2.4 SUPER PLASTICIZERS (High Range Water Reducers)

They are chemically different from normal plasticizers. Use of super plasticizers permit the reduction of water to the extent upto 30 per cent without reducing workability in contrast to the possible reduction up to 15 per cent in case of plasticizers

The use of super plasticizer is practiced for production of flowing, self-levelling, and self-compacting and for the production of high strength and high performance concrete. The mechanism of action of super plasticizers are more or less same as explained earlier in case of ordinary plasticizer.

Only thing is that the super plasticizers are more powerful as dispersing agents and they are high range water reducers. They are called High Range Water Reducers in American literature. It is the use of super plasticizer which has made it possible to use w/c as low as 0.25 or even lower and yet to make flowing concrete to obtain strength of the order 120 Mpa or more. It is the use of super plasticizer which has made it possible to use fly ash, slag and particularly silica fume to make high performance concrete.

Super plasticizers can produce:

- at the same w/c ratio much more workable concrete than the plain ones,
- for the same workability, it permits the use of lower w/c ratio,
- As a consequence of increased strength with lower w/c ratio, it also permits a reduction of cement content.

The superplasticizers also produce a homogeneous, cohesive concrete generally without any tendency for segregation and bleeding.

Superplasticizers constitute a relatively new category and improved version of plasticizer, the use of which was developed in Japan and Germany during 1960 and 1970 respectively. They are chemically different from normal plasticisers.

Amount used

- Based on various types of super plasticizers different amount is used.

- Lignosulphonates – not more than 0.25%
- Carboxylic acids – 0.1%
- Sulphonated malanie-formaldehyde condensates (SMF) – 0.5 to 3%
- Sulphonated naphthalene-formaldehyde condensates (SNF) – 05 to 3%

Classification of Super plasticizer:

Following are a few polymers which are commonly used as base for super plasticizers.

- Sulphonated malanie - formaldehyde condensates (SMF)
- Sulphonated naphthalene – formaldehyde condensates (SNF)
- Modified lignosulphonates (MLS)

In addition to the above, in other countries the following new generation super plasticizers are also used.

- Acrylic polymer based (AP)
- Copolymer of carboxylic acrylic acid with acrylic ester (CAE)
- Cross linked acrylic polymer (CLAP)
- Polycarboxylate ester (PC)
- Multicarboxylatethers (MCE)
- Combinations of above.

The first four categories of products differ Plasticizers and super plasticizers are water based. The solid contents can vary to any extent in the products manufactured by different companies. Cost should be based on efficiencies and solid content, but not on volume or weight basis. Generally in projects cost

Effects of Super plasticizers on Fresh Concrete:

It is to be noted that dramatic improvement in workability is not showing up when plasticizers or superplasticizers are added to very stiff or what is called zero slump concrete at nominal dosages.

A mix with an initial slump of about 2 to 3 cm can only be fluidised by plasticizers or super plasticizers at nominal dosages. A high dosage is required to fluidify no slump concrete. An improvement in slump value can be obtained to the extent of 25 cm or more depending upon the initial slump of the mix, the dosage and cement content.

Results – benefits

- Permits reduction of water content about 30% without reducing the workability.
- It is possible to use w/c ratio as low as 0.25 or even lower and yet to make flowing concrete to obtain strength of order 120 Mpa or more.

Effect of super plasticizer on concrete properties:

- Significant water reduction
- Reduced cement contents
- Reduce water requirement by 12-30%
- Increased workability
- Reduced effort required for placement
- More effective use of cement
- More rapid rate of early strength development
- Increased long-term strength
- Reduced permeability

Used at

- Production of flowing, self-levelling, self-compacting concrete
- Production of high strength and high performance concrete.