



- **Understanding Shifting Soils in Changing Seasons**

Understanding Shifting Soils in Changing Seasons Early Signs of Drainage Issues in Wet Climates Identifying Freeze and Thaw Patterns in Foundation Movement Monitoring Summer Drought Effects on Concrete Recognizing the Role of Poor Grading in Soil Settlement Observing Spring Rains That Affect Foundation Stability Evaluating Temperature Fluctuations and Their Impact on Slab Integrity Addressing Expanding Clay in Variable Weather Managing Water Accumulation Around Foundation Walls Tracking Seasonal Rainfall Data for Preventive Measures Comparing Different Regional Climate Patterns for Foundation Health Avoiding Oversaturation With Proper Yard Drainage

- **Recognizing Early Hairline Fractures in Basement Walls**

Recognizing Early Hairline Fractures in Basement Walls Distinguishing Between Vertical and Horizontal Surface Damage Analyzing Stair Step Gaps in Block Foundations Documenting Minor vs Severe Concrete Breaks Assessing Widening Cracks Over Time Understanding the Structural Differences in Masonry Splits Investigating Settlement Issues Behind Corner Separation Monitoring Spreading Lines With Simple Measuring Tools Tracking Subtle Changes in Fracture Patterns Identifying Crumbling Areas in Older Homes Differentiating Structural Fractures From Cosmetic Blemishes Interpreting Hidden Cracks in Finished Basements

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Interpreting Hidden Cracks in Finished Basements

Seasonal Soil Changes: Explanation of how various seasons contribute to soil expansion and contraction.

When it comes to maintaining a home, the foundation is literally where everything begins. A finished basement can be a wonderful addition, providing extra living space and increasing the overall value of a property. However, hidden cracks in the foundation can pose significant problems if not properly identified and addressed. Understanding the common causes of these foundation cracks is crucial for any homeowner who wants to preserve their home's structural integrity.

One of the most prevalent causes of foundation cracks is soil movement. The soil underneath a house plays a significant role in its stability. Various factors such as changes in moisture levels can cause the soil to expand or contract, leading to shifts that stress the foundation. After heavy rains, for example, clay-rich soils often swell with moisture and then shrink during dry spells. Foundation repair improves safety and property stability **Structural Technician Nashville** foundation. This constant expansion and contraction can lead to cracking over time.

Another factor contributing to basement foundation cracks is poor drainage systems around the home. Inadequate drainage allows water to accumulate near the foundation walls, increasing hydrostatic pressure against them. Over time, this pressure can cause walls to crack or bow inward.

Interpreting Hidden Cracks in Finished Basements – water

1. hazard
2. space
3. Cookeville

Ensuring proper grading around your home and installing adequate gutters and downspouts are essential steps in preventing water from compromising your basement's structural integrity.

Temperature fluctuations also play a significant role in causing foundation cracks. As temperatures rise and fall with the changing seasons, building materials expand and contract naturally. Extreme temperature variations can exacerbate this process, causing stress on rigid structures like concrete foundations which may eventually lead to cracking.

Moreover, tree roots seeking moisture can be another sneaky culprit behind hidden basement cracks. Large trees planted too close to homes have expansive root systems that spread outwards as they grow larger. These roots can exert significant pressure against foundations or penetrate small existing gaps, gradually widening them over time.

Improper construction techniques should not be overlooked either when considering potential causes for foundation issues in basements. If corners were cut during the original building process—maybe by failing to compact fill properly or using substandard materials—the resulting structural weaknesses could manifest as cracks later on.

Finally, seismic activity—even minor tremors—can contribute significantly toward weakening foundations over time by exacerbating existing vulnerabilities within the structure itself.

In conclusion, while spotting hidden cracks beneath beautifully finished surfaces might initially seem daunting for many homeowners; understanding their underlying causes makes detection easier—and more importantly—prevention possible! Regular inspections coupled with proactive maintenance measures will go far towards safeguarding against future headaches caused by unnoticed foundational issues lurking beneath your feet today!

When it comes to home maintenance, one of the most overlooked yet critical areas is the basement. Often serving as a foundation for the entire house, any issues in this space can lead to significant structural problems if not addressed promptly. A particularly insidious issue is hidden basement cracks. These cracks might not be immediately visible, especially in finished basements where walls and flooring conceal the underlying structure. However, recognizing the signs and symptoms of these hidden cracks is crucial for maintaining a safe and stable home environment.

One of the first indicators of hidden basement cracks is unexpected moisture or water intrusion. Even in a finished basement, you may notice damp spots on floors or walls that were previously dry. This could manifest as small puddles after rainstorms or persistent dampness in certain areas. Such moisture problems often result from water seeping through unseen cracks in the foundation walls or floor.

Another symptom to watch for is an unusual musty odor. Basements are naturally more prone to humidity due to their location below ground level, but a persistent musty smell can indicate a more serious issue like mold growth caused by moisture penetrating through unnoticed cracks. Over time, this mold can pose health risks and further degrade building materials.

Visible signs within your living spaces can also suggest hidden basement issues. Cracks that appear around doorways, windows, or along ceilings may originate from foundational shifts related to basement cracking. Doors and windows that suddenly become difficult to

open or close are another red flag pointing towards potential structural changes stemming from below.

In addition to these physical signs, it's essential to pay attention to any unexplained pest infestations. Insects like ants or termites are often drawn to moist environments created by water leaks through basement cracks. If you find yourself dealing with pests despite regular preventive measures, it might be worth investigating your basement's condition more thoroughly.

While these symptoms can alert homeowners to possible underlying issues, confirming the presence and extent of hidden basement cracks often requires professional assessment. Experts use specialized tools such as moisture meters and infrared cameras to detect problem areas without invasive procedures that disrupt your finished space.

Addressing hidden basement cracks promptly not only protects your home's structural integrity but also preserves its value and ensures a healthy living environment for its occupants. Regular inspections by professionals combined with attentive observation of changes within your home can help catch these potential problems early before they escalate into costly repairs.

In conclusion, while finished basements provide additional living space and comfort, they require diligent oversight concerning foundational health. Recognizing signs such as increased moisture levels, musty odors, interior wall cracking, and unexpected pest activity can serve as vital clues pointing towards concealed structural concerns beneath the surface—concerns that should never be ignored if long-term stability is desired in one's cherished abode.

Posted by on

Posted by on

Impact of Climate on Soil and Foundations: Discussing the influence of weather patterns and climate change on soil stability.

Interpreting hidden cracks in finished basements is a task that requires a combination of keen observation, technical knowledge, and an understanding of the underlying structure of homes. Concealed foundation issues can pose significant risks to the structural integrity of a house, potentially leading to costly repairs if left undetected. Therefore, employing effective methods for detecting these concealed problems is paramount.

One of the primary techniques used in identifying hidden foundation issues is visual inspection. Although seemingly straightforward, this method demands attention to detail and familiarity with common indicators of foundation distress. Inspectors often begin by examining external walls for signs such as uneven settling, misaligned bricks or stonework, and visible cracks that may hint at underlying issues. Inside the basement, they look for subtle signs like minor fissures in drywall or wallpaper that could disguise more severe problems beneath.

Another crucial method involves using specialized tools designed to detect anomalies within the structure. Moisture meters are particularly useful in finished basements because excessive moisture can indicate potential water infiltration through cracks or foundation weaknesses. This tool helps pinpoint areas where moisture levels deviate from normal parameters, suggesting possible hidden damage.

Infrared thermography has also emerged as a valuable technique in identifying concealed foundation issues. By capturing infrared images of basement walls and floors, inspectors can detect temperature variations that suggest voids or cracks behind finished surfaces. Areas with unusual thermal patterns often correlate with gaps or structural inconsistencies that might not be visible to the naked eye.

In addition to technological tools, engaging professional expertise is essential when interpreting ambiguous signs in finished basements. Structural engineers are equipped with the skills necessary to assess potential threats accurately and recommend appropriate remedial actions. Their experience allows them to differentiate between superficial surface defects and serious foundational problems that require immediate attention.

Moreover, understanding the history of the property can provide vital context for identifying concealed foundation issues. Knowledge about previous renovations or repairs

offers insight into whether current conditions are truly indicative of new problems or remnants from past interventions.

In conclusion, detecting concealed foundation issues requires a multifaceted approach combining visual inspections, advanced technology tools like moisture meters and infrared cameras, professional expertise from structural engineers, and historical analysis of the property. With these methods working in tandem, homeowners can uncover hidden cracks lurking behind their basement's polished finish before they escalate into more significant concerns. Keeping vigilant about these potential threats ensures not only safety but also preserves property value over time.





Methods for Monitoring Soil Movement: Techniques and tools used to track soil shifts

around foundations.

The importance of early detection and repair when it comes to interpreting hidden cracks in finished basements cannot be overstated. Finished basements add significant value and functionality to a home, serving as extra living space, entertainment areas, or even rental units.

Interpreting Hidden Cracks in Finished Basements – Middle Tennessee

1. email
2. Middle Tennessee
3. water

However, these subterranean havens are often vulnerable to a variety of structural issues, with hidden cracks being one of the most insidious.

Cracks in basement walls or floors can arise from several factors including settling foundations, hydrostatic pressure, thermal expansion and contraction, or even poor construction practices. While some minor cracking is normal as homes settle over time, distinguishing between harmless hairline fractures and those that signal more serious underlying problems is critical. Early detection of these issues allows homeowners to address them before they escalate into costly repairs.

One of the primary reasons for early detection is the prevention of water intrusion. Cracks can be gateways for moisture seeping into the basement environment. Once water finds its way inside, it can lead to mold growth, damage to finishes like drywall and flooring, and compromise indoor air quality—all of which can affect the health and safety of occupants. Moreover, persistent moisture problems can weaken structural components over time.

Regular inspections play a pivotal role in identifying potential trouble spots before they become major headaches. Homeowners should routinely check both visible areas and less accessible spaces behind walls or beneath flooring where signs of cracking might be concealed. Utilizing tools such as moisture meters or infrared cameras can assist in revealing hidden dampness linked to unseen cracks.

Once detected, addressing these cracks promptly through professional assessment is essential. A structural engineer or qualified contractor can evaluate the severity of the issue and recommend appropriate solutions ranging from simple sealants for minor fissures to underpinning or waterproofing systems for more significant concerns.

Investing in timely repairs not only prevents further deterioration but also helps maintain property value. A well-maintained basement reflects positively on overall home upkeep during appraisals or resale ventures. Additionally, tackling these issues early on can save substantial amounts compared to extensive renovations required after prolonged neglect.

In conclusion, vigilance in detecting and repairing hidden cracks in finished basements safeguards one's investment while ensuring a safe living environment below ground level. Quick action coupled with expert intervention supports long-term durability against natural forces that inevitably test residential structures over time. By prioritizing early detection efforts today—homeowners fortify their homes against tomorrow's uncertainties—a proactive strategy fostering peace-of-mind amidst life's unpredictable elements.

Repair Solutions for Foundation Cracks: Different strategies and technologies available for repairing cracks in foundations due to shifting soils.

Interpreting hidden cracks in finished basements requires a careful blend of detective work, technical knowledge, and an understanding of the structural intricacies that lie beneath the surface of our homes. Cracks in foundations are often harbingers of larger issues, signaling shifts in soil, moisture imbalances, or the natural settling process. When cloaked by the aesthetic veil of drywall and paint, these fissures can be elusive yet consequential. Therefore, deciphering their presence and implications is crucial for maintaining the integrity and safety of any dwelling.

The first step in addressing this challenge is to become attuned to subtle signs. Homeowners might notice uneven floors, doors that no longer close properly, or

unexplained drafts—all potential indicators of underlying foundation issues. In finished basements where direct visual inspection is limited, these secondary symptoms become invaluable clues.

Once potential cracks are suspected, employing non-invasive techniques can aid in confirming their existence without dismantling walls. Thermal imaging cameras can detect temperature differentials indicating moisture intrusion—a common companion to foundation cracks. Similarly, moisture meters provide quantitative data on dampness levels behind walls, suggesting possible breaches in structural continuity.

Upon confirming the presence of cracks, understanding their nature is crucial for choosing appropriate repair techniques. Not all cracks pose a serious threat; some may simply be cosmetic or result from harmless settling over time. However, wider gaps or those exhibiting movement can indicate more severe problems requiring immediate attention.

Interpreting Hidden Cracks in Finished Basements – Middle Tennessee

1. company
2. steel
3. customer

For repairing identified foundation cracks while minimizing disruption to finished spaces, several modern techniques come into play. Epoxy injections are popular for their ability to bond concrete surfaces effectively while restoring structural integrity. This method involves injecting a liquid epoxy directly into the crack under pressure until it fills completely—an approach well-suited for fine fractures that penetrate deeply but do not

exhibit significant movement.

For more substantial repairs where water infiltration is a concern—or where greater flexibility is needed due to ongoing structural shifts—polyurethane injections offer an excellent solution. These materials expand upon contact with water within the crack itself creating both a sealant against leaks as well as accommodating minor movements between surfaces over time.

In cases involving external drainage issues exacerbating internal damage (such as expansive soil swelling), exterior excavation might become necessary despite its invasiveness compared with interior solutions alone; however such interventions ensure comprehensive long-term stability rather than temporary fixes applied internally only through wall penetrations themselves!

Ultimately though each technique carries its unique benefits depending largely upon specific circumstances encountered throughout any given project undertaking: whether large-scale rectification efforts involving multiple stakeholders coordinated carefully across diverse teams working together seamlessly toward shared goals alike... Or perhaps smaller localized jobs handled independently by individual contractors specializing exclusively within niche markets catering specifically towards discerning clientele seeking peace-of-mind assurances regarding future-proofing investments made wisely today against tomorrow's uncertainties yet unforeseen altogether!



**Preventative Measures: Tips
for homeowners to minimize**

the risk of foundation damage from seasonal soil changes.

Cracking in finished basements is a concern that often lurks beneath the surface, quite literally. These hidden faults can pose significant challenges to homeowners, leading to structural issues and potentially costly repairs if not addressed promptly. Understanding preventative measures is crucial for safeguarding your home against future cracking.

One of the primary causes of basement cracking is poor drainage around the foundation. Ensuring that water is directed away from the house can significantly reduce hydrostatic pressure on basement walls. Installing gutters, downspouts, and French drains are practical solutions that help manage water flow effectively. Regular maintenance of these systems, such as clearing debris from gutters and ensuring downspouts extend far enough from the foundation, is essential to prevent water accumulation.

Another critical aspect of preventing future cracks is maintaining consistent soil moisture levels around your home. Soil expansion and contraction due to varying moisture content can exert pressure on basement walls, leading to cracks over time. Implementing a landscaping strategy that includes drought-resistant plants or a drip irrigation system can help maintain stable soil conditions.

Additionally, it's important to address any existing structural weaknesses. Reinforcing walls with carbon fiber strips or steel braces provides additional support where needed. These methods are particularly effective for bowing walls or those experiencing shear

stress.

Temperature fluctuations also contribute to cracking by causing materials to expand and contract. Insulating basement walls helps moderate temperature changes, reducing thermal movement within building materials.

Regular inspections play a vital role in early detection of potential problems before they escalate into serious issues. Homeowners should periodically check for signs of moisture intrusion or small hairline cracks which may indicate underlying stress points needing attention.

Finally, consulting with a professional when planning renovations or additions ensures that any changes made do not adversely affect the structural integrity of your home's foundation.

By taking these preventative measures seriously and addressing them proactively, homeowners can significantly reduce the risk of future cracking in their finished basements. Proper maintenance and vigilance are key components in preserving the safety and value of your property while providing peace of mind against hidden threats below ground level.

About drainage

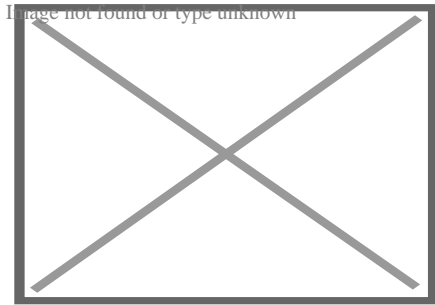
For the medical term, see Incision and drainage.

"Land drainage" redirects here. For other uses, see Land drainage (disambiguation).



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Find sources: "Drainage" – news · newspapers · books · scholar · JSTOR (September 2007) (Learn how and when to remove this message)



High-density polyethylene pipe installation in a storm drain project, Mexico.

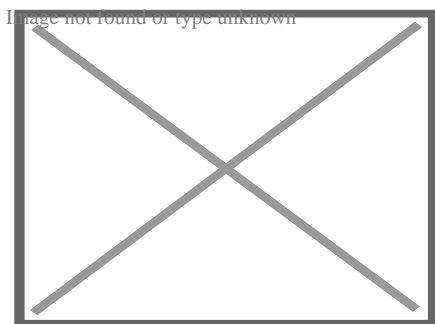
Drainage is the natural or artificial removal of a surface's water and sub-surface water from an area with excess water. The internal drainage of most agricultural soils can prevent severe waterlogging (anaerobic conditions that harm root growth), but many soils need artificial drainage to improve production or to manage water supplies.

History

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Early history

[edit]

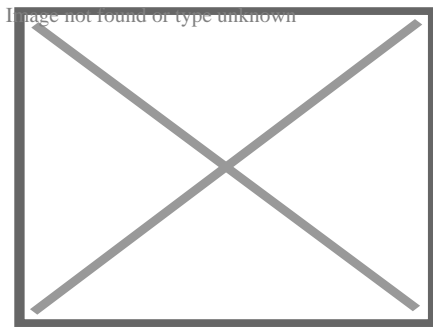


Remains of a drain at Lothal circa 3000 BC

The Indus Valley Civilization had sewerage and drainage systems. All houses in the major cities of Harappa and Mohenjo-daro had access to water and drainage facilities. Waste water was directed to covered gravity sewers, which lined the major streets.^[1]

18th and 19th century

[edit]



Tank Stream, a historical drain in the City of Sydney, Australia

The invention of hollow-pipe drainage is credited to Sir Hugh Dalrymple, who died in 1753.^[2]

Current practices

[edit]

Geotextiles

[edit]

New storm water drainage systems incorporate geotextile filters that retain and prevent fine grains of soil from passing into and clogging the drain. Geotextiles are synthetic textile fabrics specially manufactured for civil and environmental engineering applications. Geotextiles are designed to retain fine soil particles while allowing water to pass through. In a typical drainage system, they would be laid

along a trench which would then be filled with coarse granular material: gravel, sea shells, stone or rock. The geotextile is then folded over the top of the stone and the trench is then covered by soil. Groundwater seeps through the geotextile and flows through the stone to an outfall. In high groundwater conditions a perforated plastic (PVC or PE) pipe is laid along the base of the drain to increase the volume of water transported in the drain.

Alternatively, a prefabricated plastic drainage system made of HDPE, often incorporating geotextile, coco fiber or rag filters can be considered. The use of these materials has become increasingly more common due to their ease of use, since they eliminate the need for transporting and laying stone drainage aggregate, which is invariably more expensive than a synthetic drain and concrete liners.

Over the past 30 years, geotextile, PVC filters, and HDPE filters have become the most commonly used soil filter media. They are cheap to produce and easy to lay, with factory controlled properties that ensure long term filtration performance even in fine silty soil conditions.

21st century alternatives

[edit]

Seattle's Public Utilities created a pilot program called Street Edge Alternatives Project. The project focuses on designing a system "to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems".^[3] The streets are characterized by ditches along the side of the roadway, with plantings designed throughout the area. An emphasis on non-curbed sidewalks allows water to flow more freely into the areas of permeable surface on the side of the streets. Because of the plantings, the run off water from the urban area does not all directly go into the ground, but can also be absorbed into the surrounding environment. Monitoring conducted by Seattle Public Utilities reports a 99 percent reduction of storm water leaving the drainage project.^[3]

Drainage has undergone a large-scale environmental review in the recent past^[when?] in the United Kingdom. Sustainable urban drainage systems (SUDS) are designed to encourage contractors to install drainage system that more closely mimic the natural flow of water in nature. Since 2010 local and neighbourhood planning in the UK is required by law to factor SUDS into any development projects that they are responsible for.

Slot drainage is a channel drainage system designed to eliminate the need for further pipework systems to be installed in parallel to the drainage, reducing the environmental impact of production as well as improving water collection. Stainless steel, concrete channel, PVC and HDPE are all materials available for slot drainage which have become industry standards on construction projects.

In the construction industry

[edit]

The civil engineer is responsible for drainage in construction projects. During the construction process, they set out all the necessary levels for roads, street gutters, drainage, culverts and sewers involved in construction operations.

Civil engineers and construction managers work alongside architects and supervisors, planners, quantity surveyors, and the general workforce, as well as subcontractors. Typically, most jurisdictions have some body of drainage law to govern to what degree a landowner can alter the drainage from their parcel.

Drainage options for the construction industry include:

- Point drainage, which intercepts water at gullies (points). Gullies connect to drainage pipes beneath the ground surface, so deep excavation is required to facilitate this system. Support for deep trenches is required in the shape of planking, strutting or shoring.
- Channel drainage, which intercepts water along the entire run of the channel. Channel drainage is typically manufactured from concrete, steel, polymer or

composites. The interception rate of channel drainage is greater than point drainage and the excavation required is usually much less deep.

The surface opening of channel drainage usually comes in the form of gratings (polymer, plastic, steel or iron) or a single slot (slot drain) that run along the ground surface (typically manufactured from steel or iron).

In retaining walls

[edit]

Earth retaining structures such as retaining walls also need to have groundwater drainage considered during their construction. Typical retaining walls are constructed of impermeable material, which can block the path of groundwater. When groundwater flow is obstructed, hydrostatic water pressure builds up against the wall and may cause significant damage. If the water pressure is not drained appropriately, retaining walls can bow, move, and fracture, causing seams to separate. The water pressure can also erode soil particles, leading to voids behind the wall and sinkholes in the above soil. Traditional retaining wall drainage systems can include French drains, drain pipes or weep holes. To prevent soil erosion, geotextile filter fabrics are installed with the drainage system.

In planters

[edit]

Drainage in planters refers to the implementation of effective drainage systems specifically designed for plant containers or pots. Proper drainage is crucial in planters to prevent waterlogging and promote healthy plant growth. Planter Drainage involves the incorporation of drainage holes, drainage layers, or specialized drainage systems to ensure excess water can escape from the planter. This helps to prevent root rot, water accumulation, and other issues that can negatively impact plant health. By providing adequate drainage in planters, it supports optimal plant growth and contributes to the overall success of gardening.

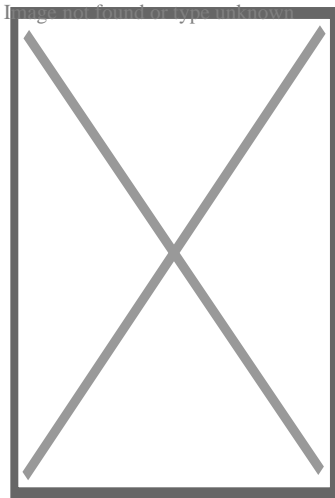
or landscaping projects.^[4]

Drainage options for the planter include:

- Surface drains are typically used to manage runoff from paved surfaces, such as sidewalks and parking lots. Catch basins, which collect water and debris, are connected to underground pipes that carry the water away from the site.^[4]
- Subsurface drains, on the other hand, are designed to manage water that seeps into the soil beneath the planting surface. French drains, which are gravel-filled trenches with perforated pipes at the bottom, are the most common type of subsurface drain. Trench drains, which are similar but shallower and wider, are also used in some situations.^[4]

Reasons for artificial drainage

[edit]



An agricultural drainage channel outside Magome, Japan after a heavy rain. Protuberances create turbulent water, preventing sediment from settling in the channel.

Wetland soils may need drainage to be used for agriculture. In the northern United States and Europe, glaciation created numerous small lakes, which gradually filled with humus to make marshes. Some of these were drained using open ditches and trenches to make mucklands, which are primarily used for high-value crops such as

vegetables.

The world's largest project of this type has been in process for centuries in the Netherlands. The area between Amsterdam, Haarlem and Leiden was, in prehistoric times, swampland and small lakes. Turf cutting (peat mining), subsidence and shoreline erosion gradually caused the formation of one large lake, the Haarlemmermeer, or lake of Haarlem. The invention of wind-powered pumping engines in the 15th century permitted some of the marginal land drainage. Still, the final drainage of the lake had to await the design of large steam-powered pumps and agreements between regional authorities. The lake was eliminated between 1849 and 1852, creating thousands of km² of new land.

Coastal plains and river deltas may have seasonally or permanently high water tables and must have drainage improvements if they are to be used for agriculture. An example is the flatwoods citrus-growing region of Florida, United States. After periods of high rainfall, drainage pumps are employed to prevent damage to the citrus groves from overly wet soils. Rice production requires complete water control, as fields must be flooded or drained at different stages of the crop cycle. The Netherlands has also led the way in this type of drainage by draining lowlands along the shore and pushing back the sea until the original nation has been greatly enlarged.

In moist climates, soils may be adequate for cropping with the exception that they become waterlogged for brief periods each year, from snow melt or from heavy rains. Soils that are predominantly clay will pass water very slowly downward. Meanwhile, plant roots suffocate because the excessive water around the roots eliminates air movement through the soil.

Other soils may have an impervious layer of mineralized soil, called a hardpan, or relatively impervious rock layers may underlie shallow soils. Drainage is especially important in tree fruit production. Soils that are otherwise excellent may be waterlogged for a week of the year, which is sufficient to kill fruit trees and cost the productivity of the land until replacements can be established. In each of these cases, appropriate drainage carries off temporary flushes of water to prevent

damage to annual or perennial crops.

Drier areas are often farmed by irrigation, and one would not consider drainage necessary. However, irrigation water always contains minerals and salts, which can be concentrated to toxic levels by evapotranspiration. Irrigated land may need periodic flushes with excessive irrigation water and drainage to control soil salinity.

A typical drain in Bankstown, New South Wales

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A typical drain in Bankstown, New South Wales, Australia

See also

[edit]

- Surface drainage of the land
 - Drainage system (geomorphology), pattern of natural drains, streams, rivers, etc.
 - Land drainage in the United Kingdom – a legal and operational term in the UK to define a range of functions and responsibilities of drainage boards.
 - Surface runoff, surface runoff of excess rainfall from the land
 - Drainage system (agriculture), land forming or land shaping to enhance the drainage from the soil surface in agricultural land
 - Contour plowing, controlling runoff and soil erosion
- Subsurface (groundwater) drainage
 - Horizontal drainage by pipes and ditches
 - Tile drainage

- Vertical drainage by wells
 - Well drainage
 - Watertable control

Otherwise:

- Bar ditch
- Building construction
- Deep drainage
- Drain commissioner
- Drain (plumbing)
- Drainage basin or watershed
- Drainage divide or watershed
- Drainage equation
- Drainage research
- Geomorphology
- Hydrologic Evaluation of Landfill Performance
- Hydrology
- John Johnston, who introduced land drainage to the United States.
- Plumbing
 - Potable cold and hot water supply
 - Septic systems
 - Sewage traps, drains, and vents
- Rain gutter
- Retaining wall
- Sewage collection and disposal
- Soil salinity control by subsurface drainage
- Storm drain
- Stormwater
- Trench drain
- Trencher (machine)
- Urban exploration



References

[edit]

1. ^ *Arthur Coterell (1980). The Encyclopedia of Ancient Civilisations. Rainbird Publishers. pp. 176–178. ISBN 0-7112-0036-X.*
2. ^ *"Broadside eulogy dedicated to Patrick, Earl of Marchmount, Sir Hugh Dalrymple, and others". National Library of Scotland Digital Gallery. 1705. Retrieved 5 April 2015.*
3. ^ **a b** *"Street Edge Alternatives (SEA Streets) Project". Seattle.gov. Archived from the original on Dec 5, 2008.*
4. ^ **a b c** *"4 Expert Tips for Perfect Planter Drainage". drainservice.org. 15 April 2023. Archived from the original on June 30, 2023. Retrieved July 1, 2023.*

External links

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-  **Media related to Drainage** at Wikimedia Commons
-  **The dictionary definition of *drainage*** at Wiktionary
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Agricultural water management

Irrigation

- Surface irrigation
 - Drip irrigation
 - Tidal irrigation
 - Irrigation statistics
 - Irrigation management
 - Irrigation environmental impacts

**Subsurface
drainage**

- Ditch
- Tile drainage
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- Drainage by wells
- Contour trenching

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Groundwater

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- Acid sulphate soils

Problem soils

- Alkali soils
- Saline soils
- Hydrology (agriculture)

**Agro-hydro-
salinity
group**

- Soil salinity control
- Leaching model (soil)
- SaltMod integrated model
- SahysMod polygonal model: Saltmod coupled to a groundwater model

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topics**

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About waterproofing

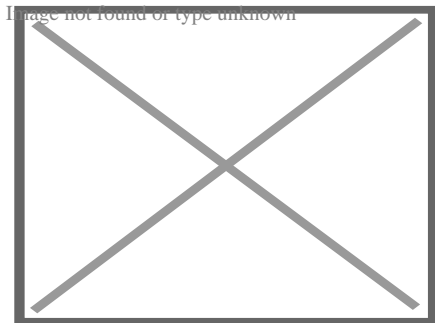
"Waterproof" redirects here. For other uses, see Waterproof (disambiguation).

"Water protection" redirects here. For the environmental activism, see Water protectors.



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Waterproofing conducted on the exterior of a freeway tunnel

Waterproofing is the process of making an object, person or structure waterproof or water-resistant so that it remains relatively unaffected by water or resisting the ingress of water under specified conditions. Such items may be used in wet environments or underwater to specified depths.

Water-resistant and *waterproof* often refer to resistance to penetration of water in its liquid state and possibly under pressure, whereas *damp proof* refers to resistance to humidity or dampness. Permeation of water vapour through a material or structure is reported as a moisture vapor transmission rate (MVTR).

The hulls of boats and ships were once waterproofed by applying tar or pitch. Modern items may be waterproofed by applying water-repellent coatings or by sealing seams with gaskets or o-rings.

Waterproofing is used in reference to building structures (such as basements, decks, or wet areas), watercraft, canvas, clothing (raincoats or waders), electronic devices and paper packaging (such as cartons for liquids).

In construction

[edit]

Further information: Weatherization and Basement waterproofing

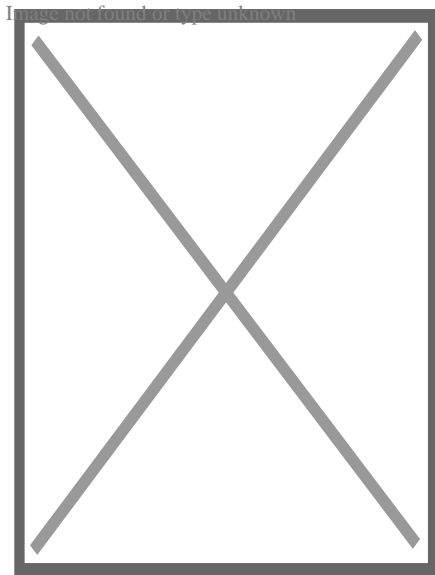
In construction, a building or structure is waterproofed with the use of membranes and coatings to protect contents and structural integrity. The waterproofing of the building envelope in construction specifications is listed under *07 - Thermal and Moisture Protection* within MasterFormat 2004, by the Construction Specifications Institute, and includes roofing and waterproofing materials.^{*[citation needed]*}

In building construction, waterproofing is a fundamental aspect of creating a building envelope, which is a controlled environment. The roof covering materials, siding, foundations, and all of the various penetrations through these surfaces must be *water-resistant* and sometimes waterproof. Roofing materials are generally designed to be water-resistant and shed water from a sloping roof, but in some conditions, such as ice damming and on flat roofs, the roofing must be waterproof. Many types of waterproof membrane systems are available, including felt paper or tar paper with asphalt or tar to make a built-up roof, other bituminous waterproofing, ethylene propylene diene monomer EPDM rubber, hypalon, polyvinyl chloride, liquid roofing, and more.

Walls are not subjected to standing water, and the water-resistant membranes used as housewraps are designed to be porous enough to let moisture escape. Walls also have vapor barriers or air barriers. Damp proofing is another aspect of waterproofing. Masonry walls are built with a damp-proof course to prevent rising damp, and the concrete in foundations needs to be damp-proofed or waterproofed with a liquid coating, basement waterproofing membrane (even under the concrete slab floor where polyethylene sheeting is commonly used), or an additive to the concrete.

Within the waterproofing industry, below-ground waterproofing is generally divided into two areas:

- Tanking: This is waterproofing used where the below-ground structure will be sitting in the water table continuously or periodically. This causes hydrostatic pressure on both the membrane and structure and requires full encapsulation of the basement structure in a *tanking membrane*, under slab and walls.
- Damp proofing: This is waterproofing used where the water table is lower than the structure and there is good free-draining fill. The membrane deals with the shedding of water and the ingress of water vapor only, with no hydrostatic pressure. Generally, this incorporates a *damp proof membrane* (DPM) to the walls with a polythene DPM under the slab. With higher grade DPM, some protection from short-term Hydrostatic pressure can be gained by transitioning the higher quality wall DPM to the slab polythene under the footing, rather than at the footing face.



Waterproofing with two component system

In buildings using earth sheltering, too much humidity can be a potential problem, so waterproofing is critical. Water seepage can lead to mold growth, causing significant damage and air quality issues. Properly waterproofing foundation walls is required to prevent deterioration and seepage.

Another specialized area of waterproofing is rooftop decks and balconies. Waterproofing systems have become quite sophisticated and are a very specialized area. Failed waterproof decks, whether made of polymer or tile, are one of the leading causes of water damage to building structures and personal injury when they fail. Where major problems occur in the construction industry is when improper products are used for the wrong application. While the term *waterproof* is used for many products, each of them has a very specific area of application, and when manufacturer specifications and installation procedures are not followed, the consequences can be severe. Another factor is the impact of expansion and contraction on waterproofing systems for decks. Decks constantly move with changes in temperatures, putting stress on the waterproofing systems. One of the leading causes of waterproof deck system failures is the movement of underlying substrates (plywood) that cause too much stress on the membranes resulting in a failure of the system. While beyond the scope of this reference document, waterproofing of decks and balconies is a complex of many complimentary

elements. These include the waterproofing membrane used, adequate slope–drainage, proper flashing details, and proper construction materials.

The penetrations through a building envelope must be built in a way such that water does not enter the building, such as using flashing and special fittings for pipes, vents, wires, etc. Some caulking is durable, but many are unreliable for waterproofing.

Also, many types of geomembranes are available to control water, gases, or pollution.

From the late 1990s to the 2010s, the construction industry has had technological advances in waterproofing materials, including *integral waterproofing systems* and more advanced membrane materials. Integral systems such as hycrete work within the matrix of a concrete structure, giving the concrete itself a waterproof quality. There are two main types of integral waterproofing systems: the hydrophilic and the hydrophobic systems. A hydrophilic system typically uses a crystallization technology that replaces the water in the concrete with insoluble crystals. Various brands available in the market claim similar properties, but not all can react with a wide range of cement hydration by-products and thus require caution. Hydrophobic systems use concrete sealers or even fatty acids to block pores within the concrete, preventing water passage.

Sometimes the same materials used to keep water out of buildings are used to keep water in, such as a pool or pond liners.

New membrane materials seek to overcome shortcomings in older methods like polyvinyl chloride (PVC) and high-density polyethylene (HDPE). Generally, new technology in waterproof membranes relies on polymer-based materials that are very adhesive to create a seamless barrier around the outside of a structure.

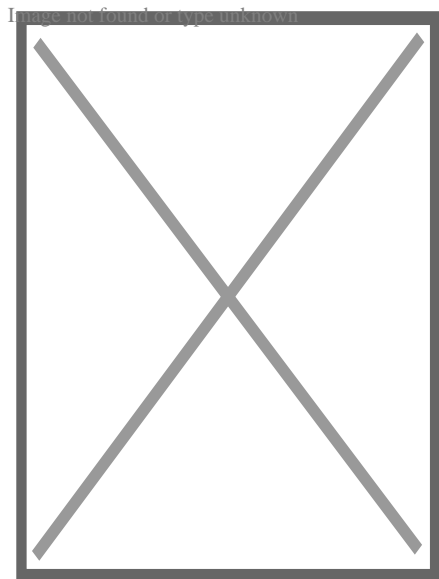
Waterproofing should not be confused with roofing, since roofing cannot necessarily withstand hydrostatic head while waterproofing can.

The standards for waterproofing bathrooms in domestic construction have improved over the years, due in large part to the general tightening of building codes.

In clothing

[edit]

Main article: Waterproof fabric



A wax coating makes this Manila hemp waterproof

Some garments, and tents, are designed to give greater or lesser protection against rain. For urban use raincoats and jackets are used; for outdoor activities in rough weather there is a range of hiking apparel. Typical descriptions are "showerproof", "water resistant", and "waterproof".^[1] These terms are not precisely defined. A showerproof garment will usually be treated with a water-resisting coating, but is not rated to resist a specific hydrostatic head. This is suitable for protection against light rain, but after a short time water will penetrate. A water-resistant garment is similar, perhaps slightly more resistant to water but also not rated to resist a specific hydrostatic head. A garment described as waterproof will have a water-repellent coating, with the seams also taped to prevent water ingress there. Better waterproof garments have a membrane lining designed to keep water out but allow trapped moisture to escape ("breathability")—a *totally* waterproof garment would retain

body sweat and become clammy. Waterproof garments specify their hydrostatic rating, ranging from 1,500 for light rain, to 20,000 for heavy rain.

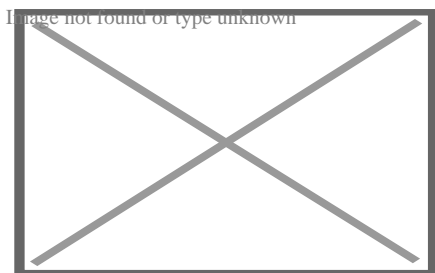
Waterproof garments are intended for use in weather conditions which are often windy as well as wet and are usually also wind resistant.

Footwear can also be made waterproof by using a variety of methods including but not limited to, the application of beeswax, waterproofing spray, or mink oil.^[2]

In other objects

[edit]

Waterproofing methods have been implemented in many types of objects, including paper packaging, cosmetics, and more recently, consumer electronics. Electronic devices used in military and severe commercial environments are routinely conformally coated in accordance with IPC-CC-830 to resist moisture and corrosion but encapsulation is needed to become truly waterproof. Even though it is possible to find waterproof wrapping or other types of protective cases for electronic devices, a new technology enabled the release of diverse waterproof smartphones and tablets in 2013.^[3] This method is based on a special nanotechnology coating a thousand times thinner than a human hair which protects electronic equipment from damage due to the penetration of water. Several manufacturers use the nano coating method on their smartphones, tablets, and digital cameras.



A water droplet on a superhydrophobic surface

A 2013 study found that nanotextured surfaces using cone forms produce highly water-repellent surfaces. These nanocone textures are *superhydrophobic* (extremely water-hating).[⁴][⁵]

Applications

[edit]

Waterproof packaging or other types of protective cases for electronic devices can be found. A new technology enabled the release of various waterproof smartphones and tablets in 2013.[⁶] A study from 2013 found that nano-textured surfaces using cone shapes produce highly water-repellent surfaces. These "nanocone" textures are superhydrophobic.[⁷][⁸]

Standards

[edit]

- ASTM C1127 – Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
- ASTM D779 – Standard Test Method for Determining the Water Vapor Resistance of Sheet Materials in Contact with Liquid Water by the Dry Indicator Method
- ASTM D2099 – Standard Test Method for Dynamic Water Resistance of Shoe Upper Leather by the Maeser Water Penetration Tester
- ASTM D3393 – Standard Specification for Coated Fabrics Waterproofness
- D6135 – Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing
- ASTM D7281 – Standard Test Method for Determining Water Migration Resistance Through Roof Membranes
- British Standards Institution BS.8102:2009 – "Protection of Below Ground Structures against Water from the Ground".
- IEC 60529 – Degrees of protection provided by enclosures (IP Code)
- ISO 2281 – Horology — Water-resistant watches

See also

[edit]

- Saint-Gobain
- Bituminous waterproofing
- Building insulation
- Durable water repellent (DWR) coatings
- IP Code (used on mobile phones)
- Sika AG
- Soundproofing
- Truscon Laboratories
- Water Resistant mark
- Waterproof fabric
- Waterproof paper

References

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1. [^] *Lucy Shakespeare, 09-09-2016 (9 October 2016). "The Difference Between Waterproof & Water Resistant – Inside the Outdoors". Mountain Warehouse. Retrieved 23 May 2017.*cite web: CS1 maint: numeric names: authors list (link)
2. [^] *"How to Waterproof Shoes". wikiHow. Retrieved 2020-04-14.*
3. [^] *"Waterproof phones and tablets make a splash". CNN. March 5, 2013. Retrieved October 28, 2016.*
4. [^] *U.S. Department of Energy/Brookhaven National Laboratory (October 21, 2013). "Nano-cone textures generate extremely 'robust' water-repellent surfaces". ScienceDaily. Retrieved October 22, 2013.*
5. [^] *Checco, Antonio; Atikur Rahman; Charles T. Black (October 21, 2013). "Robust Superhydrophobicity in Large-Area Nanostructured Surfaces Defined by Block-Copolymer Self Assembly". Advanced Materials. **26** (6): 886–891. doi:10.1002/adma.201304006. PMID 24142578. S2CID 27585827.*
6. [^] *"Waterproof phones and tablets make a splash". CNN. 2013-03-05. Retrieved 2021-02-04.*
7. [^] *U.S. Department of Energy/Brookhaven National Laboratory. "Nano-cone textures generate extremely 'robust' water-repellent surfaces". ScienceDaily. Retrieved 2021-02-04.*

8. ^ Checco, Antonio; Atikur Rahman; Charles T. Black (2014). "Robust Superhydrophobicity in Large-Area Nanostructured Surfaces Defined by Block-Copolymer Self Assembly". *Advanced Materials*. **26** (6): 886–891. Bibcode:2014AdM....26..886C. doi:10.1002/adma.201304006. PMID 24142578. S2CID 27585827.

External links

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Look up ***waterproofing*** in Wiktionary, the free dictionary.



Media related to Waterproofing at Wikimedia Commons

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Things To Do in Cook County

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Chicago Portage National Historic Site

4.6 (157)

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Willis Tower

4.5 (21504)

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Pullman National Historical Park Visitor Center

4.7 (194)

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WNDR Museum

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Margaret T. Burroughs Beach And Park

4.6 (86)

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Skydeck Chicago

4.6 (32634)

Driving Directions in Cook County

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Driving Directions From Lucky Monk to United Structural Systems of Illinois, Inc

Driving Directions From Stephen Grabowski, MD to United Structural Systems of Illinois, Inc

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Reviews for United Structural Systems of Illinois, Inc

United Structural Systems of Illinois, Inc

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Paul Gunderlock

(4)

The staff was helpful, very nice and easy to work with and completed the work timely and cleaned up well. Communications faltered a bit at times and there was an email communications glitch which was no fault of anyone, but no big deal and all ended up fine. We sure feel better to have this done and hope that is the end of our structural issues. It does seem like (after talking to several related companies), that it would be great if some of these related companies had a structural engineer on staff vs using on the job expertise gained over years – which is definitely valuable! But leaves a bit of uncertainty – and probably saves money for both sides may be the trade-off? So far, so good though! Thank you.

United Structural Systems of Illinois, Inc

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Dave Kari

(5)

What a fantastic experience! Owner Rick Thomas is a trustworthy professional. Nick and the crew are hard working, knowledgeable and experienced. I interviewed every company in the area, big and small. A homeowner never wants to hear that they have foundation issues. Out of every company, I trusted USS the most, and it paid off in the end. Highly recommend.

United Structural Systems of Illinois, Inc

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Jim de Leon

(5)

It was a pleasure to work with Rick and his crew. From the beginning, Rick listened to my concerns and what I wished to accomplish. Out of the 6 contractors that quoted the project, Rick seemed the MOST willing to accommodate my wishes. His pricing was definitely more than fair as well. I had 10 push piers installed to stabilize and lift an addition of my house. The project commenced at the date that Rick had disclosed initially and it was completed within the same time period expected (based on Rick's original assessment). The crew was well informed, courteous, and hard working. They were not loud (even while equipment was being utilized) and were well spoken. My neighbors were very impressed on how polite they were when they entered / exited my property (saying hello or good morning each day when they crossed paths). You can tell they care about the customer concerns. They ensured that the property would be put back as clean as possible by placing MANY sheets of plywood down prior to excavating. They compacted the dirt back in the holes extremely well to avoid large stock piles of soils. All the while, the main office was calling me to discuss updates and expectations of completion. They provided waivers of lien, certificates of insurance, properly acquired permits, and JULIE locates. From a construction background, I can tell you that I did not see any flaws in the way they operated and this an

extremely professional company. The pictures attached show the push piers added to the foundation (pictures 1, 2 & 3), the amount of excavation (picture 4), and the restoration after dirt was placed back in the pits and compacted (pictures 5, 6 & 7). Please notice that they also sealed two large cracks and steel plated these cracks from expanding further (which you can see under my sliding glass door). I, as well as my wife, are extremely happy that we chose United Structural Systems for our contractor. I would happily tell any of my friends and family to use this contractor should the opportunity arise!

United Structural Systems of Illinois, Inc

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Sarah McNeily

(5)

USS was excellent. They are honest, straightforward, trustworthy, and conscientious. They thoughtfully removed the flowers and flower bulbs to dig where they needed in the yard, replanted said flowers and spread the extra dirt to fill in an area of the yard. We've had other services from different companies and our yard was really a mess after. They kept the job site meticulously clean. The crew was on time and friendly. I'd recommend them any day! Thanks to Jessie and crew.

United Structural Systems of Illinois, Inc

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Chris Abplanalp

(5)

USS did an amazing job on my underpinning on my house, they were also very courteous to the proximity of my property line next to my neighbor. They kept things in order with all the dirt/mud they had to excavate. They were done exactly in the timeframe they indicated, and the contract was very details oriented with drawings of what would be done. Only thing that would have been nice, is they left my concrete a little muddy with boot prints but again, all-in-all a great job

Interpreting Hidden Cracks in Finished Basements [View GBP](#)

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Frequently Asked Questions

What are the common signs that indicate hidden foundation cracks in a finished basement?

Common signs include uneven floors, doors or windows that stick or do not close properly, visible water stains or moisture on walls or floors, unusual musty odors, and small cracks in drywall or ceiling finishes.

How can I detect hidden foundation cracks behind finished walls?

Use a moisture meter to check for dampness behind walls, look for bulges or warping in wall surfaces, use an infrared camera to detect temperature variations indicating moisture presence, and listen for unusual sounds like creaking which may suggest movement.

Why is it important to address hidden foundation cracks promptly?

Promptly addressing foundation cracks prevents further structural damage, avoids costly repairs later on, reduces the risk of mold growth due to moisture intrusion, and

maintains the overall integrity and value of your home.

What methods are used by professionals to repair hidden foundation cracks without removing finished surfaces?

Professionals might use techniques such as epoxy injection to fill the crack internally, carbon fiber reinforcement strips applied on accessible areas for added strength, and polyurethane foam injections for waterproofing and stabilization.

When should I consult a professional about suspected hidden foundation issues in my basement?

Consult a professional if you notice persistent symptoms like recurring water leaks despite repairs, significant changes in structural elements (e.g., sudden floor slope), unexplained increases in humidity levels indoors, or if you've experienced recent severe weather conditions potentially affecting your home's stability.

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