

## Plastic Curing on Concrete Surface

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**Abstract** Plastic curing is an important process in construction that helps concrete gain strength and durability. It is a modern and economical method in which plastic sheets, such as polythene, are placed over freshly laid concrete to prevent moisture loss. Proper curing is necessary because cement and water react to form a strong structure, and early loss of moisture reduces strength and causes cracks. By covering the surface and sealing the edges, plastic sheets maintain sufficient moisture and reduce evaporation. In this study, plastic sheets are placed on concrete specimens after initial setting and sealed properly to prevent air and moisture loss. This method is especially useful in areas where water is scarce or where traditional curing methods are difficult to maintain.

### 1. INTRODUCTION

Curing is a very important process in civil engineering because it helps concrete gain proper strength and durability. When concrete is kept moist for a certain period after placing, the cement and water continue their chemical reaction, which makes the concrete stronger. Proper curing increases the compressive strength of concrete and helps the structure carry loads safely. It also prevents the concrete from drying too quickly, which reduces the chances of cracks forming on the surface. Curing improves the durability of concrete structures and helps them last for a longer time. It also makes the concrete denser, which reduces water leakage and protects the structure from environmental damage. Another important benefit of curing is that it improves the surface quality of concrete elements such as slabs, beams, and columns. Proper curing also reduces shrinkage that occurs when concrete loses moisture. Therefore, curing is essential in civil engineering because it ensures that concrete structures such as buildings, bridges, roads, and dams become strong, durable, and safe. Plastic curing provides several advantages such as saving water, reducing Labour work, maintaining proper hydration, and improving the overall strength and durability of concrete. It is also simple to apply and economical for construction sites. Therefore, plastic curing is considered an effective alternative curing method for modern construction practices. Method of Plastic Curing in Concrete Plastic curing of concrete is a curing method where the surface of freshly placed concrete is covered with plastic or polythene sheets. The main purpose of

method is very useful in places where water is not easily available or where continuous water curing is difficult. Plastic curing is simple, economical, and easy to apply on construction sites.

#### 1. Polyethylene (Polythene) Sheet

Polythene sheet is a thin plastic sheet made from polyethylene material. It is very light in weight and easy to handle. It is flexible and can be folded or cut into different sizes according to the need. Polythene sheets are waterproof, so they do not allow water to pass through them. Because of this property, they are used to protect materials from rain,

moisture, and dust. In construction work, polythene sheets are commonly used for plastic curing of concrete. They are placed over the surface of fresh concrete to prevent the loss of moisture. This helps the concrete to remain wet for a longer time and gain proper strength. Polythene sheets also protect the concrete surface from direct sunlight and wind. These sheets are strong, durable, and easy to use.

#### Thickness of Polythene Sheets

The thickness of polythene sheets is usually measured in microns or milli meters (mm). Common thickness ranges are: 25 – 50 microns : Very thin sheets used for light covering or packaging. 100 – 150 micron's : Medium thickness used for agriculture and basic protection.

200 – 300 micron's : Thick sheets used in construction work like concrete curing and waterproofing. The price of a polythene sheet depends on thickness (micron), size, and quality.



## 2. METHODOLOGY

### 1. Selection of Plastic Curing Method

In this project, the plastic curing method is selected as the 10. Monitoring the Curing Process curing technique for concrete. This method is simple, During the curing period, the condition of the concrete is economical, and easy to apply on construction sites. It helps in monitored to ensure that the curing process is progressing maintaining the required moisture in concrete and prevents the properly. The plastic sheet should remain intact and fully rapid loss of water from the surface. Plastic curing is also cover the surface so that moisture is retained inside the useful in saving water compared to traditional curing methods. concrete. Proper monitoring helps in achieving better strength and durability.

### 2. Surface Preparation

Before starting the curing process, the concrete surface is 11. Removal of Plastic Sheet After Curing cleaned properly. Dust, dirt, and loose particles are removed After the curing period of about 7 to 14 days, the plastic from the surface so that the plastic sheet can be placed sheet is carefully removed from the concrete surface. This smoothly. Proper surface preparation ensures that the curing should be done slowly to avoid damaging the surface. Once process works effectively and helps in achieving better results. the sheet is removed, the concrete surface can be inspected for its quality, finish, and strength development.

### 3. Concrete Placement

Fresh concrete is placed in the required area and the finishing 12. Final Observation and Result Analysis process is completed. The concrete is spread, leveled, and The final step of the methodology involves observing the compacted properly to obtain a smooth surface. After placing condition of the concrete after curing. The surface quality, the concrete, it is allowed to settle until the initial setting strength development, and absence of cracks are examined. process begins and the surface becomes slightly hard. These observations help in evaluating the effectiveness of the plastic curing method in improving the durability and performance of concrete.

### 4. Plastic Sheet Covering

After the initial setting of concrete, a plastic or polythene sheet is placed over the entire surface. The sheet is spread carefully so that the whole concrete area is covered properly. If more than one sheet is used, they are overlapped slightly to prevent air from entering under the sheet.

### 5. Edge Sealing

The edges of the plastic sheet are sealed using soil, sandbags, or adhesive tape. This helps to keep the plastic sheet fixed in position and prevents air from entering inside. Proper sealing is important because it helps in maintaining moisture inside the concrete.

### 6. Moisture Retention

The plastic sheet acts as a barrier that prevents the evaporation of water from the concrete surface. Because of this, moisture remains inside the concrete for a longer time. This helps the cement hydration process to continue properly and improves the strength and durability of the concrete.

### 7. Curing Period

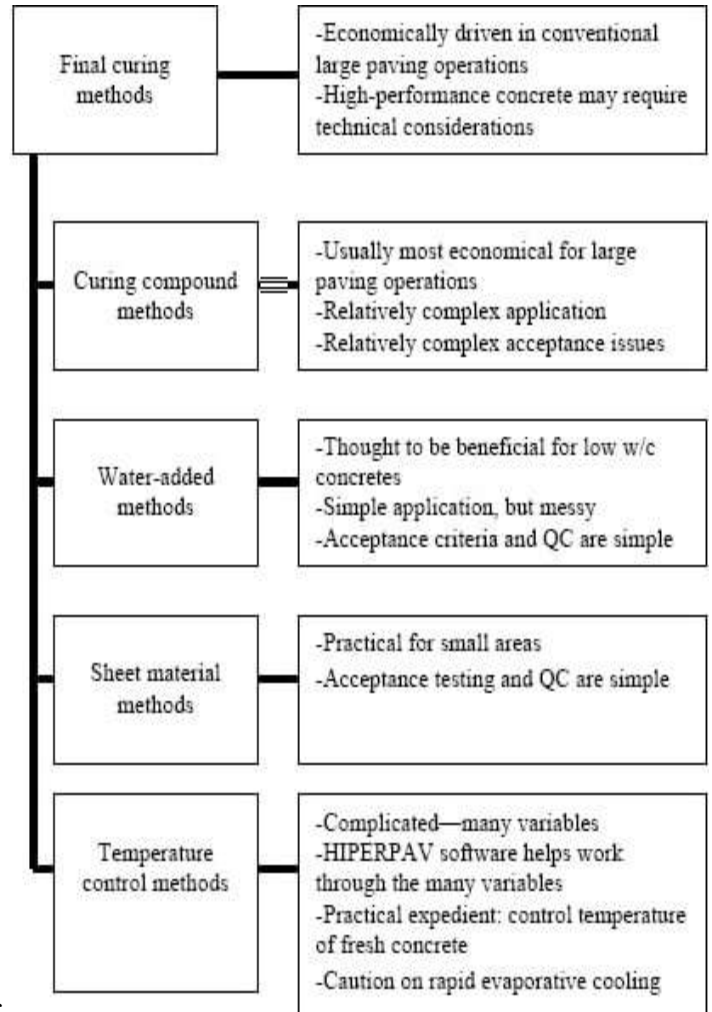
The plastic sheet is kept on the concrete surface for about 7 to 14 days. During this period, the concrete gradually gains strength as the hydration process continues. The sheet is checked regularly to ensure that it is not damaged or removed during the curing period.

### 8. Regular Inspection of Plastic Sheet

During the curing period, the plastic sheet should be inspected regularly to ensure that it remains properly placed over the concrete surface. If the sheet is damaged or displaced due to wind or other environmental factors, it should be adjusted immediately. Regular inspection helps in maintaining proper moisture conditions for effective curing.

### 9. Protection from Environmental Conditions

The plastic sheet also protects the concrete surface from external environmental factors such as sunlight, wind, and high temperature. These factors can cause rapid evaporation of water from the concrete surface. By covering the concrete with a plastic sheet, the curing process continues under controlled conditions.



### 3. RESULT

#### 1. Preparation of Wooden Mold

For the preparation of the model, a wooden mold is used to create the shape of a small concrete slab. The mold helps in holding the concrete mixture in the required form until it hardens. It also makes the demonstration easier during the project presentation.

#### 2. Mixing of Concrete Materials

In the next step, concrete materials such as cement, sand, and water are mixed properly to prepare the concrete mixture. The materials are mixed until a uniform and workable consistency is achieved. Proper mixing is important to ensure the quality and strength of the concrete.

#### 3. Placing the Concrete in the Mold

After preparing the mixture, the fresh concrete is placed inside the wooden mold. The concrete is spread evenly inside the mold so that the surface becomes level and uniform. Proper placement helps in forming a smooth concrete slab.

#### 4. Surface Finishing

Once the concrete is placed in the mold, the surface is finished using a trowel. The finishing process helps in leveling the concrete surface and removing any air gaps or unevenness. A smooth surface is necessary before applying the curing method.

#### 5. Initial Setting of Concrete

After finishing the surface, the concrete is left undisturbed for some time so that the initial setting process can begin. During this stage, the concrete becomes slightly hard and ready for the curing process.

#### 6. Application of Plastic Sheet

After the initial setting of concrete, a plastic or polythene sheet is placed over the concrete surface. The sheet is spread carefully to cover the entire area. This step is important because the plastic sheet helps in preventing the evaporation of water from the concrete.

#### 7. Moisture Retention Process

The plastic sheet acts as a barrier that traps moisture inside the concrete. This helps in maintaining the required moisture level for the hydration process of cement. Proper hydration improves the strength and durability of the concrete.

#### 8. Demonstration of Plastic Curing

The model is used to demonstrate how plastic curing works in practical situations. It helps students and viewers to understand the curing process visually and practically.

#### 9. Observation of Concrete Surface

After the curing period, the concrete surface is observed to check the quality and condition of the slab. The surface is checked for cracks, smoothness, and strength development.

#### 10. Result of the Model

The model shows that plastic curing helps in maintaining moisture in the concrete and improves its strength and durability. It also demonstrates that plastic curing is a simple and effective curing method used in construction.

The study shows that plastic curing improves the curing process by maintaining moisture.

Observed Results:

Reduced water evaporation from the surface

Proper hydration of cement

Improved surface finish

Fewer cracks compared to poorly cured concrete

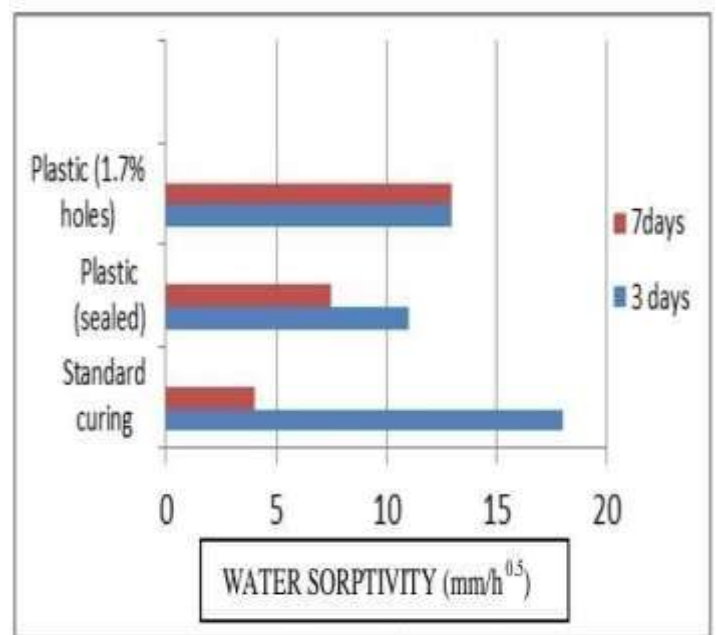
Increased or maintained compressive strength

Water-saving method

Easy and economical to apply

Final Result Statement:

Plastic curing is an effective method that improves moisture retention, reduces cracks, saves water, and enhances the strength and durability of concrete.



This chart shows the water sorptivity of concrete.

Water sorptivity means how fast water enters the concrete.

There are three types of curing methods:

Plastic (1.7% holes)

Plastic (sealed)

Standard curing

The chart compares results for 3 days (blue) and 7 days (red).

Standard curing

→ Has the highest water sorptivity

→ It absorbs more water (not very good)

Plastic (sealed)

→ Has medium water sorptivity

→ Better than standard curing

Plastic (1.7% holes)

→ Has lowest water sorptivity

→ Best result (less water enters)

#### 4. CONCLUSION

Plastic curing is a reliable and effective method used to maintain moisture in concrete by covering the surface with plastic sheets. It helps in proper hydration of cement, which is necessary for achieving good strength and durability. By preventing rapid evaporation of water, plastic curing reduces the chances of cracks and improves the overall quality of the concrete surface.

This method is very useful in modern construction because it saves a large amount of water compared to traditional curing methods. It is simple to apply, requires less labor, and can be used in different types of construction works such as roads, slabs, and pavements. It is especially beneficial in hot and dry regions where water is scarce.

Plastic curing also provides protection to concrete from environmental factors like sunlight, wind, and temperature changes. With proper placement and handling of plastic sheets, better results can be achieved.

However, care should be taken to avoid gaps in the sheet and to manage plastic waste properly. In the future, the use of eco-friendly and reusable plastic materials can make this method more sustainable.

Plastic curing is an efficient and economical method for curing concrete. It ensures proper hydration by preventing moisture loss, which improves strength, durability, and surface quality while reducing cracks.

This method is especially useful in hot and dry climates and in areas with water shortages, as it saves a significant amount of water compared to traditional methods. It is simple to use, cost-effective, and suitable for various construction works.

Plastic curing provides uniform curing, improves overall quality, and reduces labor requirements. However, proper placement and handling of plastic sheets are necessary to achieve the best results.

In conclusion, plastic curing is a reliable, practical, and water-saving method that enhances the performance and lifespan of concrete structures.

#### Key Conclusions on Plastic Curing for Concrete:

**Effectiveness in Moisture Retention:** Plastic sheets act as an efficient vapor barrier, preventing evaporation, maintaining a humid environment, and ensuring adequate hydration of the concrete, which leads to higher strength, a smoother finish, and fewer cracks.

**Best Use Cases:** It is best suited for vertical members like columns, shear walls, and retaining walls, where water curing is difficult.

**Reduced Shrinkage Cracking:** It is highly successful in restraining micro and plastic shrinkage cracks (often reducing them significantly) by trapping bleed water on the surface.

**Application and Considerations:** For optimal performance, the concrete should be cleaned, and the plastic should be applied tightly to prevent air movement. It is often used in combination with wetted hessian/burlap to enhance moisture retention.

**Comparison to Other Methods:** While effective, some studies suggest that direct water curing (immersion or sprinkling) may produce slightly higher compressive strengths.

Plastic sheeting is considered more effective than leaving concrete uncured, and in some, but not all, studies, it acts as a superior or equivalent alternative to curing compounds.

**Sustainability:** It saves water, labor, and resources, making it a sustainable and eco-friendly option.



Observed on Road using Polyethylene (Polythene) Sheet

