1.6 Admixtures and Minerals

Admixtures are ingredients other than cement, fine aggregate and coarse aggregate to improve the quality of concrete. The addition of an admixture may improve the concrete with respect to its strength, hardness, workability, water resisting power etc.

Needs of Admixtures

- To modify properties of fresh and hardened concrete.
- To ensure the quality of concrete during the mixing, transporting, placing, and curing.
- To overcome certain unexpected emergencies during concrete operations by using admixtures and etc…
- To reduce the cost of concrete construction.
- To achieve certain properties in concrete more effectively than by other means.
- To maintain the quality of concrete during the stages of mixing, transporting, placing, and curing in ad-verse weather conditions.
- To overcome certain emergencies during concreting operations.

Types of Admixture

Concrete admixtures are generally divided into 2 types

1. Chemical admixture
2. Mineral admixture

Chemical Admixtures

Chemicals mixed with concrete ingredients and spread throughout the body of concrete to favourably modify the molding and setting properties of concrete mix known as chemical admixtures.

Chemicals added to the concrete immediately or during mixing to modify its properties in the fresh hardened state.

Types:

- ✓ Accelerators – speed up the initial set of concrete.
- ✓ Retarders – delay the setting time of concrete mix.
- ✓ Plasticizers and Super-plasticizers - water reducers.
- ✓ Air entraining admixtures
- ✓ Waterproofers Pigments
- ✓ Corrosion - inhibiters
- ✓ Chemicals Anti-fungal admixtures

2.1.1 Accelerators

Accelerating admixtures are added to concrete to increase the rate of early strength development in concrete to

- ✓ Permit earlier removal of formwork;
- ✓ Reduce the required period of curing;
- ✓ Advance the time that a structure can be placed in service;
- ✓ Partially compensate for the retarding effect of low temperature during cold weather concreting;
- ✓ In the emergency repair work.

Commonly used materials as an accelerator:

- Calcium chloride (Not used now)
- Some of the soluble carbonates
- Silicates fluosilicates (Expensive)
- Some of the organic compounds such as triethenolamine (Expensive)

In the past one of the commonly used materials as an accelerator was calcium chloride. But, now a days it is not used. Instead, some of the soluble carbonates, silicates fluosilicates and some of the organic compounds such as triethenolamine are used.

Accelerators such as fluosilicates and triethenolamine are comparatively expensive. The recent studies have shown that calcium chloride is harmful for reinforced concrete and prestressed concrete. It may be used for plain cement concrete in comparatively high dose.

Some of the accelerators produced these days are so powerful that it is possible to make the cement set into stone hard in a matter of five minutes are less. With the availability of such powerful accelerator, the underwater concreting has become easy. Similarly, the repair work that would be carried out to the waterfront structures in the region of tidal variations has become easy. The use of such powerful accelerators have facilitated, the basement waterproofing operations. In the field of prefabrication also it has become an invaluable material. As these materials could be used up to 10°C, they find an unquestionable use in cold weather concreting.

Some of the modern commercial accelerating materials are Mc-Schnell OC, Mc-Schnell SDS, Mc-Torkrethilfe BE, manufactured by Mc-Bauchemic (Ind) Pvt. Ltd. MC-Torkrethilfe BE is a material specially formulated to meet the demand for efficient and multifold properties desired for sprayed concrete and shotcreting operations. A field trial is essential to determine the dose for a given job and temperature conditions when the above materials are used.

Accelerating Plasticizers:

Certain ingredients are added to accelerate the strength development of concrete to plasticizers or superplasticizers. Such accelerating superplasticizers, when added to concrete result in faster development of strength. The accelerating materials added to plasticizers or superplasticizers are *triethenolamine chlorides, calcium nitrite, nitrates and flousilicates etc.* The accelerating plasticizers or accelerating super plasticizers manufactured by well-known companies are chloride free.

Advantages / Effects of accelerator on concrete properties:

- ✓ Reduced bleeding,
- ✓ Earlier finishing
- ✓ Improved protection against early exposure to freezing and thawing,
- ✓ Earlier use of structure
- ✓ Reduction of protection time to achieve a given quality,
- ✓ Early removal of form, and early load application.
- ✓ Increases the rate of gain of strength.
- ✓ Enables earlier release from precast moulds thus speeding production.
- ✓ Reduces segregation and increase density and compressive strength.
- ✓ Cures concrete faster and therefore uniform curing in winter and summer can be achieved.
- ✓ Early use of concrete floors by accelerating the setting of concrete.
- ✓ Reduces water requirements, bleeding, shrinkage and time required for initial set.