

# Effect of Admixture on Concrete Properties

Avneesh Pandey<sup>1, a</sup>, Satya veer Singh<sup>2, b</sup>,

<sup>1</sup> Master in Technology, Rama University, Mandhana Kanpur, UP, India.

<sup>2</sup> Assistant Professor, Department of Civil Engineering, Rama University, Mandhana Kanpur, UP, India.

## **ABSTRACT-**

Materials scientists, chemists, engineers, and manufacturers' technical representatives have helped the concrete industry to improve our ability to control work times, workability, strength, and durability of Portland cement concrete by adding some supplementary substances named admixtures.

The function of each admixture focuses on a specific need, and each has been developed independently of the others. Some admixtures already have chemistry that affects more than one property of concrete, and some have simply been combined for ease of addition during the batching process. To better understand recommended usage for various application of these chemicals admixture in concrete, the present study is planned to be obtained more specific information in this direction.

**Index Terms- Concrete, Admixture, Workability, Compressive Strength**

## **1. INTRODUCTION**

Concrete is a very strong and versatile mouldable construction material. It consists of cement, sand and aggregate (e.g. gravel or crushed rock) mixed with water. When the cement has chemically reacted with the water (hydrated), it hardens and binds the whole mix together. Concrete is a composite construction material, composed of cement (commonly Portland cement) and other cementitious materials such as fly ash and slag cement, aggregate (generally a coarse aggregate made of gravels or crushed rocks such as limestone, or granite, plus a fine aggregate such as sand), water, and admixtures. Materials scientists, chemists, engineers, and manufacturers' technical representatives have helped the concrete industry to improve our ability to control work times, workability, strength, and durability of Portland cement concrete by adding some supplementary substances named admixtures.

The function of each admixture focuses on a specific need, and each has been developed independently of the others. Some admixtures already have chemistry that affects more than one property of concrete, and some have simply been combined for ease of addition during the batching process.

Admixture is an essential component of any modern concrete mix, providing a compromise for the conflict between water and workability and performance of hardened concrete. The advancement in admixture technology has played a significant role in the development of concrete technologies. The advanced PCE based admixtures have demonstrated various performance benefits and technical advantages over conventional super plasticizers in meeting the diversified challenging technical requirements of various high performance concrete technologies for construction.

In this investigation on performance of concrete with different admixture the tests on compressive strength and Workability of the concrete with Ordinary Portland cement and admixture are carried out at different curing periods for M-15, M-20, M-25 grade of concrete to conclude its behavior.

## **1.1 ADMIXTURES**

The term admixture as “a material other than water, aggregates, hydraulic cement, and fiber reinforcement, used as an ingredient of a cementitious mixture to modify its freshly mixed, setting, or hardened properties and that is added to the batch before or during its mixing.” “chemical admixtures are used to enhance the properties of concrete and mortar in the plastic and hardened state. Admixtures have long been recognized as important components of concrete used to improve its performance.

- Increase workability without increasing water content or decrease the water content at the same workability;
- Retard or accelerate time of initial setting;
- Modify the rate or capacity for bleeding;
- Reduce segregation;
- Reduce rate of slump loss;
- Retard or reduce heat evolution during early hardening;
- Accelerate the rate of strength development at early ages;
- Increase strength (compressive, tensile, or flexural);
- Increase bond of concrete to steel reinforcement;
- Increase bond between existing and new concrete;
- Improve impact and abrasion resistance;
- Produce colored concrete or mortar.

## **1.2. CHEMICAL ADMIXTURES -**

Plasticizers or dispersants are additives that increase the plasticity or fluidity of the material to which they are added; these include plastics, cement, concrete, wallboard, and clay. Although the same compounds are often used for both plastics and concretes the desired effects and results are different.

Plasticizers or water reducers, and super plasticizer or high range water reducers, are chemical admixtures that can be added to concrete mixtures to improve workability. Unless the mix is "starved" of water, the strength of concrete is inversely proportional to the amount of water added or water-cement (w/c) ratio. In order to produce stronger concrete, less water is added (without "starving" the mix), which makes the concrete mixture less workable and difficult to mix, necessitating the use of plasticizers, water reducers, super plasticizers or dispersants.

### **1.3. OBJECTIVE**

The objective of the present study is to know the workability of concrete , these results are compared with admixtures mixes and without admixtures mixes , Especially slump cone test , compressive strength test.

## **2. MATERIALS**

1. Cement
2. Fine Aggregate
3. Coarse Aggregate
4. Chemical Admixtures
5. Water

## **3. EXPERIMENTAL INVESTIGATION**

1. Individual Sieve Analysis have been done on Cement, Fine Aggregates & Coarse Aggregates
2. In this study Admixture have been used to reduce water cement ratio.
3. For M-15, M-20, M-25 Grade Trial mix design is done .
4. Slum cone Test have been done for Slump.
5. Concrete Cubes have been prepared as per the mix design.
6. Workability Test have been done for fresh Concrete.
7. Compressive Strength test have been done for all the Mix of M-15, M-20, M-25 grade concrete of 7 Days & 28 Days.

#### 4. RESULTS & DISCUSSIONS

**4.1 WORKABILITY** Slump test have been used as a measure of workability for mixes for each grade and the results are as follow:

S.NO		Grade	Slump			
			Initial	At 30 Min	At 60 Min	At 90 Min.
1	Normal Concrete	M-15	65 mm	45 mm	35 mm	10 mm
		M-20	90 mm	75 mm	55 mm	25 mm
		M-25	120 mm	95 mm	80 mm	45 mm
2	Concrete with Admixture	M-15	85 mm	65 mm	45 mm	20 mm
		M-20	125 mm	90 mm	60 mm	35 mm
		M-25	150 mm	120 mm	95 mm	65 mm

#### 4.2 WATER-CEMENT RATIO

S.NO		Grade	W/C Ratio
1	Normal Concrete	M-15	0.58
		M-20	0.50
		M-25	0.44
2	Concrete with Admixture	M-15	0.50
		M-20	0.45
		M-25	0.41

### 4.3 COMPRESSIVE STRENGTH

S.NO		Grade	Compressive Strength in N/mm <sup>2</sup>	
			7 Days	28 Days
1	Normal Concrete	M-15	18.5	28.2
		M-20	23.8	32.1
		M-25	27.3	38.6
2	Concrete with Admixture	M-15	20.1	31.0
		M-20	26.2	35.6
		M-25	30.4	40.5

### 5. CONCLUSIONS

The results from the various testes for the three grades (15, 20, and 25) conducted on the fresh and hardened state of concrete mixes lead to the following observations:

Super plasticizers admixtures improve the workability without increasing water demand, for the three grades of concrete no decreasing in compressive strength was observed.

Super plasticizers admixtures provide an increasing in ultimate strength gain by significantly reducing water demand in a concrete mix for the three grades, without affecting workability.

Super plasticizers admixtures provide improved durability by increasing ultimate strength and reducing w/c ratio.

Super plasticizers admixtures save cost of the reduced cement for the three grades of concrete.

### 6. REFERENCES

1. International Journal of Research in Advent Technology, Vol.4, No.11, November 2016E-ISSN: 2321-9637
2. Pramod Pathak, Directormm Multhichem group, Mumbai. High Performance concrete admixtures for improving properties of concrete.”
3. P.Rohith Experimental Study on Admixtures<sup>1</sup> Vishnu Institute of Technology, Bhimavaram, Civil Engineering Dept<sup>2</sup>Site Engineer, Capital Engineering Services and Projects, Department of Civil Engineering Vignan Group of Institutions, Deshmukhi, Hyderabad, Department of Civil Engineering