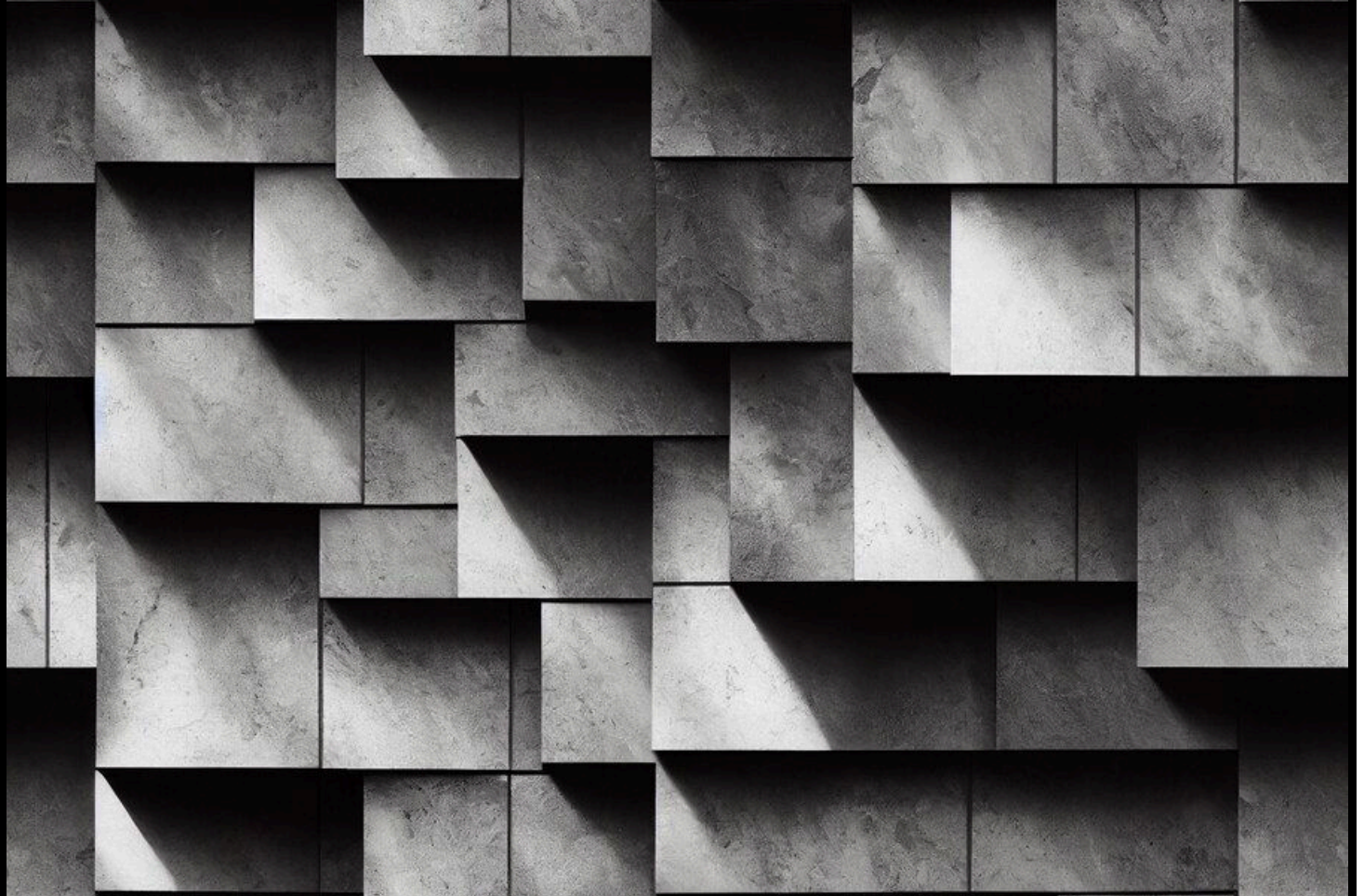


# CONCRETE ADDITIVE & ADMIXTURE



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## **Admixture Description**

A concrete additive is a substance that is added to concrete to improve or modify its properties. These additives can be used to increase the strength, durability, or workability of the concrete, or to improve its appearance or performance in specific applications. Some common types of concrete additives include water reducers, super plasticizers, retarders, accelerators, and air entraining agents. Concrete additives are commonly used in construction projects to improve the quality and performance of the finished concrete products.

## **History Of Admixture**

The use of admixtures in concrete dates back to ancient times, with evidence of various types of natural materials being added to concrete mixes to improve their properties. For example, the ancient Romans used pozzolanic materials, such as volcanic ash, to make a type of concrete called "pozzolanic concrete" that was stronger and more durable than normal concrete.

During the 19<sup>th</sup> century, the use of industrial by-products, such as fly ash and slag, began to be added to concrete as a replacement for natural materials. In the early 20<sup>th</sup> century, researchers began to develop chemical admixtures, such as air entraining agents and water reducers, to improve the workability and strength of concrete.

The first commercialized chemical admixture was the water reducer, in the 1930s. Since then, the use of admixtures in concrete has become increasingly widespread and sophisticated, with new types of admixtures being developed to meet specific performance requirements. Today, the use of admixtures is an integral part of the concrete industry and helps to create high-performance concrete for various construction projects.

## Materials That Make Up Admixtures

Admixtures are made up of a variety of different ingredients, depending on their intended purpose. Here are a few examples of common types of admixtures and their ingredients:

1. Air-entraining agents: These admixtures are used to create small, stable air bubbles in the concrete to improve its ability to withstand freeze-thaw cycles. They typically consist of surfactants, which are compounds that reduce the surface tension of liquids.
2. Water-reducing admixtures: These admixtures are used to increase the workability of the concrete while using less water. They typically consist of lignosulphonates or polycarboxylate polymers, which are compounds that reduce the amount of water needed to make the concrete workable.
3. Set-retarding admixtures: These admixtures are used to slow down the setting time of the concrete, giving the concrete more time to be poured, shaped and finished before hardening. They typically consist of compounds such as salts of lignosulfonates, hydroxylase carboxylic acids, or sugar derivatives.
4. Set-accelerating admixtures: These admixtures are used to speed up the setting time of the concrete. They typically consist of compounds such as calcium chloride or sodium chloride.
5. Pozzolanic Admixtures: Admixtures containing pozzolanic materials such as fly ash, or slag, or natural pozzolan materials like volcanic ash. These are added to the concrete to improve its strength and durability, and to help lower the carbon footprint of the concrete production process.
6. Pigmenting Admixtures: These are usually mineral oxides, mainly Iron Oxide pigments, which are added to the concrete to give a specific color.

There are many other types of admixtures with different properties, ingredients and uses. The ingredients and formulation can vary widely depending on the manufacturer and intended application.

## **Types Of Admixture**

Admixtures are added to concrete to improve or modify its properties. Some common types of admixtures include:

1. Water reducers: These are added to concrete to decrease the amount of water needed in the mix while maintaining the same workability, resulting in a higher strength concrete.
2. Super plasticizers: These are used to increase the fluidity of the concrete mix and reduce the amount of water needed while maintaining workability.
3. Retarders: These are added to slow down the setting time of the concrete, which can be useful in hot weather or when long transportation is required.
4. Accelerators: These are added to speed up the setting time of the concrete, which can be useful in cold weather or when a quick turnaround time is needed.
5. Air entraining agents: These are added to create small air bubbles in the concrete, which improves its durability and resistance to freezing and thawing.
6. Corrosion inhibitors: These are added to concrete to protect steel reinforcements from corrosion, by creating a passive film on the steel surface.
7. Shrinkage reducing agents: These are added to control the shrinkage of concrete, which can result in cracking and structural damage.
8. Micro silica: these fine powders of silica fume added to concrete, to improve its strength, durability and reduce the permeability, making it more resistant to chemical attacks and severe environmental conditions.

Admixtures are used to improve the performance of concrete and make it more suitable for different types of construction projects.

## **Dosages Of Using Admixtures**

The dosage of an admixture is the amount of the admixture that is added to a specific volume of concrete. The exact dosage will depend on the type of admixture and the properties that are desired in the final concrete mix.

For example, for water reducers, the dosage is usually in the range of 0.2% to 0.5% of the cement content by weight. For super plasticizers, the dosage is usually between 0.3% and 0.8% of the cement content by weight. The dosage for retarders and accelerators, it is typically between 0.2% and 0.5% of the cement content by weight.

It is important to note that the dosage of an admixture can also be influenced by factors such as the temperature, the moisture content of the aggregate, and the size of the aggregate. The use of the right dosage is essential to achieve the desired properties in concrete, and therefore, it is always recommended to consult the manufacturer's guidelines or consult with a concrete expert before using admixture

## **Common Companies That Produce Admixtures**

There are many companies worldwide that produce concrete additives for different types of application. Some of the leading companies include:

1. Sika AG: A multinational company that specializes in the production of construction chemicals and building materials, including concrete admixtures.



۲. BASF: A German chemical company that produces a wide range of concrete admixtures, including water reducers, super plasticizers, and air entraining agents.



۳. Dow Chemical: A global company that produces a wide range of industrial chemicals, including concrete admixtures.



۴. Fosroc: A British multinational company that specializes in the production of construction chemicals and building materials, including concrete admixtures.



- LafargeHolcim: A multinational company that produces a wide range of building materials, including concrete and concrete admixtures.



- 7. GCP Applied Technologies: An American multinational company that specializes in the production of construction chemicals and building materials, including concrete admixtures.



**gcp** applied technologies

٧. CEMEX: A Mexican multinational company that produces a wide range of building materials, including concrete and concrete admixtures. These companies offer a wide range of high-quality products that are designed to improve the performance of concrete in various construction projects, and they have a vast experience in the field of construction and engineering.



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## **Advantages Of Concrete Admixtures**

There are many advantages to using concrete admixtures in construction projects, including:

١. Improved workability: Admixtures can be used to improve the workability of the concrete, making it easier to place and finish.
٢. Increased strength: Admixtures can be used to increase the strength of the concrete, making it more durable and resistant to cracking and other types of damage.
٣. Increased durability: Admixtures can be used to improve the durability of the concrete, making it more resistant to weathering, erosion, and other types of environmental damage.



- ξ. Increased resistance to chemicals: Admixtures can be used to improve the resistance of the concrete to chemicals and other types of corrosion.
- ο. Faster setting time: Admixtures can be used to speed up the setting time of the concrete, allowing for faster construction times.
- ϕ. Reduced shrinkage: Admixtures can be used to reduce the shrinkage of the concrete, reducing the likelihood of cracking.
- ϗ. Reduced water demand: Admixtures can be used to reduce the water demand of the concrete, making it more environmentally friendly.
- Ϙ. Reduced cost: Admixtures can help to reduce the overall cost of the project, by reducing the need for additional materials or labor.
- ϙ. Enhanced freeze-thaw resistance: Admixtures can be used to improve the freeze-thaw resistance of the concrete, which can be beneficial in cold weather conditions.
- Ϡ. Improved finish ability: Admixtures can be used to improve the finish ability of the concrete, making it easier to achieve a smooth and attractive surface finish.

Overall, the use of admixtures can greatly improve the performance of concrete and make it more suitable for different types of construction projects.





## **Disadvantages of using concrete admixtures**

While concrete admixtures can provide many benefits, there are also some potential disadvantages to consider, including:

1. Compatibility issues: Some admixtures may not be compatible with certain types of cement or other materials, which can lead to reduced performance or other problems.
2. Environmental concerns: Some admixtures may have negative environmental impacts, such as increased water or energy consumption, or the release of harmful chemicals.
3. Increased complexity: Using admixtures can increase the complexity of the concrete mix and the construction process, which may require additional training and expertise.
4. Cost: Admixtures can be expensive, which may increase the overall cost of the project.
5. Incompatibility with other products: Admixtures can cause problems when combined with other construction materials, such as coatings and sealers, that can have a negative impact on the final product.
6. Limited shelf life: Some admixtures have a limited shelf life, which may limit their usefulness in certain construction projects.
7. Uncontrolled Dosages: Admixtures are potent materials and must be added to the concrete in a specific amount, if not followed it can lead to overuse or underuse, both of which can lead to a weaker final product.
8. Unexpected effects: Admixtures may have unexpected effects, such as cracking or discoloration, which can lead to a reduced quality of the final product.
9. Lack of regulations: Admixtures are not heavily regulated and some admixtures may not be suitable for certain types of construction projects, it is essential to follow the manufacturer's instructions and to consult a concrete expert before using admixtures.

It's important to weigh the potential advantages and disadvantages of using concrete admixtures, as well as to consult with experts before using them in construction projects.

## **Individual/group/stakeholders Need admixtures**

There are many different types of admixtures, each with its own specific purpose. Here are a few examples of why an individual, group, or stakeholders may need admixtures in their concrete:

- i. An individual building a residential or commercial structure may use admixtures to increase the strength and durability of the concrete, which can help ensure the safety and longevity of the building.
- ii. A group of engineers designing a bridge or other infrastructure project may use admixtures to improve the workability of the concrete, which can make it easier to pour and shape the concrete into the desired form.
- iii. A construction company may use admixtures to control the setting time of the concrete, allowing them to pour it during the hot summer day, and have enough time to finish the work while concrete still in the usable state.
- iv. A stakeholder in a project, such as an owner or investor, may be interested in using admixtures to reduce the overall cost of the project by reducing the amount of cement required or increasing the energy efficiency of the concrete.
- v. For Environmental issue an admixture such as air-entraining agent might be used to prevent cracking and damage due to freeze-thaw cycles in cold climates, or pozzolanic agents that can help lower the carbon footprint of the concrete production process.

## **Durability Of Using Admixture**

It is important to note that while admixtures can be a useful tool for improving the durability of concrete, they are not a substitute for proper design, materials selection, and construction practices. The durability of concrete is a result of combination of many factors, such as curing method, the quality of the materials and the environment that the structure is exposed to. The key to achieving durable concrete is a good understanding of the properties of the materials being used, the environment that the structure will be exposed to, and the design requirements for the structure.

## **Conclusion**

The following conclusion comes through the study of the admixtures that the Admixtures develops concrete additives, bonding, coating, flooring, repair and protection, reinforcing, roofing, strengthening and waterproofing solutions for the construction industry. So they are extensively used in worldwide for improving the quality, strength and workability of the concrete structures