International Journal For Advanced Research In Science & Technology

A peer reviewed international journal www.ijarst.in

ISSN: 2457-0362

STRENGTH INVESTIGATION OF METAKAOLIN BASED CONCRETE WITH FIBRE AS REINFORCING MATERIALS IN HIGH STRENGTH CONCRETE

K.SIVARAMAKRISHNA[1], KAYAM ANUSHA[2]

#1student,Department Of Civil Engineering, KMM INSTITUTE OF TECHNOLOGY & SCIENCE,Ramireddipalli, Tirupathi – 517 502

#2 Asst. Prof, Department Of Civil Engineering, KMM INSTITUTE OF TECHNOLOGY & SCIENCE,Ramireddipalli, Tirupathi – 517 502

ABSTRACT_ The improper management of waste steel fibres causes a huge environmental damage. Proper utilization of these waste steel fibres can be done in civil engineering. Concrete obtained by adding these fibres is considered to show a good mechanical improvement of brittle matrix, moreover it is a promising candidate for both structural and non-structural applications. In the present work, as a continuation of research already performed in this field by the other authors, the post cracking performances of FRC (fibre reinforced concrete) were evaluated by means tests on flexural elements and slabs. All fresh and hardened concrete properties are estimated experimentally. By the means of flexural test the post-cracking behaviour of SFRC is obtained. This work examines the mechanical properties of concrete by using waste steel fibres from mechanical labs and metakaolin replacement of cement. In this work cement was replaced by metakaolin by 25% of cement by weight in each mix, waste re fibres with varying percentages like 1, 2, 3,4 and 5% in the mix, and 5% so super plasticizer has been used to increase workability in M-30 and M-60 grade concrete

Key Words: Waste steel fibres, metakaolin,Naphthalene Sulfonate Formaldehyde, workability, compressive strength, tensile strength, flexural strength.

1.INTRODUCTION

Metakaolin is a dehydroxylated form of the clay mineral kaolinite. Rocks that are rich in kaolinite are known as china clay or kaolin, traditionally used in the manufacture of porcelain. The particle size of metakaolin is smaller than cement particles, but not as fine as silica fume. The quality and reactivity of metakaolin is strongly dependent of the characteristics of the raw material used. Cement concrete is the most widely used material for various constructions. Properly designed & prepared concrete result in good strength & durable properties. Even such well-designed & prepared cement concrete mix under controlled conditions also have certain limitations because of which above properties of concrete are found to be inadequate for special situations & certain special structures. The main ingredient in the conventual concrete is the Portland cement. The amount of cement production emits approximately equal amount of carbon dioxide into the atmosphere. Cement production is consuming a significant amount of natural resources. To overcome above ill effects, the advent of newer materials & construction techniques in this drive, admixture has taken newer things with various administers has become a necessity. Availability of mineral admixtures marked opening of new era for designing concrete mix of higher strength. As a result, the use of new mineral admixtures has considerably increased within the concrete industry. For attaining a high strength & durable concrete for major applications in the constructions such as high-rise buildings, tall structures, nuclear power points etc., the essential need for additives both chemical & mineral are must to improve the performance of concrete. Changes on some mechanical properties of concrete specimens produced by metakaolin and steel fibres with the objective to obtain more ductile high strength concrete were observed.

FRC is a composite mixture of cement mortar / concrete with suitable discrete fibres. Fibers are the small size materials that are reinforced which when mixed enhances the properties of the mixture after hardened state. The shape may be flat, circular or crimped. The fibres are defined by the discrete parameter called the "Aspect Ratio". It's represented by l/d ratio where d is diameter and l is the length, usually ranges from 30 to 150. The introduction of fibres is to improvise strength, impact resistance, toughness, enhance other engineering properties and to reduce cracking. The fibers are available in different forms, shapes and sizes.

2.LITERATURE SURVEY

N.Shirsath (2017)Metakaolin concrete increases the compressive and flexural strength effectively as compared with conventional concrete. Workability decreases as percentage of metakaolin in concrete increases. The strength of concrete increases with increase in metakaolin content up to 15% replacement of cement. As the percentage of metakaolin powder in concrete increases, workability of concrete decreases.

Dr.K.Srinivasu et.al., (2015), Better Results are achieved by adding mineral admixtures like metakaolin with silica fume, fly ash and steel fibres in HPC. Water absorption is improved by use of metakaolin in concrete which increases density.

Avinash Gornale et.al., (2014), The increase in Compression strength for M-20,M-30 and M-40 at 3,7 and 28 days was increased by 20% to 30%. The increase in flexural strength for M-20, M-30 and M-40 at 3,7 and 28 days was increased by 25% to 30%.The increase in Flexural strength for M-20,M-30 and M-40 at 3,7 and 28 days was increased by 25% to 30% when compared with the normal concrete at 28 days

3. MATERIALS AND PROPERTIES

3.1 Description Of Materials

Concrete is a composition of three raw materials. Cement, Fine aggregate and Coarse aggregate. These three raw materials play an important role in the manufacturing of concrete. By varying the properties and amount of these materials, the properties of concrete will changes. The main raw materials used in this experimental work are Cement, fine aggregate, Coarse aggregate.

3.2 CEMENT

Ordinary Portland cement is the most common type of cement in general use around the world as a basic ingredient of

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362
IJARST

concrete, mortar, stucco, and most non-specialty grout. Cement is the main ingredient in the manufacturing of concrete. The characteristics of concrete will be greatly affected by changing the Cement content. The Cement used in this project is Ordinary Portland Cement of 53 grade confirming to IS 12269 – 1987.

It developed from other types of hydraulic lime in England in mid 19th century and usually originates from limestone. It is a fine powder produced by heating materials to form clinker. After grinding the clinker we will add small amounts of remaining ingredients. Many types of cements are available in market. When it comes to different grades of cement, the 53 Grade OPC Cement provides consistently higher strength compared to others. As per the Bureau of Indian Standards (BIS), the grade number of a cement highlights the minimum compressive strength that the cement is expected to attain within 28 days. For 53 Grade OPC Cement, the minimum compressive strength achieved by the cement at the end of the 28th day shouldn't be less than 53MPa or 530 kg/cm2. The color of OPC is grey color and by eliminating ferrous oxide during manufacturing process of cement we will get white cement also.

OXIDE	COMMON NAME	ABSERVATION	AP. AMOUNT %
CaO	LIME	C	60.0-67.0
SiO_2	SILICA	S	14.0-25.0
Al_2O_3	ALUMINA	A	3.0-8.0
Fe_2O_3	IRON-OXIDE	F	0.1-5.0
Mgo	MAGNESIA	M	0.1-4.0
Na_2O	SODA	N	0.1-1.3
K_2O	POTASSA	K	0.1-1.3
SO_3	SULFURIC ANHYDRIDE	S	0.5-3.0

Table no.3.1 Chemical composition of Ordinary Portland cement -53 Grade

Ordinary Portland Cement (OPC) is the cement best suited to general concreting purposes. OPC 53 grade confirming with IS: 12269-2013 is used. The cement is kept in an airtight container and stored in the humidity controlled room to prevent cement from being exposed to moisture.

S No	Properties	Values observed	As per IS Standards
1	Specific Gravity	3.14	3.15(IS: 2383-(part-3)1963)
2	Normal consistency	330%	
3	Initial setting time	35 min	As per IS:4031-1968, Min:30min
4	Final setting time	570 min	As per IS:4031-1968, Max:600min
5	Soundness	7.7 mm	

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Table 3.2 Physical properties of Ordinary Portland cement - 53 Grade

3.3 FINE AGGREGATE

Gradation refers to the particle size distribution of aggregates. Grading is a very important property of aggregate used for making concrete, in view of its packing of particles, resulting in the reduction of voids. This in turn influences the water demand and cement content of concrete.

Grading is described in terms of the cumulative percentages of weights passing a particular IS sieve. IS 383-1970 specifies four ranges or zones for fine aggregate grading. Table gives the range of percentage passing for each zone.

Zone I sand is the coarsest and Zone IV is the finest whereas sand in Zone II and Zone III are moderate. It is recommended that fine aggregates conforming to grading zone II or Zone III can be used in reinforced concrete

S.No	Property	Result
1	Fineness Modulus	2.67
2	Specific Gravity	2.7
3	Bulk Density	
	Loose State	1.715 gm/cc
	Compacted State	1.788gm/cc

Table 3.3 Physical properties of Fine aggregates

3.4 COURSE AGGREGATE

The aggregate which is retained over IS Sieve 4.75 mm is termed as coarse aggregate. The normal maximum size is gradually 10-20 mm; however particle sizes up to 40 mm or more have been used in Self Compacting Concrete. Gap graded aggregates are frequently better than those continuously graded, which might expensive grader internal friction and give reduced flow. Regarding the characteristics of different types of aggregate, crushed aggregates tend to improve the strength because of interlocking of angular particles, while rounded aggregates improved the flow because of lower internal friction.

Locally available coarse aggregate having the maximum size of 20 mm and minimum size of 12.5 mm was used in this work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per IS: 383-1970.

S.No	Property	Result
1	Fineness Modulus	8.00
2	Specific Gravity	2.74
3	Bulk Density	
	Loose State	1.185gm/cc
	Compacted State	1.421 gm/cc

Table 3.4 Physical properties of course aggregates

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

3

.5 METAKAOLIN

Considerable research has been done on activated ordinary clay and kaolinitic clay. These un purified materials have often been called as “metakaolin”. Such a product white or cream in color, purified, thermally activated is called s “high reactive metakaolin”. High reactive metakaolin by trade name “METACEM” is being manufactured in India by “SPECIALITY MINERALS DIVISION” in BARODA.

Figure3.1 METAKAOLIN

Metakaolin that we have used in this project work was contributed by “AKARSHA SPECIALITIES IN CHENNAI”CALCINED CLAY – HIMACEM is a High Reactivity Metakaolin (HRM), which is manufactured by the high temperature treatment of specially selected kaolin under controlled conditions. It is a white mineral admixture, having very good pozzolanic properties. It reacts with free lime produced during the hydration of cement to form additional cementations products.

3.6 STEEL FIBER

Steel fiber is a metal reinforcement. Steel fiber for reinforcing concrete is defined as short, discrete lengths of steel fibers with an aspect ratio (ratio of length to diameter) from about 20 to 100, with different cross-sections, and that are sufficiently small to be randomly dispersed in an unhardened concrete mixture using the usual mixing procedures. A certain amount of steel fiber in concrete can cause qualitative changes in concrete’s physical property, greatly increasing resistance to cracking, impact, fatigue, and bending, tenacity, durability, and other properties .

Figureno.3.2 Waste steel fibres

3.7 WATER

Generally, water that is suitable for drinking is satisfactory for use in concrete. Water from lakes and streams that contain marine life also usually is suitable. When water is obtained from sources mentioned above, no sampling is necessary. When it is suspected that water may contain sewage, mine water, or wastes from industrial plants or canneries, it should not be used in concrete unless tests indicate that it is satisfactory. Water from such sources should be avoided since the quality of the water could change due to low water or by intermittent tap water is used for casting. The potable water is generally considered satisfactory for mixing and curing of concrete.

3.8 NAPHTHALENE SULFONATE FORMALDEHYDE

Naphthalene Sulfonate Formaldehyde is a naphthalene-based Superplasticizer a chloride-free admixture which is supplied as a brown powder to be instantly dissolved in water. This concrete admixture is used to affect substantial water reduction to concrete without influencing normal setting time and further improves the durability, workability, and strength of concrete.

Figure no.3.2 naphthalene sulfonate formaldehyde

Typical Properties

Items	
Appearance	Light Brown Powder
Specific Gravity	1.24
Sodium Sulfate Content, %	18.0 max.
pH value	8–10
Solid Content, %	92 min
Moisture, %	8.0 max
Fineness (0.315mm remains), %<	15

Table no 3.5 Typical Properties of superplasticizer

4.RESULTS

4.1 Slump Cone Test

The strength of concrete of a given mix proportion is seriously affected by the degree of its compaction. It is therefore important that the consistency of the mix is such that the concrete can be transported, placed and finished sufficiently easily and without segregation. A concrete satisfying these conditions is said to be workable. Workability is a physical property of the concrete depending on the external and internal friction of the concrete matrix; internal friction being provided by the aggregate size and shape and external friction being provided by the surface on which the concrete comes into contact with. Consistency of concrete is another way of expressing workability but it is more confined to the parameters of water content. Thus concrete of the same consistency may vary in workability. One test which measures the consistency of concrete is the slump test. It does not measure the workability of concrete but it is very useful in detecting variations in the uniformity of a mix of given nominal proportions. Mixes of stiff consistency have zero slump. In this dry range no variation can be detected between mixes of different workability. In a lean mix with a tendency to harshness a true slump can easily change to the shear slump or even to collapse. Different values of slump can be obtained from different samples of the same

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

mix. Despite the limitations, the slump test is very useful on site as a check on the day-today or hour-to-hour variations in the materials being fed into the mixer. An increase in slump may mean, for instance, that the moisture content of aggregate has unexpectedly increased; another cause would be a change in the grading of aggregate, such as a deficiency in sand. Too high or too low a slump gives immediate warning and enables the mixer operator to remedy the situation

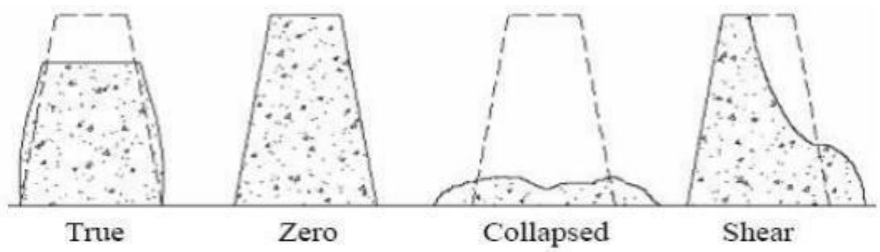


Fig no. 4.1Types of Concrete Slump Test Results

Ratio	Slump value in mm
Control mix M-30	87
M30 + M.K 05 % + 1 % SFR	86
M30 + M.K 10 % + 2 % SFR	84
M30 + M.K 15 % + 3 % SFR	83

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
IJARST
ISSN: 2457-0362

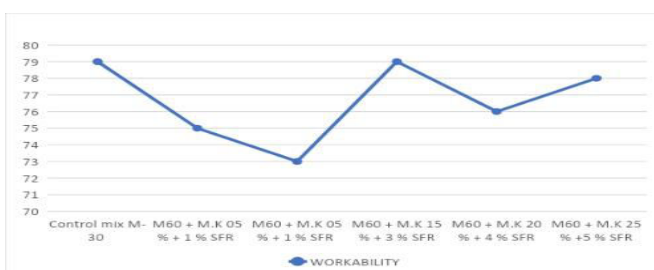
M30 + M.K 20 % + 4 % SFR	83.5
M30 + M.K 25 % +5 % SFR	81

Table no.4.1 workability results M30 grade

Graph no 4.1 - Table no.5.1 workability results M30 grade

Ratio	Slump value in mm
Control mix M-60	79
M60 + M.K 05 % + 1 % SFR	75
M60 + M.K 10 % + 2 % SFR	73
M60 + M.K 15 % + 3 % SFR	79
M60 + M.K 20 % + 4 % SFR	76
M60 + M.K 25 % +5 % SFR	78

Table no.4.2 workability results M60 grade



Graphno 4.2 -workability results for M-60 grade concerte

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362
IJARST

Ratio	Slump value M-30 in mm	Slump value M-60 in mm
Control mix M-30 /M60	87	79
M30/M60 + M.K 05 % + 1 % SFR	86	75
M30/M60 + M.K 10 % + 2 % SFR	84	73
M30/M60 + M.K 15 % + 3 % SFR	83	79
M30/M60 + M.K 20 % + 4 % SFR	83.5	76
M30/M60 + M.K 25 % +5 % SFR	81	78

Table no.4.3 comparison of workability results M-30 and M60 grade

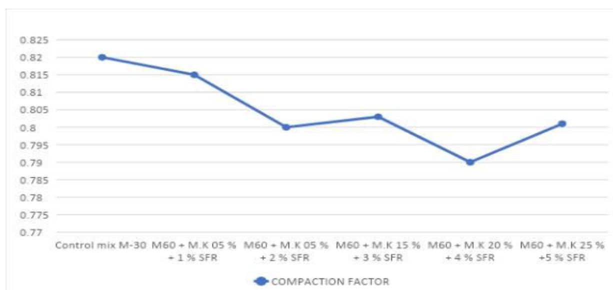
Graph no.4.3 comparison of workability results M-30 and M-60 grade

4.2 COMPACTION FACTOR TEST

Scope and Significance Compaction factor test is adopted to determine the workability of concrete, where nominal size of aggregate does not exceed 40mm, and is primarily used in laboratory. It is based upon the definition, that workability is that property of the concrete which 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. To find the workability of freshly prepared concrete, the test is carried out as per specifications of IS: 1199-1959. Workability gives an idea of the capability of being worked, i.e., idea to control the quantity of water in cement concrete mix to get uniform strength. It is more sensitive and precise than slump test and is particularly useful for concrete mixes of low workability. The compaction factor (C.F.) test is able to indicate small variations in workability over a wide range.

Ratio	Compaction factor
Control mix M-30	0.82
M30 + M.K 05 % + 1 % SFR	0.815
M30 + M.K 10 % + 2 % SFR	0.80
M30 + M.K 15 % + 3 % SFR	0.803
M30 + M.K 20 % + 4 % SFR	0.79
M30 + M.K 25 % +5 % SFR	0.801

Table no.4.4 compaction factor test results M-30 grade

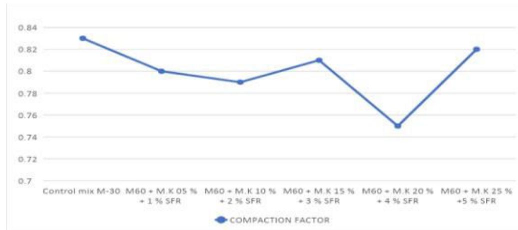


Graph - no.4.4 compaction factor test results M-30 grade

Ratio	Compaction factor
Control mix M-60	0.83
M60 + M.K 05 % + 1 % SFR	0.8
M60 + M.K 10 % + 2 % SFR	0.79
M60 + M.K 15 % + 3 % SFR	0.81
M60 + M.K 20 % + 4 % SFR	0.75
M60 + M.K 25 % +5 % SFR	0.82

Table no.5.5 compaction factor test results M-60 grade

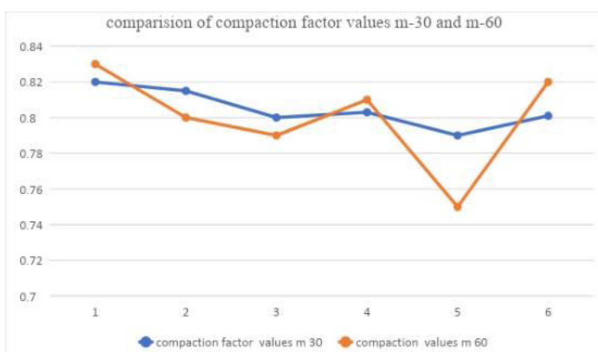
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362



Graph no 4.5 -compaction factor results for M-60 grade concrete

Ratio	Compaction factor M-30	Compaction factor M-60
Control mix M-30 /M60	0.82	0.83
M30/M60 + M.K 05 % + 1 % SFR	0.815	0.8
M30/M60 + M.K 10 % + 2 % SFR	0.80	0.79
M30/M60 + M.K 15 % + 3 % SFR	0.803	0.81
M30/M60 + M.K 20 % + 4 % SFR	0.79	0.75
M30/M60 + M.K 25 % +5 % SFR	0.801	0.82

Table no.4.6 comparison of compaction factor results M-30 and M-60 grade



Graph no.4.6 comparison of compaction factor results M-30 and M-60 grade

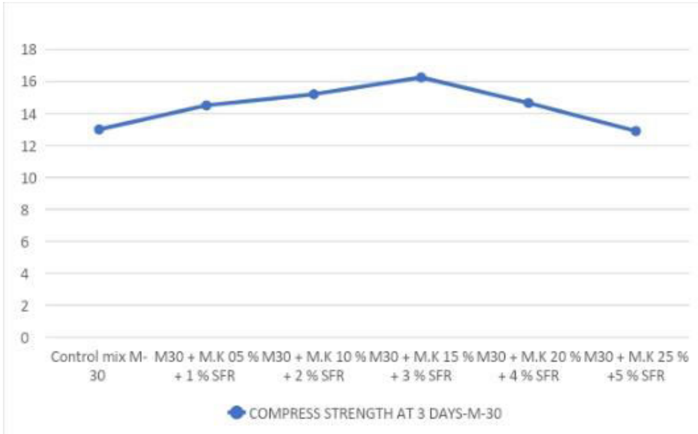
4.3 COMPRESSION TEST ON CONCRETE CUBES

The determination of the compressive strength of concrete is very important because the compressive strength is the criterion of its quality. Other strength is generally prescribed in terms of compressive strength. The strength is expressed in N/mm2. This method is applicable to the making of preliminary compression tests to ascertain the suitability of the available materials or to determine suitable mix proportions. The concrete to be tested should not have the nominal maximum size of aggregate more than 20mm test specimens are either 15cm cubes or 15cm diameter used. At least three specimens should be made available for testing. Where every cylinder is used for compressive strength results the cube strength can be calculated as under. The concrete specimens are generally tested at ages 14 days and 28 days.The cubes are generally tested at 14 & 28 days unless specific early tests are required, for example to remove a concrete shutter safely prior to 14 days. Usually 1 cube will be tested 2 cubes at 28 days, however this may vary depending of the requirements, check the design first. The cubes are removed from the curing tank, dried and grit removed. The cubes are tested using a calibrated compression machine. This can be carried out internally by competent personnel or by a certified test house. The cubes are tested on the face perpendicular to the casting face. The compression machine exerts a constant progressing force on the cubes till they fail, the rate of loading is 0.6 ± 0.2 M/Pas ($N/mm^2/s$). The reading at failure is the maximum compressive strength of the concrete. BS EN 12390-2: 2009 /BS EN 12390-3:2009. The concrete minimum compressive strength will be specified by the client/designer in a specific format

Mix no.	**w/c ratio**	**% of METAKAOLIN AND STEEL FIBERS (FSR)**	**3 days average compressive strength in N/mm^2**
1.	0.4	Control mix M-30	13
2.	0.4	M30 + M.K 05 % + 1 % SFR	14.5
3.	0.4	M30 + M.K 10 % + 2 % SFR	15.2
4.	0.4	M30 + M.K 15 % + 3 % SFR	16.25
5	0.4	M30 + M.K 20 % + 4 % SFR	14.65
6	0.4	M30 + M.K 25 % +5 % SFR	12.9

Table no.4.7 compressive strength test results M-30 grade in 3 days

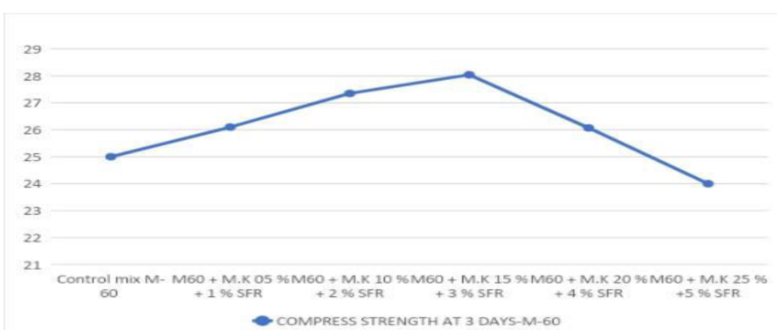
International Journal For Advanced Research
In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362



graph no.4.7 compressive strength test results M-30 grade in 3 days

Mix no.	w/c ratio	% of METAKAOLIN AND STEEL FIBERS (FSR)	3 days average compressive strength in N/mm^2
1.	0.4	Control mix M-60	25
2.	0.4	M60 + M.K 05 % + 1 % SFR	26.1
3.	0.4	M60 + M.K 10 % + 2 % SFR	27.35
4.	0.4	M60 + M.K 15 % + 3 % SFR	28.04
5	0.4	M60 + M.K 20 % + 4 % SFR	26.07
6	0.4	M60 + M.K 25 % +5 % SFR	24

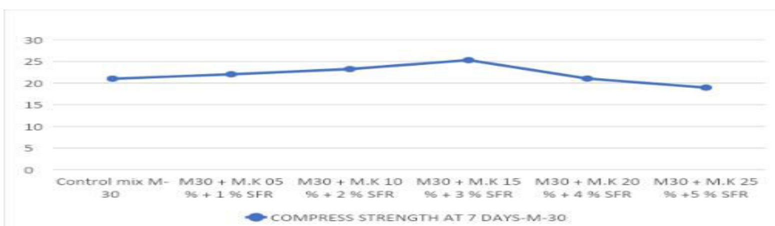
Table no.4.8 compressive strength test results M-60 grade in 3 days



graph no.4.8 compressive strength test results M-60 grade in 3 days

Mix no.	w/c ratio	% of METAKAOLIN AND STEEL FIBERS (FSR)	7 days average compressive strength in N/mm^2
1.	0.4	Control mix M-30	21
2.	0.4	M30 + M.K 05 % + 1 % SFR	22.05
3.	0.4	M30 + M.K 10 % + 2 % SFR	23.25
4.	0.4	M30 + M.K 15 % + 3 % SFR	25.32
5	0.4	M30 + M.K 20 % + 4 % SFR	21.05
6	0.4	M30 + M.K 25 % +5 % SFR	18.97

Table no.5.9 compressive strength test results M-30 grade in 7 days



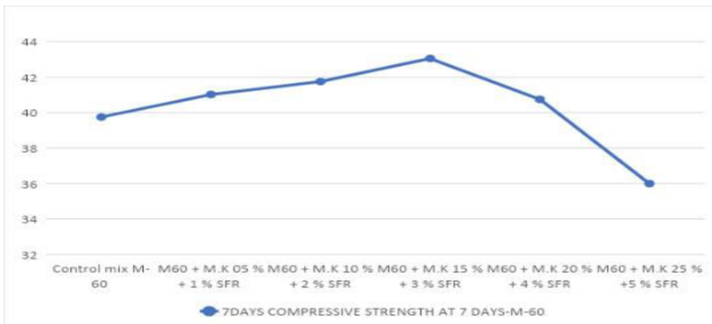
graph no.4.9 compressive strength test results M-30 grade in 7 days

Mix no.	w/c ratio	% of METAKAOLIN AND STEEL FIBERS (FSR)	7 days average compressive strength in N/mm^2
1.	0.4	Control mix M-60	39.05
2.	0.4	M60 + M.K 05 % + 1 % SFR	41.25
3.	0.4	M60 + M.K 10 % + 2 % SFR	41.87
4.	0.4	M60 + M.K 15 % + 3 % SFR	42.5

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

5	0.4	M60 + M.K 20 % + 4 % SFR	41.01
6	0.4	M60 + M.K 25 % +5 % SFR	36

Table no.4.10 compressive strength test results M-60 grade in 7 days

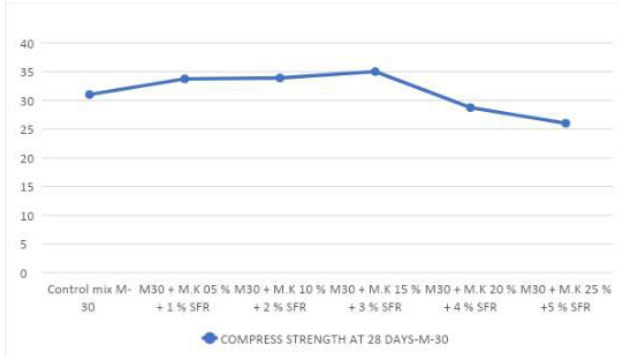


graph.4.10 compressive strength test results m 60 grade in 7 days

Mix no.	**w/c ratio**	**% of METAKAOLIN AND STEEL FIBERS (FSR)**	**28days average compressive strength in N/mm^2**
1.	0.4	Control mix M-30	31.02
2.	0.4	M30 + M.K 05 % + 1 % SFR	33.75
3.	0.4	M30 + M.K 10 % + 2 % SFR	33.91
4.	0.4	M30 + M.K 15 % + 3 % SFR	35.02
5	0.4	M30 + M.K 20 % + 4 % SFR	28.75
6	0.4	M30 + M.K 25 % +5 % SFR	26.02

Table no.4.11 compressive strength test results M-30 grade in 28 days

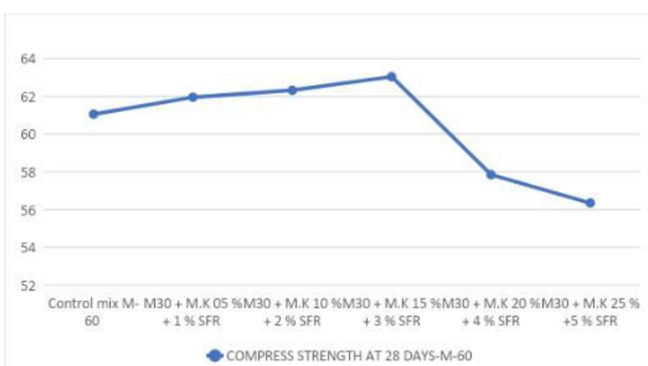
International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362



graph no.4.11 compressive strength test results M-30 grade in 28 days

Mix no.	**w/c ratio**	**% of METAKAOLIN AND STEEL FIBERS (FSR)**	**28 days average compressive strength in N/mm^2**
1.	0.4	Control mix M-60	61.05
2.	0.4	M60 + M.K 05 % + 1 % SFR	61.95
3.	0.4	M60 + M.K 10 % + 2 % SFR	62.32
4.	0.4	M60 + M.K 15 % + 3 % SFR	63.04
5	0.4	M60 + M.K 20 % + 4 % SFR	57.85
6	0.4	M60 + M.K 25 % +5 % SFR	56.35

Table no.4.12 compressive strength test results m 60 grade in 28 days

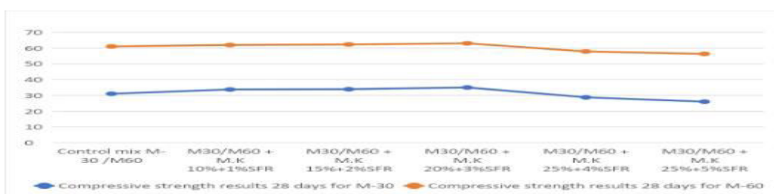


International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Graph no.4.12 compressive strength test results M-60 grade in 28 days

Ratio	Compressive strength results 28 days for M-30 in N/mm^2	Compressive strength results 28 days for M-60 in N/mm^2
Control mix M-30 /M60	31.02	61.05
M30/M60 + M.K 05 % + 1% SFR	33.75	61.95
M30/M60 + M.K 10 % + 2 % SFR	33.91	62.32
M30/M60 + M.K 15 % + 3 % SFR	35.02	63.04
M30/M60 + M.K 20 % + 4 % SFR	28.75	57.85
M30/M60 + M.K 25 % +5 % SFR	26.02	56.35

able no.4.13 compressive strength test results mM-30 M-60 grade in 28 days



graph no.4.13 compressive strength test results M-30 M-60 grade in 28 days

6.CONCLUSION

From the corresponding table no:5.12 & graph no:5.12 compressive strength at the percentage of different admixtures added in M-30 grade concrete (M30+15%M.K+3% SFR) – 35.02 N/mm^2

From the corresponding table no:5.12 & graph no:5.12 the highest compressive strength at the percentage of different admixtures added in M-60 grade concrete (M60+15%M.K+3% SFR)– 63.04 N/mm^2

From t he corresponding table no:5.20 & graph no:5.20 the highest split tensile strength at the percentage of different admixtures added in M-30 grade concrete

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

(M30+15%M.K+3% SFR)– 2.66 N/mm^2

From the corresponding table no:5.20 & graph no:5.20 the highest split tensile strength at the percentage of different admixtures added in M-60 grade concrete (M60+15%M.K+3% SFR)– 3.57 N/mm^2

From the corresponding table no:5.27 & graph no:5.27 the highest flexural strength strength at the percentage of different admixtures added inM-30 grade concrete (M30+15%M.K+3%SFR)– 4.412 N/mm^2

From the corresponding table no:5.27 & graph no:5.27 the highest flexural strength at the percentage of different admixtures added in M-60 grade concrete (M60+15%M.K+3%SFR)– 5.557N/mm^2

REFERENCES

- Dr.H.M.Somashekaraiah**:** a study had been made for the development of High Performance Concrete using mineral admixtures such as Fly-ash, Silica-fume and Metakaolin along with steel and Polypropylene fibers.
- Beulah M :. an experimental investigation on the effect of partial replacement of cement by Metakaolin by various percentages viz 0%, 10%, 20%, and 30% on the properties of high performance concrete,
- Barham Haidar Ali :an experimental research on mechanical properties of conventional concrete and a concrete incorporated Metakaolin (MK) with and without steel fibre

IS-CODE BOOKS:

IS – 456 – 2000

IS – 10262 – 2009

IS – 383 -1987