

Why Concrete Cracks



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Overview of Main Causes

Concrete is one of the most commonly used construction materials in the world, valued for its durability, stability, and longevity. However, like any material, concrete is susceptible to various factors that can lead to its cracking. Understanding these causes is crucial for maintaining the structural integrity of concrete structures.

Change in Temperature and Humidity

- ❖ Concrete is a material that reacts to changes in temperature and humidity, expanding and contracting in response to these changes. Sudden or drastic fluctuations in temperature and humidity can lead to cracks in the concrete, especially if it does not have sufficient opportunity to properly adjust to the new conditions.

Building Settlement

- ❖ Building settlement is a natural process that occurs as the structure gradually settles on its foundation. However, uneven settlement can lead to cracks in concrete structures, as uneven pressure is exerted on different parts of the building.

Improper Mixing and Application of Concrete

- ❖ The process of mixing and applying concrete is incredibly important for its strength and longevity. If the concrete mix is not properly prepared, or if the concrete is not properly poured and cured, it can lead to cracking. That's why it's so important to always adhere to the appropriate preparation and application procedures for concrete.

Structural Load

- ❖ Concrete is a material with high strength, but like any material, it has its limits. Excessive load on a concrete structure can lead to cracking, when the forces acting on the concrete exceed its strength.

Reinforcement Corrosion

- ❖ Concrete is often reinforced with steel, which adds to its strength. Unfortunately, steel is susceptible to corrosion, which can lead to cracks in the concrete. If cracks occur, the path for environmental water and gases to the reinforcement becomes open, which can lead to the carbonation of the concrete, a process that stimulates corrosion.

Chemical Attacks

- ❖ Concrete can be exposed to various chemical attacks, for example, by aggressive salts contained in groundwater. These substances can react with the concrete, causing it to crack and destroying its structural integrity.

Construction Errors

- ❖ Errors in design and execution, such as improper expansion joint planning, can lead to cracks. Careful planning and experience are necessary to prevent such problems.

Seismic Movements

- ❖ In regions with high seismic activity, earthquakes can cause cracks in concrete structures. Buildings in such areas must be designed to withstand these forces to prevent concrete cracking.

The Impact of Trees on Concrete Structures

- ❖ Trees and plants can affect concrete structures in several ways. First, tree roots can grow underground and press against concrete structures, leading to cracks. In addition, trees can exert pressure on concrete structures through their weight, especially when planted too close to the building. Finally, trees and plants can affect soil moisture, leading to changes in the building's degree of settlement and cracks in the concrete.

Poor Drainage

- ❖ For example, poor drainage can lead to water accumulation around structures, causing cracks. Water can soak into the concrete, causing it to expand and contract, which in turn leads to cracking.

The Impact of Weather

- ❖ Extreme weather conditions, such as strong winds, rain, snow, and ice, can also lead to cracks in concrete. For example, strong winds can cause cracks in concrete through physical impact, while freeze-thaw cycles of water in the concrete can lead to cracking.

Low-Quality Materials

- ❖ The use of low-quality materials or mixing techniques can also lead to cracks. For example, if the concrete is too dry, it can crack during hardening.

Errors in Concrete Pouring

- ❖ Improper concrete pouring is one of the most common causes of cracking. If the concrete is not evenly distributed, weaknesses can occur, leading to cracking. Moreover, the speed at which concrete is poured is crucial. Pouring too quickly can lead to the formation of air voids, weakening the structure.
- ❖ Temperature has a key influence on the concrete binding process. Rapid changes in temperature can cause cracks, as concrete expands and contracts with temperature changes. If concrete is poured at too low a temperature, it can freeze before it properly binds, weakening the structure.
- ❖ Poor Vibrating - During the concrete pouring process, it's necessary to vibrate the concrete to remove any air bubbles that could weaken the structure. If this process isn't carried out properly, it can lead to the formation of air voids and cracks.

SUMMARY:

In conclusion, despite its immense strength and versatility, concrete is susceptible to cracks caused by a variety of factors. From errors during pouring, through adverse weather conditions, improper care, to natural processes such as building settlement and the influence of vegetation - all these affect the durability of concrete structures. Also, serious damage, such as "concrete cancer", is the result of processes like reinforcement corrosion.

But concrete is not just a construction material - it's a material that carries a history of millions of years. The key ingredient of concrete, limestone, comes from seashells and other marine remains accumulated at the bottom of oceans. This fascinating fact reminds us of how much our daily life is connected to the depths of the marine world and how complex the world of construction materials is. Ultimately, understanding and taking all these factors into account is crucial for maintaining the durability and safety of our concrete structures.

