages of GGBS. By leveraging this waste product, we not only enhance the strength and performance of paver blocks but also promote environmentally friendly practices in the construction industry

Index Terms **- Paver blocks, Sustainability, GGBS (Grounded Granulated Blast Slag).**

I. INTRODUCTION

Concrete consumption is on the rise, particularly in the usage of concrete paver blocks for various applications such as street roads, small and medium market roads, and construction sites. Concrete block pavement provides flexibility to withstand stress from earthquakes, freezing, thawing, and ground erosion.

The process of construction waste management involves several steps:

- Initiating: Analyzing construction waste materials to prevent their disposal in landfills.
- Planning: Identifying the root causes of waste materials and categorizing them as reusable or unusable.
- Executing: Reducing the purchase of new materials and disposal costs, implementing effective waste management practices.

- Controlling and closing: Identifying the root causes of material waste, providing training to workers and engineers, and exploring alternative methods to minimize waste during construction activities.

By implementing these steps, we can effectively manage construction waste and promote sustainable practices in the industry

Blast furnace slag undergoes various cooling processes to produce different types of slag with unique properties. These types include air-cooled slag, granulated slag, and expanded slag. Air-cooled slag forms naturally in pits under atmospheric conditions, resulting in porous and low-density aggregates suitable for many applications, such as ready mixed concrete and road bases. Granulated slag is produced by quenching the molten slag with high-pressure water jets, creating granular and glassy aggregates. It is commonly used in cement production due to its pozzolanic characteristics.

Steel plants utilize cold slag for internal purposes and for outside sale, such as road metal and railway ballast. Granulated slag is also sold to cement plants, reducing the overall production cost of cement. Expanded slag is formed by controlled cooling in water or with a combination of steam and compressed air, resulting in a lightweight aggregate suitable for concrete. However, domestic iron and steel plants do not produce expanded slag.

Another product derived from blast furnace slag is mineral wool/slag wool, produced by melting the cooled slag and forming fibrous materials with excellent thermal insulation properties. These diverse forms of slag have found applications in construction, cement production, and insulation, contributing to cost-effective and sustainable practices in the industry.

II. OBJECTIVES OF THE PAPER

1. This research aims to uncover the potential of using induction furnace slag as a substitute for natural aggregate in concrete, exploring its feasibility and benefits.
2. The primary focus of this study is to examine the characteristics and properties of concrete when incorporating induction furnace slag aggregates.
3. The objective is to analyze the impact of induction furnace slag on the compressive strength of concrete, evaluating its performance in this aspect.
4. By comparing the fundamental properties, including compressive strength and splitting tensile strength, of ground granulated blast furnace slag with ordinary concrete, this investigation aims to gain insights into their differences and advantages.

III. NEED OF STUDY

- Since the use of conventional bricks has administered labour cost and material cost to a large extent which also requires mortar for binding purpose, the cost reduction is the major need in today's industry so as to achieve economy on larger scale use.
- No doubt conventional bricks are of good strength, but it takes time and money together, rather than that , paver blocks can be used in such a way that minimizes the cost as well as strength. And hence, this optimization procedure is adopted to find out the best solution in terms of quality and cost.
- Now a days, waste reduction has just became a myth, whether it is a wastewater sludge or production waste. If this study gets a way through, the large scale waste can be reused for this purpose converting the myth to reality.
- If the interlocking paver blocks are used in the construction procedure, the construction time reduction leading to the aim of providing shelter to the maximum crowd will be a boon to society.

IV. SCOPE OF THE STUDY

This research exclusively focuses on utilizing construction waste in the form of GGBS (Ground granulated blast furnace slag), while excluding other waste materials like crushed bricks, asphalt wastes, and plastic fragments. The investigation centers on four key properties of concrete paving blocks: compressive strength, tensile splitting strength, water absorption, and abrasion resistance. Additionally, different laying patterns, such as stretcher pattern, basket pattern, and herringbone pattern, exist for paving blocks. However, in this study, the paving blocks were specifically laid in a stretcher pattern during the static loading test conducted on a section of block pavement.

V. LITERATURE REVIEW

(Badwaik, Zade and Kolhe) worked on the objective of this study where they explored the use of blast furnace slag (BFS) and granulated blast furnace slag (GBFS) in paver blocks, specifically replacing sand with BFS and cement with GBFS. This experimental investigation aims to contribute towards sustainable development. The study involves mixing BFS and GBFS with sand and cement at various weight ratios, preparing different material compositions. Compression tests are conducted on each sample to assess its performance. The obtained results are analyzed, and the potential application of the material in paver blocks is evaluated.

(Bhadange, Bhusare and Garole) did experimental investigation which focuses on replacing natural river sand with granulated blast furnace slag (GBFS) as a fine aggregate in cement concrete. GBFS is a by-product of the iron and steel production process and is typically discarded as solid waste. However, utilizing GBFS as a substitute for fine aggregate offers an environmentally friendly solution to solid waste management. In this project, different percentages of GBFS (ranging from 0% to 30%, 40%, and 50%) were used to replace natural river sand in the compression test, resulting in the casting of 12 cubes to assess the concrete's compression strength. Additionally, GBFS was used in quantities of 25%, 30%, and 35% to replace natural river sand, and concrete properties such as compression, tension, and flexure were evaluated. For the compression test, nine cubes were produced, and 12 cylinders were created for the split tensile test, covering different percentages of tensile strengths.

(Jallul, Ganjian and Sadeghi-Pouya), their investigation explored the use of by-product materials and waste in paving block production. Ground granulated blast-furnace slag, basic oxygen slag, plasterboard gypsum, and cement by-pass dust were examined. Ternary blends were tested for various properties according to British Standard BS EN 1338. The study found that up to 30% cement replacement can be achieved without significant impact on strength and durability. Cement mixes can contain specific percentages of slag, dust, and gypsum. Paving blocks with up to 10% by-pass dust met tensile strength requirements. Strength can be achieved with less than 5% plasterboard gypsum.

(Yeole and Varma), in this paper, did a parametric experimental study for producing paving blocks using waste steel aggregates (the form of rounded bearings of size 6.35 mm) is presented. Waste steel bearings are added in concrete of paver blocks in various percentages. Rubber pads are also used below the paver blocks. Impact strength of paver blocks with various percentages of waste steel aggregates and using rubber pads is investigated. Test results show that combination of using rubber pads and adding various percentages of waste steel aggregates in paver blocks gives up to 50% more impact strength than ordinary paver blocks.

A new processing technique has been developed in this study by (Kumar, Kumar and Sah) to convert blast furnace slag into fine aggregate, fully replacing river sand in construction. The processed slag, known as slag sand or PGBS, meets the required strength, durability, and workability standards for concrete. This innovative alternative material offers economic benefits, conserves natural resources, and promotes the recycling of by-products. JSW Steel Vijayanagar works in India extensively utilizes and markets this slag sand. The two-stage processing technique transforms the slag particles into high-density sand that meets specifications. Concrete samples using processed slag as a replacement for river sand showed promising performance, allowing for full or partial replacement with manufactured sand or river sand.

(Gawatre, Ghaytadkar and Gage) explored the sustainable use of concrete waste in the manufacturing of interlocking paver blocks. Crushed concrete waste is utilized as a replacement for coarse and fine aggregate in the paver blocks, with a half replacement ratio following specifications. The project considers material selection, size, shape, mix design, and specific casting methodology, along with various tests. The impact value and crushing value of the concrete waste aggregates exceed the requirements recommended by IS standards. The interlocking paver blocks achieved a maximum compression strength of 30.33MPa after 28 days with 40% debris, a maximum flexure strength of 4.57MPa after 28 days with 50% debris, and a minimum water absorption of 3.02% after 28 days with 40% debris.

VI. METHODOLOGY

This flowchart shown below gives the brief idea about the paper.

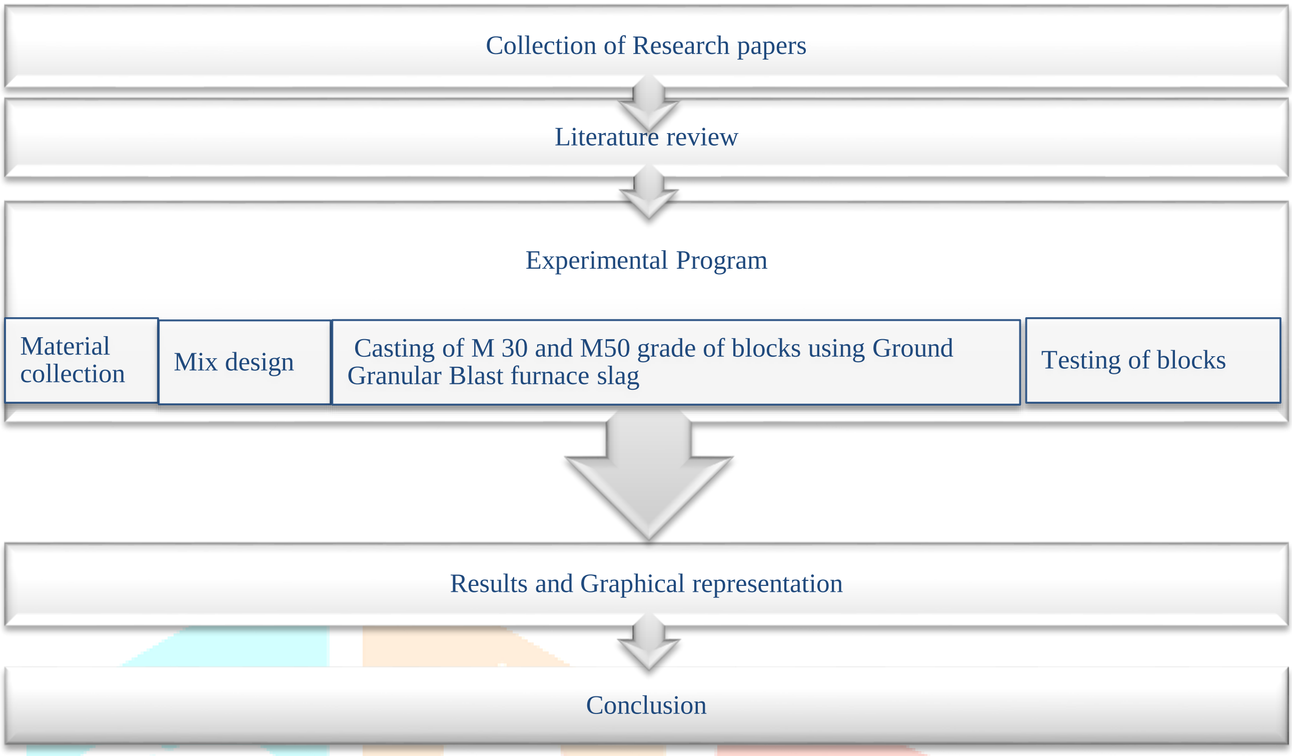

Figure 1 Flowchart of Methodology

VII. RESULTS AND DISCUSSION

Paver blocks were casted with two different concrete mixes, M30 and M50 grade, following IS 10262:2009. The aggregates used had a nominal size of 12mm as per IS 15656:2006. The blocks were tested at 7 and 28 days. The design mixes had a 49% proportion of coarse aggregate and a 51% proportion of fine aggregate. The thickness of the concrete paving blocks was 60mm for M30 grade and 100mm for M50 grade. Various percentages of Grounded Granular Blast Furnace Slag (0% to 100%) were added to the cement content. The mix proportions complied with IS 10262:2009, IRC: SP: 63:2004, and IS: 15658:2006 guidelines. A total of 216 blocks were casted, with 108 blocks each for M30 and M50 grade, considering different replacements and curing periods.

Water Absorption test result:

The table below shows the result of water absorption test conducted

Table 1 Water Absorption of M30 and M50 concrete paver block

Mix	Water absorption (%)					
	Control	20%	40%	60%	80%	100%
M30	4.21	4.2	4.12	4.2	4.3	4.69
M50	2.97	2.86	2.89	2.87	2.98	2.99

The graph below shows the variation of water absorption due to change in Ground Granulated blast furnace slag for M 30& M50

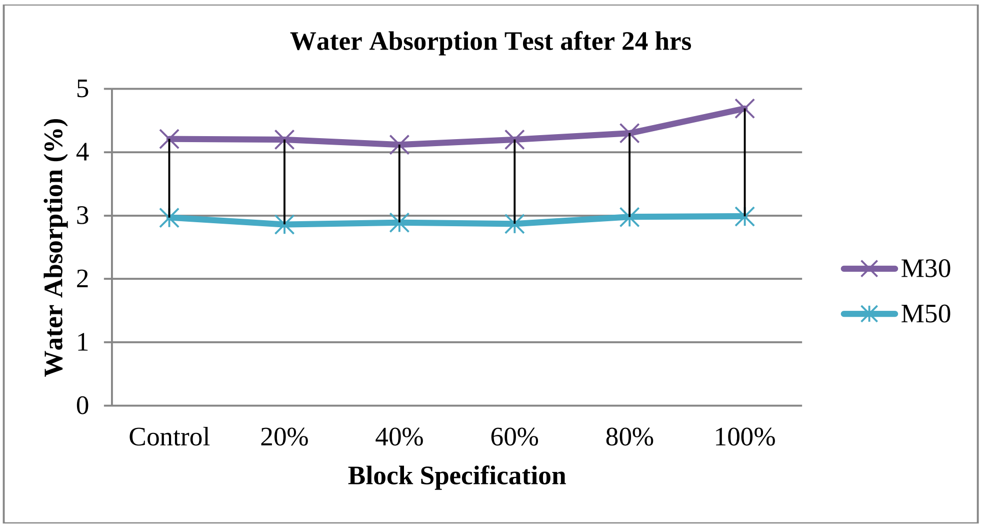

Figure 2 Water absorption test graph for M30 and M50 concrete grades

Compressive Strength Result (7 days) (M30 grade)

Notations for block specifications:
CC - Control
C20 - Compression testing cubes (20% replacement)
C40 - Compression testing cubes (40% replacement)
C60 - Compression testing cubes (60% replacement)
C80 - Compression testing cubes (80% replacement)
C100 - Compression testing cubes (100% replacement)

Table 2 Compressive Strength (7days) for M30 grade of concrete paver block

Compressive Strength (7days) for M30 grade of concrete paver block				
Sr. No.	**Block Specification**	**Load (kN)**	**Compressive stress (MPa)**	**Average Compressive stress (MPa)**
1	**CC-1**	747	21.74	21.96333
2	**CC-2**	756.83	22.026	
3	**CC-3**	760.21	22.124	
4	**C20-1**	560.21	16.3	17.82
5	**C20-2**	628.23	18.23	
6	**C20-3**	650.34	18.93	
7	**C40-1**	771.82	22.46	22.50667
8	**C40-2**	782.21	22.76	
9	**C40-3**	766.1	22.3	
10	**C60-1**	735.2	21.4	20.92333
11	**C60-2**	720.15	20.96	
12	**C60-3**	701.24	20.41	
13	**C80-1**	698.54	20.33	20.09333
14	**C80-2**	688.65	20.04	
15	**C80-3**	684.14	19.91	
16	**C100-1**	556.23	16.188	16.326
17	**C100-2**	586.44	17.06	
18	**C100-3**	540.6	15.73	

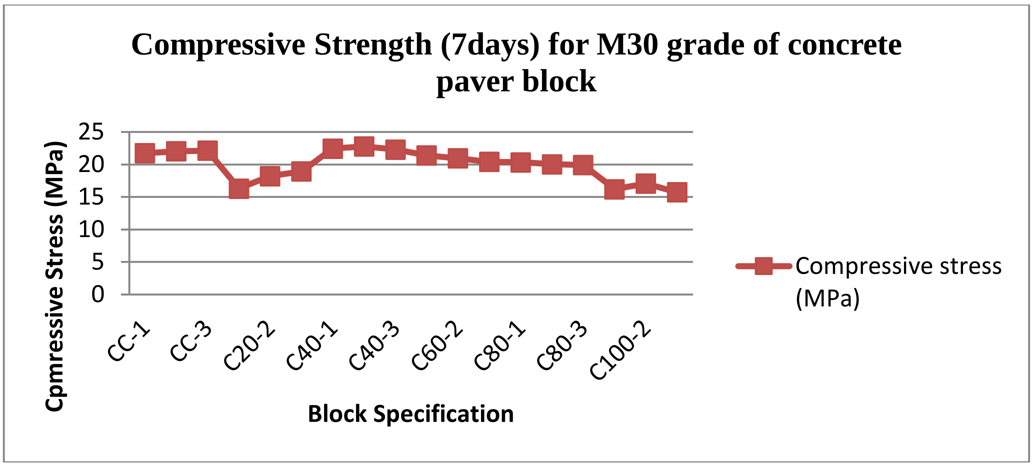

Figure 3 Graph of Compressive strength after 7 days for M30 grade of concrete paver block

Compressive Strength Result (28 days) (M 30 grade)

Notations for block specifications:
CC - Control
C20 - Compression testing blocks (20% replacement)
C40 - Compression testing blocks (40% replacement)
C60 - Compression testing blocks (60% replacement)
C80 - Compression testing blocks (80% replacement)
C100 - Compression testing blocks (100% replacement)

Table 2 Compressive Strength (28days) for M30 grade of concrete paver block

Compressive Strength (28days) for M30 grade of concrete paver block				
Sr. No.	**Block Specification**	**Load (kN)**	**Compressive stress (MPa)**	**Average Compressive stress (MPa)**
1	**CC-4**	1072.26	31.207	32.275
2	**CC-5**	1102.35	32.082	
3	**CC-6**	1152.32	33.537	
4	**C20-4**	980.21	28.528	28.391
5	**C20-5**	950.52	27.664	
6	**C20-6**	995.86	28.983	
7	**C40-4**	1200.91	34.951	35.962
8	**C40-5**	1265.31	36.825	
9	**C40-6**	1240.7	36.109	
10	**C60-4**	1005.23	29.256	30.012
11	**C60-5**	1025.3	29.840	
12	**C60-6**	1063.1	30.940	
13	**C80-4**	998.45	29.058	28.142
14	**C80-5**	956.32	27.832	
15	**C80-6**	946.13	27.536	
16	**C100-4**	968.32	28.182	27.948
17	**C100-5**	956.23	27.830	
18	**C100-6**	956.32	27.832	

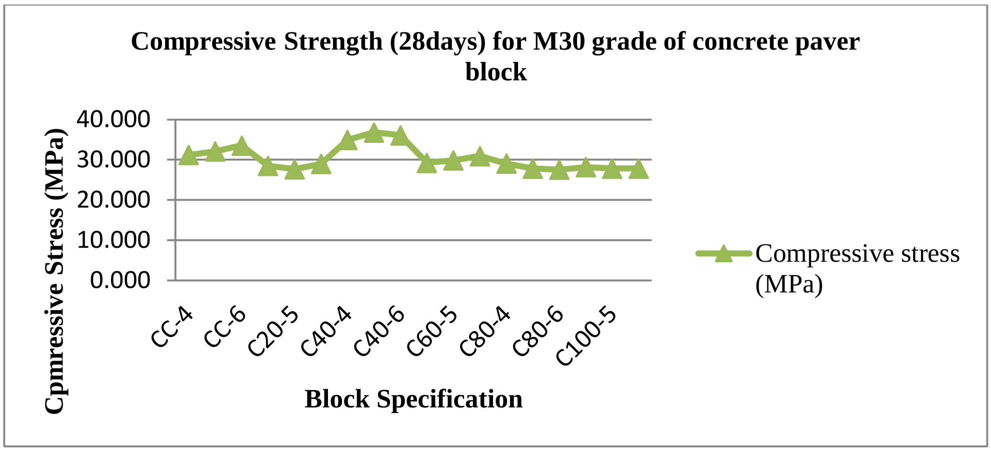

Figure I Graph of Compressive Strength (28days) for M30 grade of concrete paver block

Splitting Tensile Strength (7 days) (M30 grade)

Table I.3 Splitting Tensile Strength (7days) for M30 grade of concrete paver block

Splitting Tensile Strength (7days) for M30 grade of concrete paver block			
Sr. No.	**Block Specification**	**Splitting Tensile Strength (MPa)**	**Average Splitting Tensile Strength (MPa)**
1	**ST-1**	2.25	2.116667
2	**ST-2**	2.1	
3	**ST-3**	2	
4	**S20-1**	2	1.993333
5	**S20-2**	2.01	
6	**S20-3**	1.97	
7	**S40-1**	2.27	2.243333
8	**S40-2**	2.26	
9	**S40-3**	2.2	
10	**S60-1**	2.14	2.133333
11	**S60-2**	2.11	
12	**S60-3**	2.15	
13	**S80-1**	1.98	1.963333
14	**S80-2**	1.95	
15	**S80-3**	1.96	
16	**S100-1**	1.95	1.95
17	**S100-2**	1.96	
18	**S100-3**	1.94	

ST - Splitting tensile Control specimen
S 20 - Splitting tensile strength blocks (20% replacement)
S 40 - Splitting tensile strength blocks (40% replacement)
S 60 - Splitting tensile strength blocks (60% replacement)
S 80 - Splitting tensile strength blocks (80% replacement)
S 100 - Splitting tensile strength blocks (100% replacement)

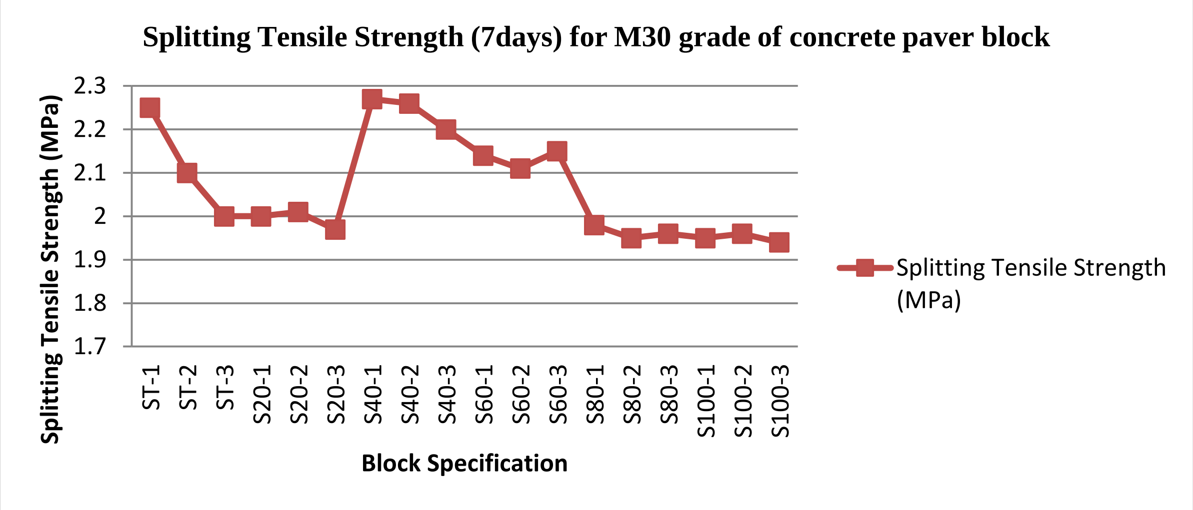

Figure 5 Graph of Splitting Tensile Strength (7days) for M30 grade of concrete paver block

Splitting Tensile Strength (28 days) (M30 grade)

Table 4 Splitting Tensile Strength (28days) for M30 grade of concrete paver block

Splitting Tensile Strength (28days) for M30 grade of concrete paver block			
Sr. No.	**Block Specification**	**Splitting Tensile Strength (MPa)**	**Average Splitting Tensile Strength (MPa)**
1	**ST-4**	2.67	2.59
2	**ST-5**	2.5	
3	**ST-6**	2.6	
4	**S20-4**	2.25	2.23
5	**S20-5**	2.21	
6	**S20-6**	2.23	
7	**S40-4**	2.67	2.796667
8	**S40-5**	2.85	
9	**S40-6**	2.87	
10	**S60-4**	2.4	2.483333
11	**S60-5**	2.45	
12	**S60-6**	2.6	
13	**S80-4**	2.02	2.043333
14	**S80-5**	2.1	
15	**S80-6**	2.01	
16	**S100-4**	2.01	2.003333
17	**S100-5**	1.98	
18	**S100-6**	2.02	

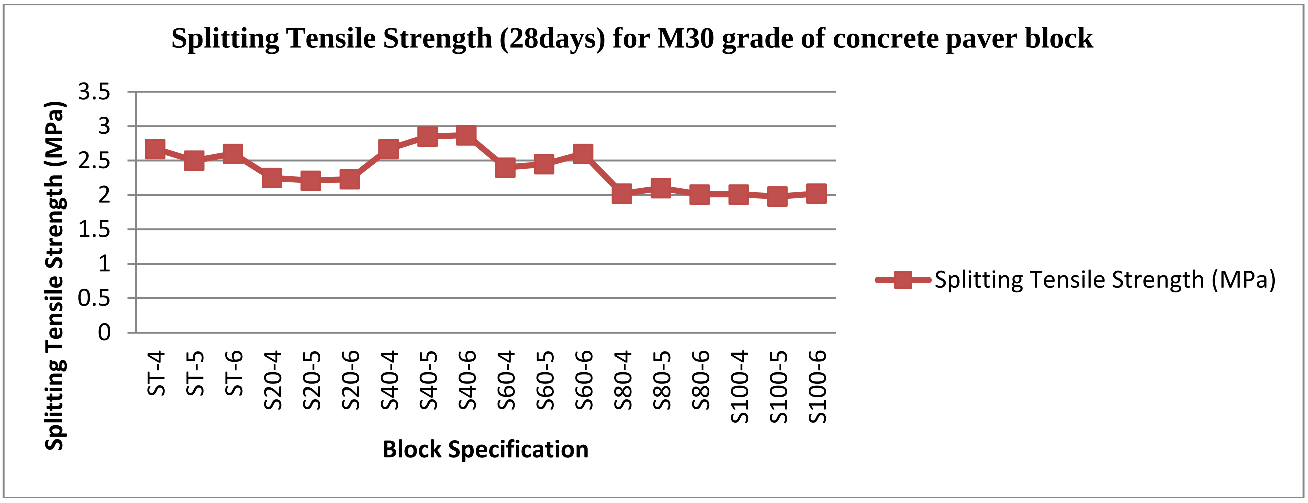

Figure 6 Graph of Splitting Tensile Strength (28days) for M30 grade of concrete paver block

Abrasive Resistance Test (M 30 grade of Concrete Paver Block)

Notations:
AR - Abrasion Resistance control specimen
A 20 - Abrasion Resistance paver blocks (20% replacement)
A 20 - Abrasion Resistance paver blocks (40% replacement)
A 20 - Abrasion Resistance paver blocks (60% replacement)
A 20 - Abrasion Resistance paver blocks (80% replacement)
A 20 - Abrasion Resistance paver blocks (100% replacement)

Table 5 Abrasive Resistance (7days) for M30 grade of concrete paver block

Abrasive Resistance (7days) for M30 grade of concrete paver block			
Sr. No.	**Block Specification**	**Abrasive Resistance (mm)**	**Average Abrasive Resistance (mm)**
1	**AR-1**	0.719	0.714
2	**AR-2**	0.705	
3	**AR-3**	0.719	
4	**A20-1**	0.721	0.714
5	**A20-2**	0.71	
6	**A20-3**	0.71	
7	**A40-1**	0.72	0.707
8	**A40-2**	0.7	
9	**A40-3**	0.7	
10	**A60-1**	0.71	0.713
11	**A60-2**	0.71	
12	**A60-3**	0.72	
13	**A80-1**	0.715	0.716
14	**A80-2**	0.716	
15	**A80-3**	0.718	
16	**A100-1**	0.719	0.723
17	**A100-2**	0.72	
18	**A100-3**	0.73	

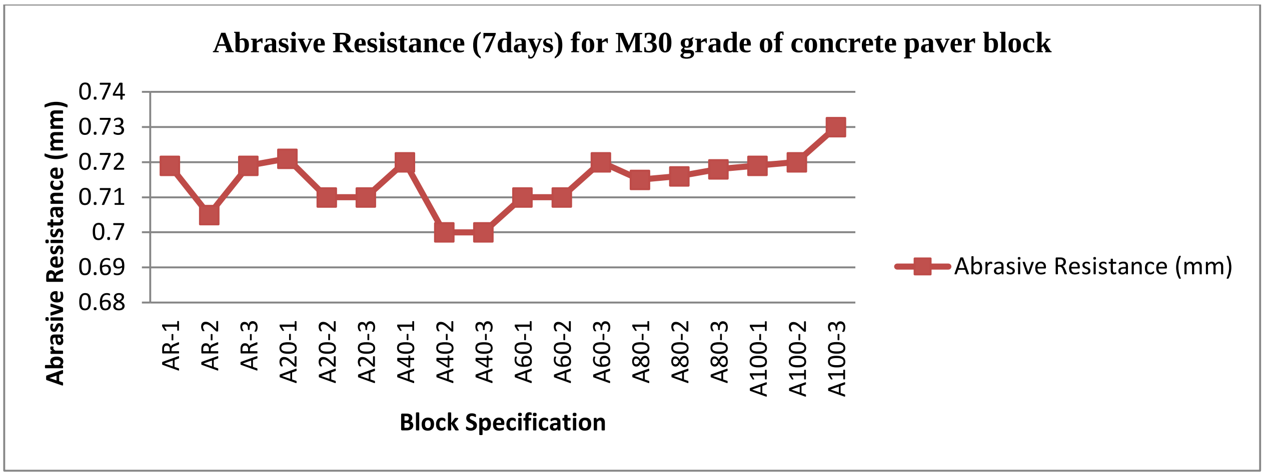

Figure 7 Graph of Abrasive Resistance (7days) for M30 grade of concrete paver block

Compressive Strength Result (7 days) (M50 grade)

Table 7 Compressive Strength (7days) for M50 grade of concrete paver block

Compressive Strength (7days) for M50 grade of concrete paver block				
Sr. No.	**Block Specification**	**Load (kN)**	**Compressive stress (MPa)**	**Average Compressive stress (MPa)**
1	**CC-7**	1200.23	34.931	35.496
2	**CC-8**	1252.12	36.441	
3	**CC-9**	1206.62	35.117	
4	**C20-7**	1255.21	36.531	36.715
5	**C20-8**	1263.1	36.761	
6	**C20-9**	1266.32	36.854	
7	**C40-7**	1275.52	37.122	37.412
8	**C40-8**	1285.66	37.417	
9	**C40-9**	1295.21	37.695	
10	**C60-7**	1265.32	36.825	36.511
11	**C60-8**	1256.14	36.558	
12	**C60-9**	1242.05	36.148	
13	**C80-7**	1201.2	34.959	35.204
14	**C80-8**	1214.32	35.341	
15	**C80-9**	1213.32	35.312	
16	**C100-7**	1210.02	35.216	35.088
17	**C100-8**	1201.3	34.962	
18	**C100-9**	1205.6	35.087	

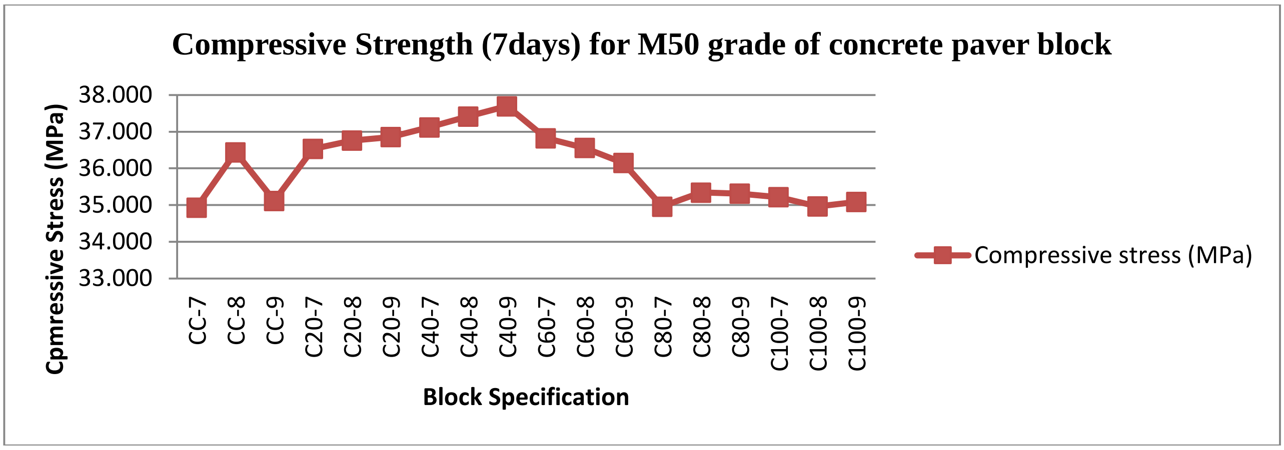

Figure 8 Graph of Compressive Strength (7days) for M50 grade of concrete paver block

Compressive Strength Result (28 days) (M50 grade)

Table 8 Compressive Strength (28days) for M50 grade of concrete paver block

Compressive Strength (28days) for M50 grade of concrete paver block				
Sr. No.	**Block Specification**	**Load (kN)**	**Compressive stress (MPa)**	**Average Compressive stress (MPa)**
1	**CC-10**	1805.23	52.539	53.121
2	**CC-11**	1810.23	52.684	
3	**CC-12**	1860.21	54.139	
4	**C20-10**	1865.21	54.284	54.094
5	**C20-11**	1865.13	54.282	
6	**C20-12**	1845.66	53.715	
7	**C40-10**	1900.91	55.323	55.272
8	**C40-11**	1895.23	55.158	
9	**C40-12**	1901.33	55.336	
10	**C60-10**	1855.41	53.999	53.890
11	**C60-11**	1859.23	54.110	
12	**C60-12**	1840.36	53.561	
13	**C80-10**	1842.02	53.609	53.359
14	**C80-11**	1832.6	53.335	
15	**C80-12**	1825.62	53.132	
16	**C100-10**	1820.1	52.971	52.704
17	**C100-11**	1802.35	52.455	
18	**C100-12**	1810.3	52.686	

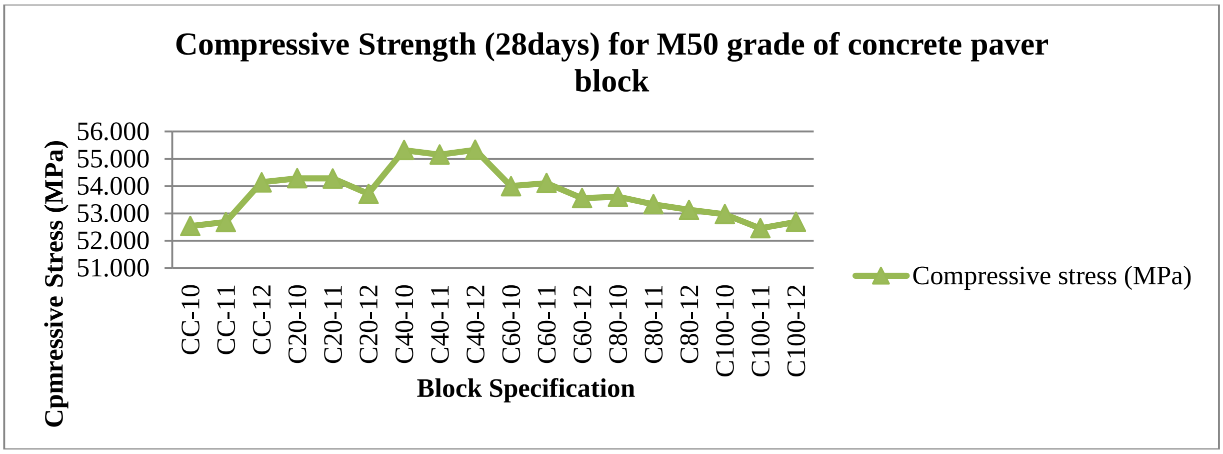

Figure 9 Graph of Compressive Strength (28days) for M50 grade of concrete paver block

Splitting Tensile Strength (7days) (M50 grade)

Table I.6 Splitting Tensile Strength (7days) for M50 grade of concrete paver block

Splitting Tensile Strength (7days) for M50 grade of concrete paver block			
Sr. No.	**Block Specification**	**Splitting Tensile Strength (MPa)**	**Average Splitting Tensile Strength (MPa)**
1	**ST-7**	3.08	3.097
2	**ST-8**	3.06	
3	**ST-9**	3.15	
4	**S20-7**	3.05	3.117
5	**S20-8**	3.2	
6	**S20-9**	3.1	
7	**S40-7**	3.3	3.330
8	**S40-8**	3.35	
9	**S40-9**	3.34	
10	**S60-7**	3.2	3.183
11	**S60-8**	3.15	
12	**S60-9**	3.2	
13	**S80-7**	3.18	3.110
14	**S80-8**	3.1	
15	**S80-9**	3.05	
16	**S100-7**	3.06	3.037
17	**S100-8**	3.05	
18	**S100-9**	3	

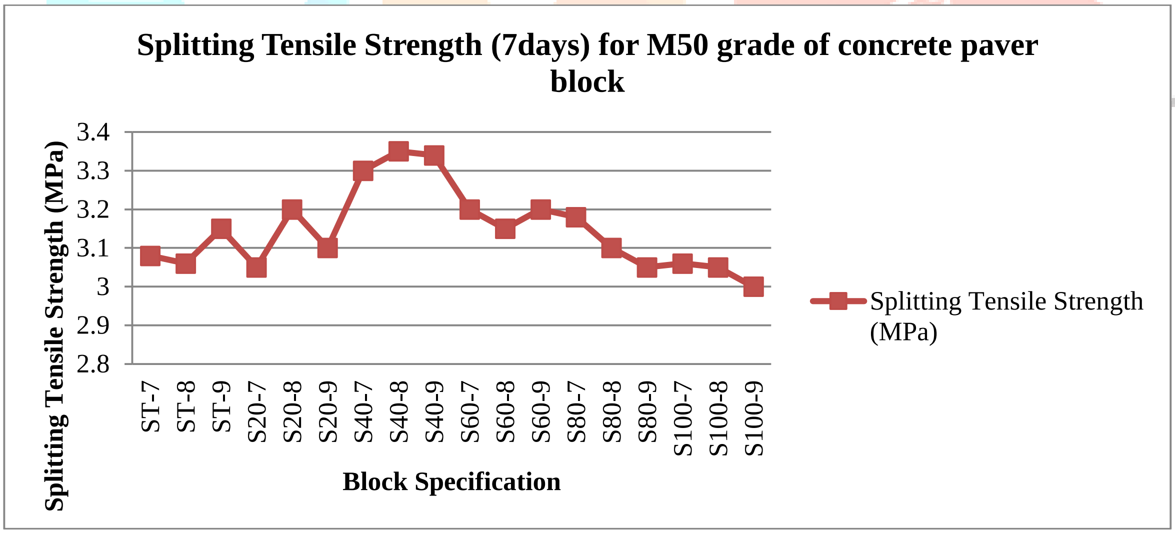

Figure 10 Graph of Splitting Tensile Strength (7days) for M50 grade of concrete paver block

Splitting Tensile Strength (28days) (M50 grade)

Table 12 Splitting Tensile Strength (28days) for M50 grade of concrete paver block

Splitting Tensile Strength (28days) for M50 grade of concrete paver block			
Sr. No.	**Block Specification**	**Splitting Tensile Strength (MPa)**	**Average Splitting Tensile Strength (MPa)**
1	**ST-10**	5.05	5.097
2	**ST-11**	5.09	
3	**ST-12**	5.15	
4	**S20-10**	5.11	5.130
5	**S20-11**	5.16	
6	**S20-12**	5.12	
7	**S40-10**	5.22	5.247
8	**S40-11**	5.23	
9	**S40-12**	5.29	
10	**S60-10**	5.1	5.170
11	**S60-11**	5.22	
12	**S60-12**	5.19	
13	**S80-10**	5.15	5.140
14	**S80-11**	5.13	
15	**S80-12**	5.14	
16	**S100-10**	5.1	5.057
17	**S100-11**	5.05	
18	**S100-12**	5.02	

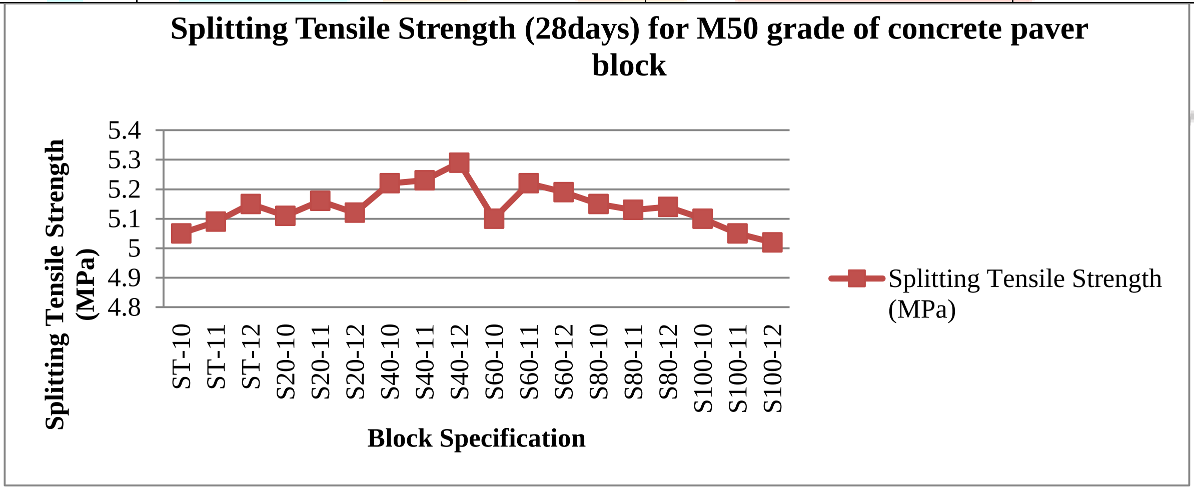

Figure 11 Graph of Splitting Tensile Strength (28days) for M50 grade of concrete paver block

Abrasive Resistance (7days) for M50 grade

Table I.7 Abrasive Resistance (7days) for M50 grade of concrete paver block

Abrasive Resistance (7days) for M50 grade of concrete paver block			
Sr. No.	**Block Specification**	**Abrasive Resistance (mm)**	**Average Abrasive Resistance (mm)**
1	**AR-7**	0.8	0.783
2	**AR-8**	0.85	
3	**AR-9**	0.7	
4	**A20-7**	0.75	0.777
5	**A20-8**	0.78	
6	**A20-9**	0.8	
7	**A40-7**	0.76	0.737
8	**A40-8**	0.74	
9	**A40-9**	0.71	
10	**A60-7**	0.75	0.740
11	**A60-8**	0.74	
12	**A60-9**	0.73	
13	**A80-7**	0.76	0.763
14	**A80-8**	0.78	
15	**A80-9**	0.75	
16	**A100-7**	0.76	0.767
17	**A100-8**	0.76	
18	**A100-9**	0.78	

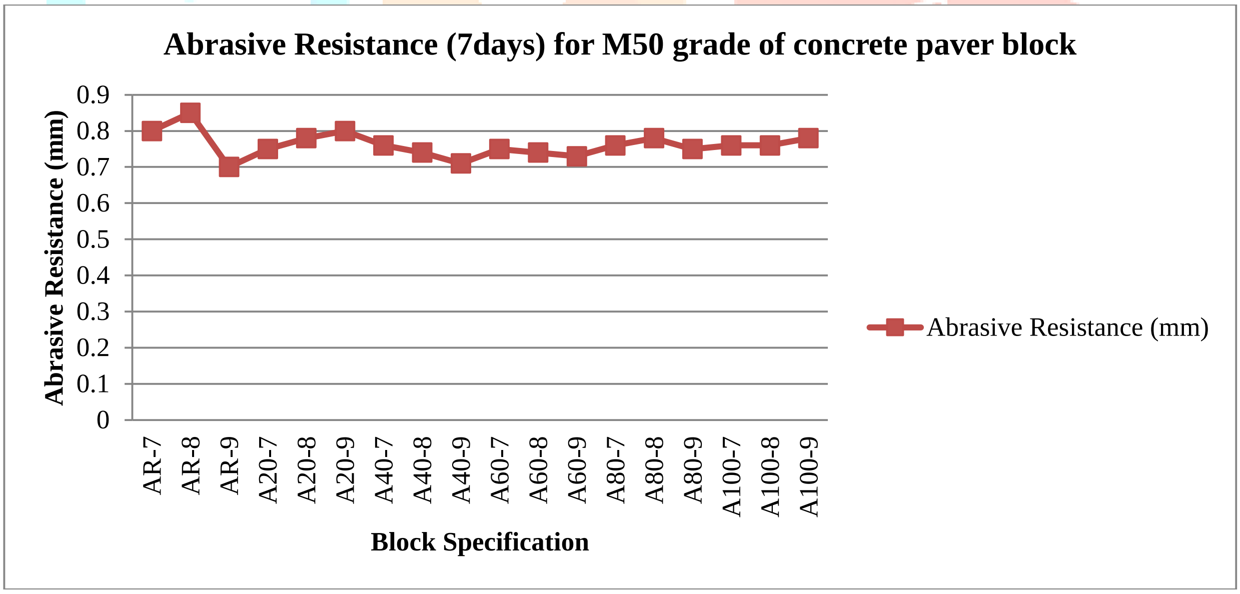

Figure 12 Graph of Abrasive Resistance (7days) for M50 grade of concrete paver block

Abrasive Resistance (7days) for M50 grade

Table 12 Abrasive Resistance (28 days) for M50 grade of concrete paver block

Abrasive Resistance (28 days) for M50 grade of concrete paver block			
Sr. No.	**Block Specification**	**Abrasive Resistance (mm)**	**Average Abrasive Resistance (mm)**
1	**AR-10**	1.35	1.314
2	**AR-11**	1.287	
3	**AR-12**	1.305	
4	**A20-10**	1.25	1.303
5	**A20-11**	1.305	
6	**A20-12**	1.355	
7	**A40-10**	1.305	1.283
8	**A40-11**	1.285	
9	**A40-12**	1.258	
10	**A60-10**	1.298	1.303
11	**A60-11**	1.305	
12	**A60-12**	1.307	
13	**A80-10**	1.309	1.309
14	**A80-11**	1.31	
15	**A80-12**	1.309	
16	**A100-10**	1.301	1.308
17	**A100-11**	1.308	
18	**A100-12**	1.315	

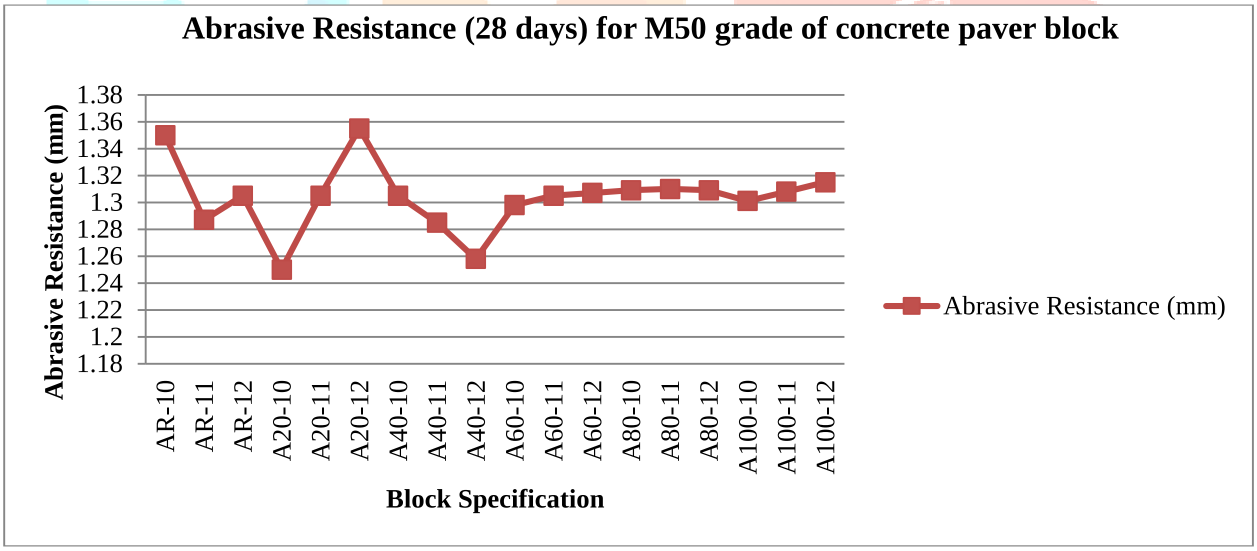

Figure 13 Graph of Abrasive Resistance (28 days) for M50 grade of concrete paver block

VIII. CONCLUSION

1. Compressive Strength of Concrete Paver Blocks for M30 grade of is highest for 40 % replacement of GGBFS after 7 and 28 days i.e., 22.5 MPa and 35.96 MPa as compared with the other replacements. Its lowest for 100% replacement of GGBFS.
2. Similarly, Compressive Strength of Concrete Paver Blocks for M50 grade is higher for 20 % and 40 % replacement values of GGBFS i.e., 54.094 MPa and 55.272 MPa after 28 days and the lowest values of compressive strength are for 100% replacement.
3. Splitting Tensile Strength of concrete paver blocks for M30 grade is highest for 40% replacement of GGBFS after 7 and 28 days i.e., 2.24 MPa and 2.79 MPa respectively, whereas the lowest values are for 80 % and 100% replacements 1.96 MPa and 1.95 MPa after 7 days and 2.04MPa and 2.00 MPa respectively.
4. Splitting Tensile Strength of concrete paver blocks for M50 grade is highest for 40% replacement of GGBFS after 7 and 28 days i.e., 3.33 MPa and 5.247MPa with respect to the other values having lower values for conventional and 100% replacement.
5. Abrasive resistance of concrete paver blocks for M30 grade is higher in 100 % replacement of GGBFS after 7 days, i.e., 0.723 mm and highest in 60 % replacement after 28 days i.e., 1.287 mm whereas these values are lower for 50 % replacement of GGBFS.
6. Abrasive resistance of concrete paver blocks for M50 grade is higher for conventional block (control) after 7 days i.e., 0.783mm and 1.314 mm after 28 days, whereas these values are lower for 40% and 60 % replacement after 7 and 28 days.
7. The above results shows that 40 % replacement of GGBFS in paver blocks will give the optimum results leading to cost savings and strength achievements.
8. Moreover, these results suggest to focus on the results between 20% and 40 % replacement values of GGBFS to do more work to get accurate results of optimum replacement values.

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