Experimental Investigation on Behaviour of Waste Foundry Sand Concrete

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Abstract— Ease concrete generation by supplanting of fine sand with Foundry sand is another pattern and makes successfully utilization of Waste foundry sand as designing material by diminishing transfer and contamination issue. Waste foundry sand is waste material which seems to have the possibility to mostly supplant customary sand as fine aggregates in concrete, giving a reusing open door for them. With the quick advancement of development industry prompting extreme normal asset utilization and the crumbling of the earth, the logical inconsistency between the supportable improvement of development industry and the deficiency of assets will turn out to be increasingly serious. In the meantime, a lot of strong waste is created during the time spent development of new structures each year. The overall utilization of sand as fine aggregates in concrete generation is high and a few creating nations have experienced some strain in the supply of common sand with the end goal to meet the expanding needs of infrastructural improvement lately. To defeat the pressure and request of stream sand, analysts and professionals in the development businesses have distinguished a few choices. Natural river sand takes millions of years for its formation and is not renewable. As a substitute to natural sand, Artificial (Manufactured) sand is used as a complete replacement. The investigation centers around giving strength as equivalent as customary concrete. Test prompts the investigation of strength parameters as beam. Trial additionally prompts the exploration of synthetic and restricting properties of concrete. The present specialized report centers around exploring qualities of cement with halfway supplanting of fine total with Foundry Sand. In this study, The Sand is replaced with foundary sand by 15 %, 30 % and 45 % replacement. As per IS: 10262-1982 mix design was prepared for M25 grade and same design was used in preparation of test samples. After curing for 24hrs the samples were demoulded and subjected to compressive strength test and tensile split test for 7and 28 days.

Keywords: Waste Foundry Sand

I. Introduction

A. General

Concrete is the most widely used man-made construction materials in the world. Slightly more than a ton of concrete is produced each year for every human being on the planet fundamentally, concrete is economical, strong, and durable. Although concrete technology across the industry continues to rise to the demands of a changing market place. The construction industry recognizes that considerable improvements are essential in productivity, product performance, energy efficiency and environmental performance.

The industry will need to face and overcome a number of institutional competitive and technical challenges. One of the major challenges with the environmental awareness and scarcity of space for land-filling is the wastes/byproducts utilization as an alternative to disposal. Throughout the industrial sector, including the concrete industry, the cost of environmental compliance is high. Use of industrial by-products such as foundry sand, fly ash, bottom ash and slag can result in significant improvements in overall industry energy efficiency and environmental performance.

The consumption of all type of aggregates has been increasing in recent years in most countries at a rate far exceeding that suggested by the growth rate of their economy or of their construction industries. Artificially manufactured aggregates are more expensive to produce, and the available source of natural aggregates may be at a considerable distance from the point of use, in which case, the cost of transporting is a disadvantage. The other factors to be considered are the continued and expanding extraction of natural aggregates accompanied by serious environmental problems. Often it leads to irremediable deterioration of the country side. Quarrying of aggregates leads to disturbed surface area etc., but the aggregates from industrial wastes are not only adding extra aggregate sources to the natural and artificial aggregate but also prevent environmental pollution.

Foundry industry produces a large amount of by-product material during casting process. The ferrous metal casts in foundry are cast iron and steel, non ferrous metal are aluminium, copper, brass and bronze. Over 70% of the total by-product material consists of sand because moulds usually consist of moulding sand, which is easily available, inexpensive, resistance to heat damage, easily bonded with binder, and other organic material in mould. Foundry industry use high quality specific size silica sand for their moulding and casting process. This is high quality sand than the typical bank run or natural sand. Foundries successfully recycle and reuse the sand many times in foundry. When it can no longer be reused in the foundry, it is removed from the industry, and is termed as waste foundry sand (WFS).

II. Objectives

Keeping in mind the gap in the research area, the objective of this study is to determine the strength and durability properties of concrete Grade M-30 of concrete containing WFS (0 to 20% at an increment of 5%) as partial replacement of fine aggregate. Following are the objectives of this study:

- Characterization (Physical and Chemical Properties) of waste foundry sand
- Study of strength properties such as compressive strength, splitting tensile strength at the ages of 7, 28, 90 days

– Non-destructive testing (Rebound Hammer) on concrete cubes
– Comparative study of strength and durability properties results of both the grades of concrete containing waste foundry sand

III. LITERATURE REVIEW

Due to ever increasing quantities of waste materials and industrial by-products, solid waste management is the prime concern in the world. Scarcity of land-filling space, because of its ever increasing cost, recycling and utilization of industrial by-products and waste materials has become an attractive proposition to disposal. There are several types of industrial by-products and waste materials. The utilization of such materials in concrete not only makes it economical but also helps in reducing disposal concerns. Natural sand is getting depleted due to large scale construction. So it is important to find out an alternative of natural sand, which can be used as partial replacement of natural sand (fine aggregate). There are several types of waste material/byproducts, which have been explored for possible use in concrete as a partial replacement of fine aggregate. Such types of materials are coal bottom ash, recycled fine aggregate, sewage sludge ash, stone dust and glass cullet, and waste foundry sand, etc.

Celik et al. (1996), Sahu et al. (2003), Tripathy and Barai (2006) and Shi-cong et al (2009) have reported the use of stone dust (SD) as partial replacement of fine aggregate. Celik et al. (1996) reported that increasing the dust content up to 10% improve the compressive strength and flexure strength of concrete. Sahu et al. (2003) concluded that there is significant increase in compressive strength, modulus of rupture and split tensile strength of concrete when sand was partially replaced by stone dust up to 40 percent. Tripathy and Barai (2006) investigated the compressive strength of mortar made with crusher stone dust (CSD) under normal, hot water curing and autoclaving curing. They concluded that up to 40% cement replacement by crusher stone dust and autoclave curing of mortar mix, gave same or better compressive strength than the control mortar mix (without CSD and normal curing). Shi-cong et al (2009) investigated the properties of concrete with crushed fine stone (CFS), furnace bottom ash (FBA) and fine recycled aggregate (FRA) as a fine aggregate. The test results showed that when furnace bottom ash and CSD was used as a fine aggregate to replace natural aggregates, the concrete exhibited higher compressive strength, lower drying shrinkage and higher resistance to the chloride-ion penetration.

Cyr et al. (2007) used sewage sludge ash (SSA) in cement based materials. They observed that compressive strength of mortars containing 25% and 50% of SSA was always lower than those of reference mortars but it shown that SSA has a long term positive effect which might be related to a slight pozzolanic activity.

Aggerwal et al. (2007), Kim et al. (2011) and Bilir (2012) reported the effect of coal bottom ash as replacement of fine aggregate in concrete. Aggarwal et al. (2007) carried out experimental investigation to study the effect of bottom coal ash. Compressive strength, flexural strength and splitting tensile strength tests were carried out with 0% to 50% replacement. They concluded that compressive strength of concrete containing 50% bottom ash is acceptable for most structural application. Kim et al. (2011) investigated the mechanical properties of high strength concrete. The compressive strength was unchanged and the flexural strength of concrete almost linearly decreased as the replacement ratio of the fine bottom ash was increased. The modulus of rupture was decreased to 19.5% and 24.0% in accordance with 100% replacement of normal aggregates with coarse bottom ash (CBA). It was also found that compressive strength was not affected by the replacement of fine aggregate with CBA. Bilir (2012) investigated the effect of non-ground coal bottom ash (NGCBA) and non-ground granulated blast furnace slag (NGGBFS) on durability properties of concrete. He concluded that replacement of fine aggregate up to 40% NGGBFS and up to 30% NGCBA, concrete has very low chloride permeability.

Khatib (2005), Rakshvir and Barai (2006), Evangelista et al. (2007), Rao et al. (2007) and Soutsos et al. (2011) studied the properties of concrete incorporating recycled aggregate. Khatib (2005) used recycled fine aggregate to study mechanical properties. The fine aggregate in concrete was replaced with 0, 25, 50 and 100% recycled aggregate. Beyond 28 days of curing, the rate of strength development in concrete containing recycled aggregate was higher than that of the control mix indicating cementing action in the presence of fine recycled aggregate. Rakshvir and Barai (2006) studied on recycled aggregate based concrete. They studied various physical and mechanical properties of recycled concrete. It was observed that compressive strength showed a decrease up to 10% with the increase in recycled aggregate content Evangelista et al. (2007) concluded that the use of fine recycled concrete aggregates does not jeopardize the mechanical properties of concrete, for replacement ratios up to 30%. Rao et al. (2007) reported the use of aggregate from construction and demolition waste in concrete. They reported that the use of these waste is suitable for making good qualityconcrete. Soutsos et al. (2011) concluded that compressive and tensile splitting strength of paving blocks made with recycled demolition aggregate determined levels of replacement which produced similar mechanical properties to paving blocks made with newly quarried aggregates.

Park et al. (2004), Shayan et al. (2005) and Idir et al. (2011) studied the use of waste glass as a partial replacement of fine aggregate in concrete. Park et al. (2004) reported that compressive, tensile, and flexural strength of concrete containing waste glass aggregates demonstrated a decreasing tendency along with an increase in the mixing ratio of the waste glass aggregates. The concrete containing waste glass aggregates of 30% mixing ratio gave the highest strength properties. Shayan et al. (2005) concluded that strength gain was slower in glass powder bearing concrete up to 28 days, but at the age of 404 days all the mixtures exceeded the 40 MPa target and achieved about 55 MPa strength and glass powder also reduced the chloride ion penetrability of the concrete. Idir et al. (2011) investigated the pozzolanic properties of fine and coarse mixed glass cullet. The result showed that the pozzolanic activity increases with glass fineness. Due to this activity compressive strength of mortar is increased by 10%.

Aggarwal et al. (2006) investigated the use of fly ash, slag, silica fume and marble dust as replacement of cement on the compressive strength of cement mortar. The result showed that the replacement of various industrial wastes (up to 20%) improved the compressive strength of mortar.

Mishra et al. (1994) investigate the effect of blast furnace slag, fly ash and silica fume on permeability of concrete. Rapid chloride permeability test was performed to check the quality of concrete. They concluded that use of these waste in concrete decreased the permeability of concrete and increases the quality of concrete.

Cwirzen A. (2010) reported the effect of nano-materials on physical properties of cementations matrixes. The results showed that mechanical properties such as compressive and flexural strength can be increased up to 50% by addition of 0.23wt% of carbon nano-tubes. Carbon nano-tubes and carbon nano-fibres and/or nano-silica appeared to improve frost resistance. Other properties such as autogenous shrinkage decreased significantly after addition of carbon nano-fibres. Nano-silica enabled an immense densification of the hydrated binder matrix, which in turn improved for instance the durability and mechanical properties.

IV. METHODOLOGY

A. Mix Design

Mix design is a process of selecting suitable ingredients for concrete and determining their proportions which would produce, as economically as possible, a concrete that satisfies the job requirements. The proportioning of the ingredients of concrete is an important phase of concrete technology as it ensures quality and economy. In pursuit of the goal of obtaining concrete with desired performance characteristics, the selection of component materials is the first step, the next step is a process called mix design by which one arrives at the right combination of the ingredients. There are many methods of designing concrete mixes.

1) Design of Concrete Mix

The compressive strength of concrete is considered as the index of its quality. Therefore the mix design is generally carried out for a particular compressive strength of concrete with adequate workability so that the fresh concrete can be properly mixed, placed and compacted. The proportions for the mix were calculated adopting the requirements of water as specified in BIS: 10262-1982.

The proportioning of concrete mixes consists of three interrelated steps.

1) Selection of suitable ingredients-cement, supplementary cementing materials, aggregates water and chemical admixtures.
2) Determination of the relative quantities of these materials in order to produce as economically as possible a concrete, that has desired rheological properties i.e. strength and durability.
3) Careful quality control of every phase of the concrete making process

a) M20 design mix: Data

Characteristic strength at 28 days = 20 N/mm2
Degree of quality control expected at site = Good
Maximum size of aggregate = 12.5mm
Degree of workability desired (C.F.) = 0.9 (Medium)
Type of exposure = Mild, no sulfate attack
Concrete use = Concrete structure
Target mean strength = 30 N/mm2

b) M30 design mix: Data

Characteristic strength at 28 days = 30 N/mm2 Degree of quality control expected at site = Good Maximum size of aggregate = 12.5mm

Degree of workability desired (C.F.) = 0.9 (Medium) Type of exposure = Mild, No sulphate attack Concrete use = Concrete structure

Target mean strength: = 403

B. Mix Composition

Initially, two series of control mixes were designed to have 28-day compressive strength of 30 MPa (M20 grade of concrete) and 40 MPa (M30 grade of concrete). The concrete mixes were designed with constant cement, fine aggregate, coarse aggregate and superplasticizer. N/mm2

C. Testing Procedure

After required period of curing, the specimens were taken out of the curing tank and their surfaces were wiped off. Besides measuring the fresh properties (workability, air content and concrete temperature), following tests were performed on hardened concrete.

Strength Properties

– Compressive strength (BIS: 516 – 1959)
– Splitting tensile strength (BIS: 5816 – 1999)

These properties were determined at the age of 7, 28, 93.5.1 Fresh Properties

The workability of fresh concrete is a composite property which includes the diverse requirements of stability, mobility, compactability, placeability and finishability. There are different methods for measuring the workability. Each of them measures only a particular aspect of it and there is really no unique test which measures workability of concrete in its totality. The fresh properties were studied in the following tests with the order of testing as mentioned below:

1) Slump test
2) Compaction factor test

1) Slump Test

The vertical settlement of unsupported fresh concrete, flowing to the sides and sinking in height is known as slump. Slump is a measure indicating the consistency or workability of cement concrete. It gives an idea of water content needed for concrete to be used for different works. A concrete is said to be workable if it can be easily mixed, placed, compacted and finished. A workable concrete should not show any segregation or bleeding.

2) Compaction Factor Test

Compaction factor test is based on the definition, that workability is that property of the concrete that determines the amount of work required to produce full compaction. The test consists essentially of applying a standard amount of work to standard quantity of concrete and measuring the resulting compaction

D. Strength Properties

1) Compressive strength test

Compressive strength test is initial step of testing concrete because the concrete is primarily meant to withstand compressive stresses. Compressive strength tests were carried out on 150 mm x 150 mm x 150 mm cubes with compression testing machine of 3000 KN capacity. The specimens after removal from the curing tank were cleaned and properly dried. The surface of the testing machine was cleaned.

E. Split tensile strength test

Split-tensile strength test is an indirect method to determine tensile strength of concrete. The test consists of applying compressive line loads along the opposite generators of concrete cylinder placed with its axis horizontal between the platens. Cylinders of size 150mm diameter and 300mm height were cast to check the splitting tensile strength of the concrete. Specimens were tested at 7 and 28 days of casting.

F. Rebound Hammer

Rebound hammer test is also called surface hardness method. The rebound hammer test measure the elastic rebound of concrete and primarily for compressive integration. The test was conducted on 150mm cube at the age of 28, 91 and 365 days. SCHMIDT rebound hammer (digital) was used for testing as shown in Fig. 3.10. In this method a test hammer hits the concrete at a definite energy 2.2Nm and compressive strength is directly obtained from rebound hammer.

V. RESULTS AND DISCUSSIONS

A. General

In this chapter, the findings of experimental investigations are presented. In which, various tests were conducted to evaluate the effect of waste foundry sand on compressive strength, splitting tensile strength of concrete.

B. COMPRESSIVE STRENGTH

1) Compressive Strength of M20 Grade Concrete

The mix M1 was used as control mix i.e. WFS content as 0% and compressive strength at 28 days was 25.0 MPa.

Mix	7 Days	28 Days	90 Days
M1 (MPa)	14.7	25.0	27.8
M2 (MPa)	17.4	27.9	30.0
M3 (MPa)	18.3	29.7	32.75
M4 (MPa)	20.3	30.2	33.8
M5 (MPa)	19.8	29.5	33.0

Table 5.1: Compressive Strength of M20 Mixes

At age of 7 days M2, M3, M4 and M5 achieved 15.6%, 19.7%, 27.6% and 25.8% of M1 respectively. Compressive strength of M2, M3, M4 and M5 was found to increase by 14.6, 22.6, 26 and 23.3% of M1 at 28 days, respectively. At age of 90 days M2, M3, M4 and M5, compressive strength increased by 11.69, 18.8, 20.8 and 18.2% respectively than M-1 (27.8 MPa).

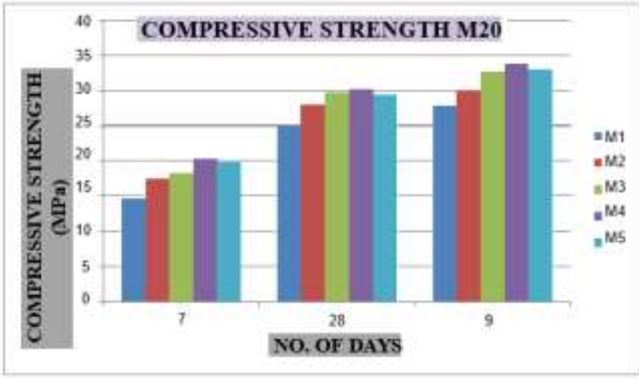

Fig. 5.1: Compressive Test Results of M20 Mixes

2) Compressive Strength of M30 Grade Concrete

The mix M1 was used as control mix i.e. WFS content as 0% and compressive strength at 28 days was 36.6 MPa.

Mix	7 Days	28 Days	90 Days
M6 (MPa)	21.8	36.6	39.0
M7 (MPa)	23.6	39.6	41.9
M8 (MPa)	23.8	41.1	42.65
M9 (MPa)	25.6	42.8	43.7
M10 (MPa)	25.1	41.1	42.2

Table 5.2: Compressive Strength of M30 Mixes

At age of 7 days M7, M8, M9 and M10 achieved 7.6%, 8.5%, 15% and 25.13.28% of M6 respectively. Compressive strength of M7, M8, M9 and M10 was found to increase by 7.6, 11%, 14.5% and 11.6% of M6 at 28 days, respectively. At age of 90 days M7, M8, M9 and M10, compressive strength increased by 7%, 8.5%, 10.8% and 7.6% respectively than M6 (39.0 MPa).

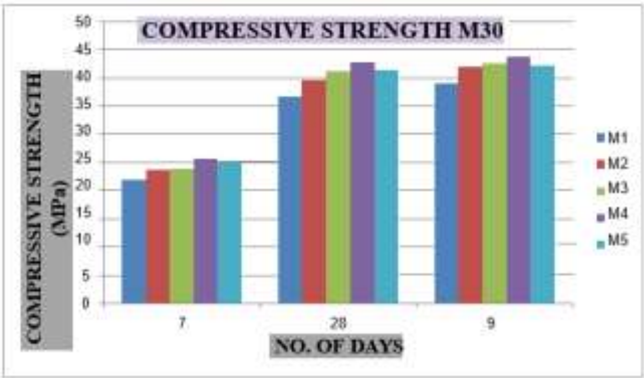

Fig. 5.2: Compressive Test Results of M30 Mixes

3) Comparison between M20 and M30 Grade of Concrete

Comparison between M20 and M30 Grade of concrete was evaluated on the basis of percentage increase. Percentage increase in compressive strength for all mixes of M20 and M30 Grades of concrete was calculated in comparison with 28-day compressive strength of mix M-1(0%WFS) for M20 Grade of concrete and 28 days compressive strength of mix M-6(0%WFS) for M30 Grade of concrete. Maximum percentage increase was found at 15% replacement at all age. At 15% replacement of fine sand with WFS, M20 Grade of concrete showed better percentage increase than M30 Grade of concrete by 9% at 28 days, 19.5% at 90 days. It means that effect of WFS is more upon M20 Grade of concrete than M30 Grade of concrete. It is probably due to the packing behavior of matrix particle. M20 Grade of concrete has more voids between the particles than M30

Grade of concrete so voids of M20 Grade of concrete is well packed by fine particles of WFS.

C. Splitting Tensile Strength

1) Splitting Tensile Strength for M20 Grade Concrete

The split tensile strength of M1 was 1.6 MPa at 7 days. Split tensile strength of M2, M3, M4 and M5 was found to increase by 5%, 10%, 14% and 10.8% at 7 days respectively, when compared to M1. At age of 28 days, M2, M3, M4 and M5 was found to increase by 7.5%, 12%, 12% and 8.5% of the strength when compared to M1, respectively. At age of 90 days, M2, M3, M4 and M5 was found to increase by 6%, 10.2%, 10.8% and 8.7% of the strength when compared to M1, respectively.

2) Splitting Tensile Strength for M30 Grade Concrete

The split tensile strength of M1 was 2.35 MPa at 7 days. Split tensile strength of M7, M8, M9 and M10 was found to increase by 10.6%, 13.3%, 15.5% and 10% at 7 days respectively, when compared to M1. At age of 28 days, M7, M8, M9 and M10 was found to increase by 4.5%, 7.5%, 9.5% and 6% of the strength when compared to M1, respectively. At age of 90 days, M7, M8, M9 and M10 was found to increase by 3%, 9%, 10.1% and 7.1% of the strength when compared to M1, respectively.

Mix	7 Days	28 Days	90 Days
M1 (MPa)	1.6	2.62	2.74
M2 (MPa)	1.68	2.83	2.91
M3 (MPa)	1.77	2.95	3.05
M4 (MPa)	1.86	2.96	3.07
M5 (MPa)	1.78	2.83	3.0

Table 5.3: Split Tensile Strength M20 Mixes

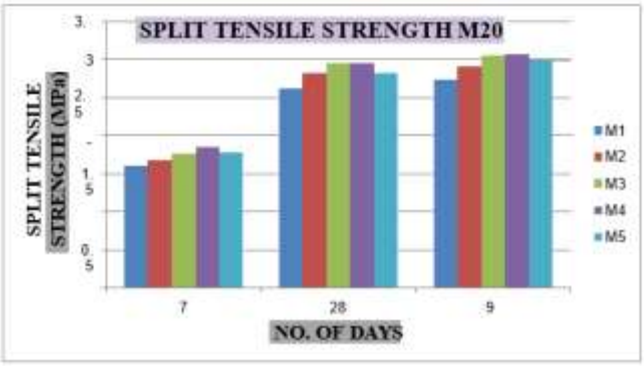

Fig. 5.3: Split Tensile Test Results of M20 Mixes

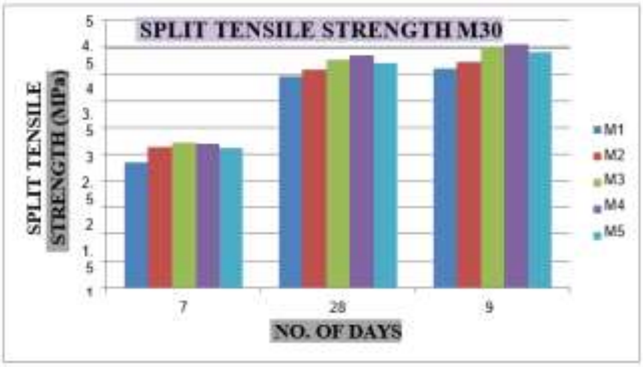

Fig. 5.4: Split Tensile Test Results of M30 Mixes

3) Comparison between M20 and M30 Grade of Concrete

Comparison between splitting tensile strength of M20 and M30 grades of concrete was calculated in term of percentage increase. M20 Grade of concrete mixes (M-1 to M-5) showed higher percentage increase in splitting tensile strength than M30 Grade of concrete mixes (M-6 to M-10). Percentage increase was determined in comparison with the 28-day splitting tensile strength of M-1(0% WFS) and M-6(0% WFS) for M20 and M30 Grade of concrete respectively. Maximum increase was found at 15% replacement at all age. At 15% replacement, M20 Grade of concrete mix (M-4) achieved higher percentage increase. It means that, particle size distribution of M20 Grade of concrete mixes with 15% WFS has more adherence than M30 Grade concrete mixes.

Mix	7 Days	28 Days	90 Days
M6 (MPa)	23.5	3.95	4.10
M7 (MPa)	2.63	4.09	4.23
M8 (MPa)	2.71	4.27	4.50
M9 (MPa)	2.78	4.36	4.56
M10 (MPa)	2.61	4.20	4.41

Table 5.4 Split Tensile Strength M30 Mixes

D. Rebound Hammer

Rebound hammer is used to predict the compressive strength of the concrete. In this research, compressive strength was found out for concrete mixes M-1, M-2, M-3, M-4 and M-5 (M20 Grade concrete) and M-6, M-7, M-8, M-9 and M-10 (M30 Grade concrete) by using rebound hammer. It is not an accurate method. According to BIS: 13311 (part 2)-1992, accuracy of prediction of concrete strength in structure is ± 25 percent. Values of the compressive strength for both grades of concrete are given in Table 4.5. 15% error was found at 28 days compressive strength of control mix M-1 (0%WFS) when compared with the 25 MPa (28 days destructive strength of control mix). Similar trend was observed in M30 Grade concrete. Destructive strength control mix M-6 (0%WFS) was 36.6 MPa. Compressive strength of 33.3 MPa was found by rebound hammer. The error was 9%. Due to inclusion of waste foundry sand content in concrete, the compressive strength was observed higher than that of control one.

M20 Grade of Concrete (MPa)				M30 Grade of Concrete (MPa)			
Mix	WFS (%)	28 days	90 days	Mix	WFS (%)	28 days	90 days
M-1	0	21.25	23.63	M-6	0	33.30	35.20
M-2	5	23.70	25.50	M-7	5	36.00	37.90
M-3	10	25.50	28.00	M-8	10	37.40	38.80
M-4	15	25.80	28.50	M-9	15	39.00	39.50
M-5	20	25.00	27.60	M-10	20	38.40	37.20

Table 5.5 Compressive Strength (MPa) by Rebound Hammer

VI. CONCLUSION

A. General

The present work investigated the influence of waste foundry sand as partial replacement of fine aggregate (sand) on the properties of two grades (M20 & M30) of concrete. On the basis of the results from the present study, following conclusions are drawn.

B. Strength Properties

1) Compressive Strength

1) Compressive strength of both grades of concrete mixes (M20 and M30) increased due to replacement of fine aggregate with waste foundry sand. However, compressive strength observed for both grades of concrete mixes were appropriate for structural uses.
2) M20 grade concrete mix obtained increase in 28-day compressive strength from 25.0MPa to 30.20MPa on 15% replacement of fine aggregate with WFS, whereas it increase was from 36.6MPa to 42.8MPa for M30 grade of concrete mix. Maximum strength was achieved with 15% replacement of fine aggregate with WFS. Beyond 15% replacement it goes to decrease for both grades of concrete, but was still higher than control concretes
3) At 15% replacement of fine sand with WFS, M20 Grade of concrete showed better percentage increase than M30 Grade of concrete by 9% at 28 days, 19.5% at 90 days

2) Splitting Tensile Strength

– Concrete mixes obtained linear increase in 28-day splitting tensile strength from 2.62MPa to 2.96MPa for M20 grade of concrete mix (M-1) and 3.95MPa to 4.36MPa for M30 grade of concrete mix (M-6) on replacement of 15% of fine aggregate with waste foundry sand.
– Ease concrete generation by supplanting of fine sand with Foundry sand is another pattern and makes successfully utilization of Waste foundry sand as designing material by diminishing transfer and contamination issue. Waste foundry sand is waste material which seems to have the possibility to mostly supplant customary sand as fine aggregates in concrete, giving a reusing open door for them. With the quick advancement of development industry prompting extreme normal asset utilization and the crumbling of the earth, the logical inconsistency between the supportable improvement of development industry and the deficiency of assets will turn out to be increasingly serious. In the meantime, a lot of strong waste is created during the time spent development of new structures each year. The overall utilization of sand as fine aggregates in concrete generation is high and a few creating nations have experienced some strain in the supply of common sand with the end goal to meet the expanding needs of infrastructural improvement lately. To defeat the pressure and request of stream sand, analysts and professionals in the development businesses have distinguished a few choices. Natural river sand takes millions of years for its formation and is not renewable. As a substitute to natural sand, Artificial (Manufactured) sand is used as a complete replacement. The investigation centers around giving strength as equivalent as customary concrete. Test prompts the investigation of strength parameters as beam. Trial additionally prompts the exploration of synthetic and restricting properties of concrete. The present specialized report centers around exploring qualities of cement with halfway supplanting of fine total with Foundry Sand. In this study, The Sand is replaced with foundary sand by 15 %, 30 % and 45 % replacement. As per IS: 10262-1982 mix design was prepared for M25 grade and same design was used in preparation of test samples. After curing for 24hrs the samples were demoulded and subjected to compressive strength test and tensile split test for 7and 28 days.Splitting tensile strength of all concrete mixes for both grades of concrete (M20 and M30) was found to increase with increase in with varying percentage of waste foundry sand.

3) Rebound Hammer

– Rebound hammer is used to predict the compressive strength of the concrete. It is not an accurate method. According to BIS: 13311 (part 2)-1992, accuracy of prediction of concrete strength in structure is ± 25 percent. Due to inclusion of waste foundry sand content in concrete, the compressive strength was observed higher than that of control one.

VII. SCOPE OF FUTURE WORK

– Further study can be made by use of different type of waste materials like silica fume, fly ash, furnace slag etc.
– Different types of fibres like synthetic fibre, carbon fibres, or glass fibres may also be used for future investigation.
– Durability aspects such as permeability, sulphate resistance, freezing and thawing and shrinkage of concrete can be investigated
– Further study can be done on concrete mixes of different grades containing waste materials subjected to elevated temperatures.

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