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Plaster in Older Historic Structures

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Older historic structures were often constructed using plaster as both structural components and decorative elements. As the plaster is affected by the environment in which the buildings live, it changes and degrades. The plaster cracks and falls from the walls and ceilings. It may discolor as it ages. In order to preserve the plaster, it's important to understand the types of plaster and causes of damage.



Union Station Before Renovation *(Indiana Historical Society)*

Some common types of plaster used in older buildings were lime-based, gypsum, and clay-based. All of them vary in their chemical composition.

Lime-based plaster, often used until the early 1900s, is made of building lime (calcium carbonate). It has a longer drying time and sets more slowly than other types of plaster. The material allows walls to breathe and is fairly flexible. It is less likely to be damaged over time and under normal circumstances.

Gypsum plaster is 79% calcium sulfate and 21% water. The composition means that it sets quickly and is easier to work with than other types. The chemical composition also means that it's prone to damage through moisture incursion.

Clay-based plasters are a mixture of clay, sand, and natural fibers. This plaster is hygroscopic which means that it absorbs and releases moisture well and can help control relative humidity. It is commonly used in specific climates and regions because of its effect on building temperatures. The clay in this type of plaster acts as a binding agent and holds the other ingredients together. The fibers add flexibility and the sand helps the plaster be more durable. The water contributes to its viscosity (resistance to a fluid's flow) which affects the plaster's thickness and stickiness.

Cracks in plaster are common and are not necessarily cause for concern. Hairline cracks are often cosmetic and occur during the drying and aging processes. Spreading or web-like cracks may indicate excessive shrinkage during the drying process or are caused as buildings settle normally. Linear or deep cracks signal a serious problem with substrate (the material layer under the plaster). These cracks could mean that there are structural issues that cause building movement such as a shift in a wall or foundation subsidence. To monitor the cracking, measure the length, width, depth of the cracks and note any changes. Record the measurements and the date they were taken so that changes can be tracked over time.

If there is water incursion into the walls or ceilings, plaster may bubble or blister. As the moisture increases and the wall becomes saturated, the water will begin to seek a way out. This causes the bubbling and blistering. The plaster will eventually fall from the wall and leave the substrate exposed. If a bubble appears, check the wall around it. Look for any signs of water damage such as discoloration or damp patches. Try to identify where the water is coming from. Examine the walls and ceilings on floors above and below the affected wall. Also check the exterior walls. Look for any loss of mortar, holes in the façade, or damage to the structure in the area of the interior damage. One way to track the spread of water damage is to use a pencil to trace the damaged area. Note the day the line was drawn. Then go back to see if the discoloration or dampness moves beyond the pencil line.

Plaster that is crumbling, flaking, or has a powdery appearance is also evidence of water incursion. As water is absorbed into the wall, it may cause dirt, chemicals, minerals, and impurities from the substrate to leach into the plaster. The water and the impurities it brings with it hinder the plaster's ability to adhere to the substrate and causes it to crumble and flake. As the minerals and other substances work their way through the wall, they will push through the plaster and may cause efflorescence, a chalky residue on the surface of the plaster.

As with most collections and building-related issues, vigilance and good maintenance planning are key. It is better to catch problems as soon as possible, quickly work to determine the cause of the problems, and develop a plan for solving them. Consider contacting a preservationist, architect, or engineer to conduct a building assessment or provide a Historic Structures Report to aid in developing preservation and maintenance plans so that any problems along with recommended solutions are identified quickly.

Resources

Common Plasterwork Problems Found in Historic House and How to Overcome Them (Artisan)

Deteriorated Plaster Finishes (National Park Service)
Plaster 101: Types, History, and How to Fix It (Plaster Magic)
Problems with Plaster: Causes, Fixes, and When to Worry (Argo Contractors)

Further Resources

Collections Advisors (Indiana Historical Society)
Timely Tips (Indiana Historical Society)

Collection Trainings

Wet Salvage for Home and Community Collections
Nov. 2 (Conservation Center for Art and Historical Artifacts)
Creating Preservation-Quality Oral Histories
Nov. 3 (Northeast Document Conservation Center)
Hope Crew Coffee Conversations: Historic Masonry
Nov. 17 (Preservation Directory)
Basics of Archives Management
Nov. 18 (American Association for State and Local History)

Recorded Webinars

Connecting to Collections Care
Indiana Historical Society
Northeast Document Conservation Center
Texas Historical Commission

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