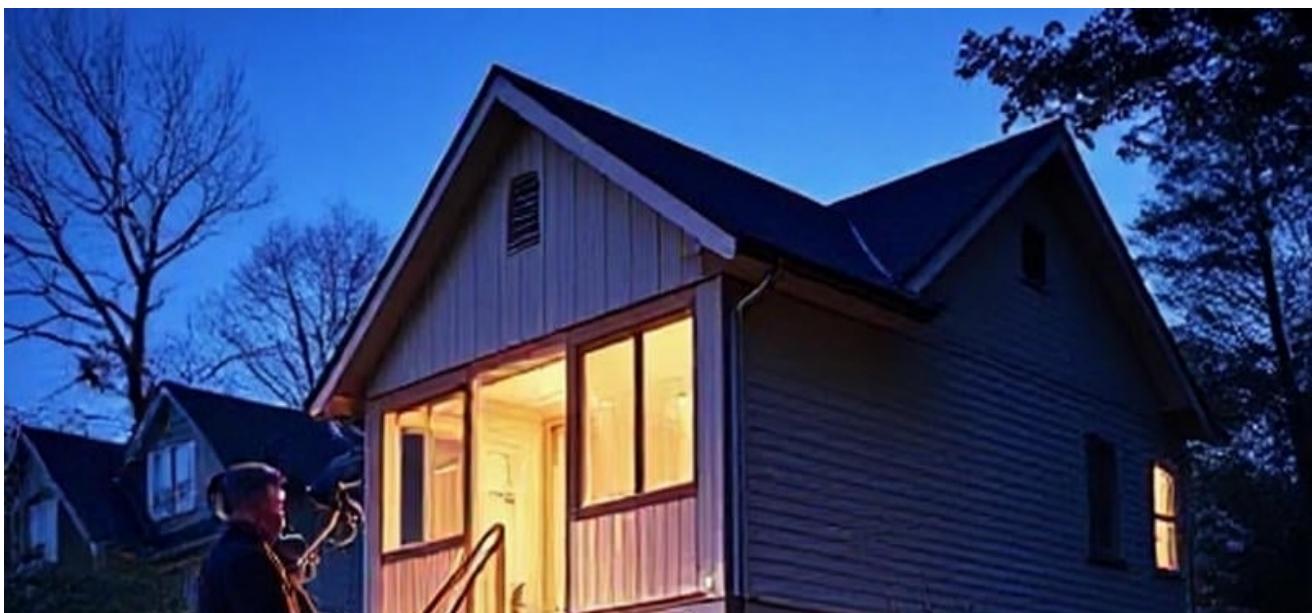




- **Understanding Expansive Clay and Its Impact on Foundations**
Understanding Expansive Clay and Its Impact on Foundations **Examining Sandy Loam for Residential Support** **Identifying Areas Vulnerable to Soil Erosion** **Evaluating Soil Moisture Fluctuations Beneath Homes** **Approaches for Chemical Soil Stabilization** **Techniques for Addressing Soil Heave Issues** **Managing Settlement with Targeted Soil Compaction** **Recognizing Soil Drainage Limitations** **Investigating Soil Stress Testing in Residential Sites** **Incorporating Root Barriers to Prevent Shifts** **Examining Seasonal Swelling and Shrinking of Soil** **Employing Sustainable Methods for Long Term Soil Health**
- **Planning French Drains for Effective Water Control**
Planning French Drains for Effective Water Control **Setting Up Sump Pumps to Prevent Basement Flooding** **Extending Gutter Downspouts for Extra Protection** **Excavation Basics for Residential Construction Projects** **Coordinating Soil Compaction Methods on Site** **Limiting Erosion Through Proper Grading Techniques** **Evaluating Perimeter Drain Systems for Dry Foundations** **Installing Exterior Waterproof Barriers for Walls** **Adapting Site Plans to Local Rainfall Patterns** **Understanding Swale Placement for Controlled Water Flow** **Enhancing Overall Site Drainage with Gravel Trenches** **Minimizing Subsurface Water Accumulation Around Foundations**
- **About Us**



Understanding the geological and environmental factors contributing to soil erosion. Residential foundation repair service ensures long-term home stability [home foundation repair service](#) gypsum drywall.

Understanding the geological and environmental factors contributing to soil erosion is crucial when identifying areas vulnerable to this natural phenomenon. Soil erosion is a complex process influenced by a myriad of factors, each playing a significant role in determining the susceptibility of a region to erosion.

Firstly, geological factors such as soil type and structure are fundamental. Soils with a high proportion of fine particles, like silt and clay, are more prone to erosion compared to those with a higher content of sand and gravel. This is because fine particles are lighter and can be more easily transported by wind and water. Additionally, the slope gradient and length are critical geological factors. Steeper slopes accelerate the flow of water, increasing its erosive power, while longer slopes allow for more water accumulation, leading to greater erosion.

Environmental factors also play a significant role. Climate, particularly rainfall patterns, is a major contributor. Areas with intense and frequent rainfall are more susceptible to soil erosion, as the impact of raindrops can dislodge soil particles, and the runoff can carry them away. Vegetation cover is another crucial environmental factor. Areas with sparse vegetation are more vulnerable to erosion, as plants help to bind the soil together and reduce the impact of rainfall. Moreover, human activities, such as deforestation, agriculture, and construction, can exacerbate soil erosion by removing vegetation and disrupting the natural landscape.

Understanding these factors allows for the identification of vulnerable areas. For instance, regions with a combination of steep slopes, fine-textured soils, high rainfall, and minimal vegetation cover are highly susceptible to soil erosion. By recognizing these patterns, effective strategies can be implemented to mitigate erosion, such as planting cover crops, constructing terraces, and implementing sustainable land management practices. Ultimately, a comprehensive understanding of the geological and environmental factors contributing to soil erosion is essential for protecting our landscapes and ensuring the sustainability of our soil resources.

Identifying signs of soil erosion around residential properties.

Recognizing the signs of soil erosion around residential properties is crucial for maintaining the health of your landscape and preventing potential damage to your home. Soil erosion, the process by which topsoil is washed away by water or blown away by wind, can lead to a variety of problems including loss of fertile soil, decreased plant growth, and even structural issues for buildings if left unchecked.

One of the most common indicators of soil erosion is the presence of gullies or channels carved into the soil. These often form after heavy rain and indicate where water has flowed rapidly over the surface, carrying soil particles with it. If you notice these gullies forming in your yard, it's a clear sign that erosion is occurring.

Another sign to look out for is the accumulation of sediment in low-lying areas or near water sources such as ponds, streams, or even your own garden beds. This sediment, which consists of soil particles that have been displaced, can smother plant roots and reduce the effectiveness of your irrigation system.

Bare spots in your lawn or garden are also a red flag. When topsoil is eroded, it leaves behind a layer of subsoil that is less fertile and more prone to compaction. This makes it difficult for grass and plants to grow, leading to patchy, uneven coverage.

Additionally, you might observe changes in the landscape itself. Slopes may appear steeper or more pronounced, and previously level areas might show signs of unevenness. This is because soil erosion can alter the topography of your property over time.

To mitigate soil erosion, consider implementing erosion control measures such as planting ground cover, installing retaining walls, or creating rain gardens to capture runoff. Regularly inspecting your property for these signs can help you take proactive steps to protect your landscape and home from the damaging effects of soil erosion.

The role of vegetation in preventing soil erosion and maintaining soil stability.

Certainly!

The role of vegetation in preventing soil erosion and maintaining soil stability is paramount, especially when identifying areas vulnerable to soil erosion. Vegetation serves as a natural barrier against the forces of wind and water, which are the primary agents of soil erosion.

Firstly, the root systems of plants play a crucial role in anchoring the soil. They bind soil particles together, creating a stable network that resists displacement. This is particularly important in sloped areas where gravity can exacerbate the effects of erosion. The intricate root structures not only hold the soil in place but also improve its structure and porosity, allowing for better water infiltration and reducing surface runoff.

Secondly, the above-ground parts of vegetation, such as leaves and stems, act as a shield against the impact of raindrops. When rain falls directly onto bare soil, it can cause significant damage by dislodging particles and creating small channels that lead to larger gullies over time. Vegetation absorbs much of this impact, minimizing the energy transferred to the soil surface and thereby reducing erosion.

Moreover, vegetation contributes to the overall health of the soil. Plants add organic matter through the decomposition of leaves, stems, and roots, which enhances soil fertility and

structure. Healthy soil is more resistant to erosion because it is better able to retain moisture and nutrients, supporting more robust plant growth in a feedback loop that further protects against erosion.

In identifying areas vulnerable to soil erosion, it is essential to consider the presence and type of vegetation. Areas with sparse or no vegetation are more susceptible to erosion, particularly if they are exposed to high winds or heavy rainfall. Conversely, areas with dense, diverse vegetation are typically more stable. Therefore, efforts to combat soil erosion often include planting native species that are well-adapted to the local climate and soil conditions, as these are more likely to thrive and provide long-term protection.

In conclusion, vegetation is a critical factor in preventing soil erosion and maintaining soil stability. By understanding and leveraging the natural capabilities of plants, we can better identify and protect vulnerable areas, ensuring sustainable land use and preserving the integrity of our ecosystems.

Effective landscaping techniques to mitigate soil erosion risks.

Effective landscaping techniques can play a crucial role in mitigating soil erosion risks, especially in areas identified as vulnerable. When targeting these sensitive regions, it's important to implement strategies that not only prevent soil loss but also enhance the overall health of the landscape. One of the primary techniques involves the use of vegetation. Planting a variety of ground covers, grasses, and shrubs can significantly reduce erosion by anchoring the soil with their root systems. These plants help to absorb rainwater, reducing the amount of runoff that can carry away topsoil.

Another effective method is the creation of contour barriers. By building ridges along the natural contours of the land, water is encouraged to infiltrate the soil rather than flow over it, which reduces the erosive force of runoff. Additionally, incorporating mulch into landscaping designs can protect the soil surface from the impact of raindrops, which can dislodge soil particles and initiate erosion.

Terracing is another valuable technique, particularly in sloped areas. This involves creating leveled steps on the landscape, which can slow down water flow and promote better water absorption. Furthermore, the strategic placement of rock gardens or stone walls can serve as both aesthetic elements and functional erosion controls.

Lastly, maintaining a healthy soil structure through organic matter addition and avoiding compaction is vital. Healthy soils are more resistant to erosion and support more robust plant growth, which in turn provides better protection against erosion. By integrating these landscaping techniques, we can effectively manage and reduce soil erosion risks in vulnerable areas, preserving the land for future generations.

Importance of proper drainage systems in preventing soil erosion.

When we talk about soil erosion, it's essential to understand that it's a natural process, but human activities can significantly accelerate it. Soil erosion occurs when the topsoil is washed or blown away from its original location. This can lead to reduced agricultural productivity, loss of fertile land, and even damage to infrastructure. To mitigate soil erosion, proper drainage systems play a crucial role.

Drainage systems are designed to manage the flow of water across landscapes, ensuring that excess water is efficiently removed. When heavy rains occur, without proper drainage, water can pool on the surface, leading to runoff. This runoff can pick up and carry away topsoil, contributing to soil erosion. By implementing effective drainage solutions, we can significantly reduce the velocity and volume of water moving across the land, thereby minimizing soil displacement.

In areas vulnerable to soil erosion, identifying and installing proper drainage systems is paramount. These areas often have specific characteristics, such as steep slopes, compacted soils, or regions with high rainfall. In such environments, even a slight mismanagement of water can lead to significant erosion. Therefore, constructing drainage ditches, installing French drains, or using permeable pavements can help in directing water away from erosion-prone areas.

Moreover, proper drainage systems also help in maintaining the structural integrity of the soil. When soil becomes waterlogged, it loses its stability and becomes more susceptible to erosion. Effective drainage prevents this waterlogging, ensuring that the soil remains firm and less likely to be washed away.

In conclusion, the importance of proper drainage systems in preventing soil erosion cannot be overstated. By managing water flow and reducing runoff, these systems help preserve the topsoil, maintain land productivity, and protect both natural and man-made environments. For areas identified as vulnerable to soil erosion, investing in and maintaining robust drainage solutions is a proactive step towards sustainable land management.

Case studies of residential properties affected by soil erosion and subsequent foundation repair strategies.

Certainly! Here's a short essay on the topic "Identifying Areas Vulnerable to Soil Erosion" with a focus on case studies of residential properties affected by soil erosion and subsequent foundation repair strategies:

Identifying areas vulnerable to soil erosion is a critical step in safeguarding residential properties and ensuring the longevity of structures. Soil erosion, a natural process exacerbated by human activities, can lead to significant damage to homes, particularly affecting their foundations. By examining case studies of residential properties impacted by soil erosion, we can better understand the vulnerabilities and explore effective foundation repair strategies.

One notable case study involves a residential neighborhood in a hilly region where heavy rainfall and deforestation have accelerated soil erosion. Homeowners in this area began noticing cracks in their foundations and uneven floors, indicative of underlying soil erosion issues. Geotechnical engineers were brought in to assess the situation. They identified that the primary cause was the loss of topsoil and the undermining of the foundation due to water runoff.

To address this, a multi-faceted approach was adopted. Firstly, soil stabilization techniques were employed, including the use of geotextiles and retaining walls to prevent further erosion. Additionally, proper drainage systems were installed to redirect water away from the foundations. For the affected homes, foundation repair strategies such as underpinning were utilized. Underpinning involves extending the depth or breadth of existing foundation piles to a depth where they rest on more stable soil, thereby providing additional support and stabilizing the structure.

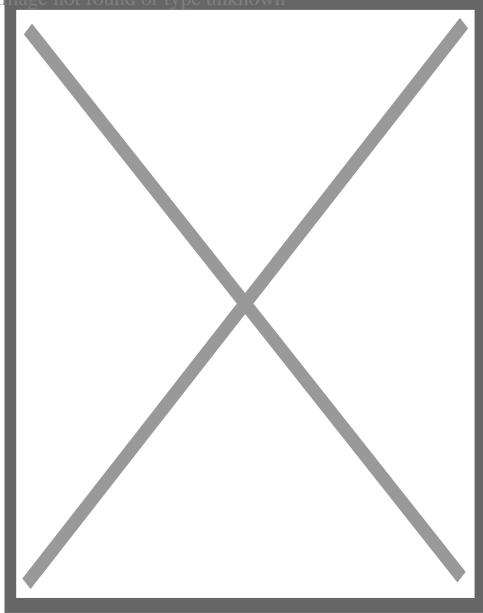
Another case study highlights a coastal community where soil erosion is driven by tidal action and storm surges. Here, homes situated close to the shoreline experienced significant foundation issues due to the constant erosion of the soil beneath. The solution involved a combination of natural and engineered approaches. Mangrove planting was encouraged to act as a natural barrier against erosion, while engineering solutions like groins and seawalls were constructed to protect the coastline. For the homes, pier and beam foundation repairs were conducted, where additional supports were added beneath the existing structure to elevate and stabilize it.

These case studies underscore the importance of identifying vulnerable areas to soil erosion through comprehensive site assessments and monitoring. Early detection allows for proactive measures to be taken, minimizing potential damage to residential properties. Furthermore, employing a combination of preventive and reparative strategies ensures the resilience of homes against the ongoing threat of soil erosion. By learning from these examples, communities can better prepare and protect their residential properties, ensuring safety and structural integrity for years to come.



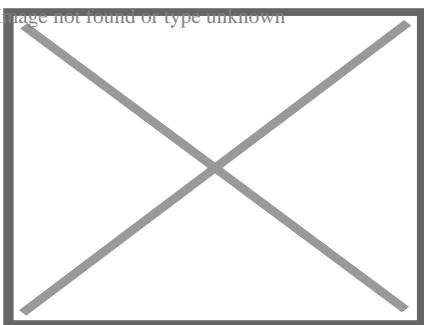
About geotechnical engineering

Image not found or type unknown



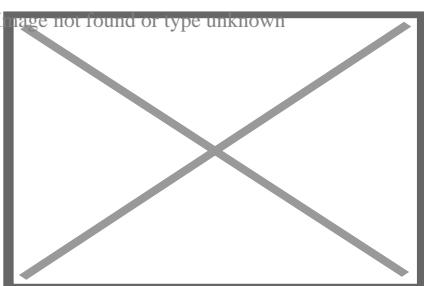
Boston's Big Dig presented geotechnical challenges in an urban environment.

Image not found or type unknown



Precast concrete retaining wall

Image not found or type unknown



A typical cross-section of a slope used in two-dimensional analyzes.

Geotechnical engineering, also known as **geotechnics**, is the branch of civil engineering concerned with the engineering behavior of earth materials. It uses the principles of soil mechanics and rock mechanics to solve its engineering problems. It also relies on knowledge of geology, hydrology, geophysics, and other related sciences.

Geotechnical engineering has applications in military engineering, mining engineering, petroleum engineering, coastal engineering, and offshore construction. The fields of geotechnical engineering and engineering geology have overlapping knowledge areas. However, while geotechnical engineering is a specialty of civil engineering, engineering

geology is a specialty of geology.

History

[edit]

Humans have historically used soil as a material for flood control, irrigation purposes, burial sites, building foundations, and construction materials for buildings. Dykes, dams, and canals dating back to at least 2000 BCE—found in parts of ancient Egypt, ancient Mesopotamia, the Fertile Crescent, and the early settlements of Mohenjo Daro and Harappa in the Indus valley—provide evidence for early activities linked to irrigation and flood control. As cities expanded, structures were erected and supported by formalized foundations. The ancient Greeks notably constructed pad footings and strip-and-raft foundations. Until the 18th century, however, no theoretical basis for soil design had been developed, and the discipline was more of an art than a science, relying on experience.^[1]

Several foundation-related engineering problems, such as the Leaning Tower of Pisa, prompted scientists to begin taking a more scientific-based approach to examining the subsurface. The earliest advances occurred in the development of earth pressure theories for the construction of retaining walls. Henri Gautier, a French royal engineer, recognized the "natural slope" of different soils in 1717, an idea later known as the soil's angle of repose. Around the same time, a rudimentary soil classification system was also developed based on a material's unit weight, which is no longer considered a good indication of soil type.^{[1][2]}

The application of the principles of mechanics to soils was documented as early as 1773 when Charles Coulomb, a physicist and engineer, developed improved methods to determine the earth pressures against military ramparts. Coulomb observed that, at failure, a distinct slip plane would form behind a sliding retaining wall and suggested that the maximum shear stress on the slip plane, for design purposes, was the sum of the soil cohesion, c (independent of the soil type), and friction, $\tau = c + \sigma \tan(\phi)$, on the slip plane and ϕ is the friction angle of the soil. By combining Coulomb's theory with Christian Otto Mohr's 2D stress state, the theory became known as Mohr-Coulomb theory. Although it is now recognized that precise determination of cohesion is impossible because c is not a fundamental soil property, the Mohr-Coulomb theory is still used in practice today.^[3]

In the 19th century, Henry Darcy developed what is now known as Darcy's Law, describing the flow of fluids in a porous media. Joseph Boussinesq, a mathematician and physicist, developed theories of stress distribution in elastic solids that proved useful for estimating stresses at depth in the ground. William Rankine, an engineer and physicist, developed an alternative to Coulomb's earth pressure theory. Albert Atterberg developed the clay consistency indices that are still used today for soil classification.^{[1][2]} In 1885, Osborne Reynolds recognized that shearing causes volumetric dilation of dense materials and contraction of loose granular materials.

Modern geotechnical engineering is said to have begun in 1925 with the publication of *Erdbaumechanik* by Karl von Terzaghi, a mechanical engineer and geologist. Considered by many to be the father of modern soil mechanics and geotechnical engineering, Terzaghi developed the principle of effective stress, and demonstrated that the shear strength of soil is controlled by effective stress.^[4] Terzaghi also developed the framework for theories of bearing capacity of foundations, and the theory for prediction of the rate of settlement of clay layers due to consolidation.^[1]^[3]^[5] Afterwards, Maurice Biot fully developed the three-dimensional soil consolidation theory, extending the one-dimensional model previously developed by Terzaghi to more general hypotheses and introducing the set of basic equations of Poroelasticity.

In his 1948 book, Donald Taylor recognized that the interlocking and dilation of densely packed particles contributed to the peak strength of the soil. Roscoe, Schofield, and Wroth, with the publication of *On the Yielding of Soils* in 1958, established the interrelationships between the volume change behavior (dilation, contraction, and consolidation) and shearing behavior with the theory of plasticity using critical state soil mechanics. Critical state soil mechanics is the basis for many contemporary advanced constitutive models describing the behavior of soil.^[6]

In 1960, Alec Skempton carried out an extensive review of the available formulations and experimental data in the literature about the effective stress validity in soil, concrete, and rock in order to reject some of these expressions, as well as clarify what expressions were appropriate according to several working hypotheses, such as stress-strain or strength behavior, saturated or non-saturated media, and rock, concrete or soil behavior.

Roles

[\[edit\]](#)

Geotechnical investigation

[\[edit\]](#)

Main article: Geotechnical investigation

Geotechnical engineers investigate and determine the properties of subsurface conditions and materials. They also design corresponding earthworks and retaining structures, tunnels, and structure foundations, and may supervise and evaluate sites, which may further involve site monitoring as well as the risk assessment and mitigation of natural hazards.^[7]^[8]

Geotechnical engineers and engineering geologists perform geotechnical investigations to obtain information on the physical properties of soil and rock underlying and adjacent to a site to design earthworks and foundations for proposed structures and for the repair of distress to earthworks and structures caused by subsurface conditions. Geotechnical investigations involve surface and subsurface exploration of a site, often including subsurface sampling and

laboratory testing of retrieved soil samples. Sometimes, geophysical methods are also used to obtain data, which include measurement of seismic waves (pressure, shear, and Rayleigh waves), surface-wave methods and downhole methods, and electromagnetic surveys (magnetometer, resistivity, and ground-penetrating radar). Electrical tomography can be used to survey soil and rock properties and existing underground infrastructure in construction projects.^[9]

Surface exploration can include on-foot surveys, geologic mapping, geophysical methods, and photogrammetry. Geologic mapping and interpretation of geomorphology are typically completed in consultation with a geologist or engineering geologist. Subsurface exploration usually involves in-situ testing (for example, the standard penetration test and cone penetration test). The digging of test pits and trenching (particularly for locating faults and slide planes) may also be used to learn about soil conditions at depth. Large-diameter borings are rarely used due to safety concerns and expense. Still, they are sometimes used to allow a geologist or engineer to be lowered into the borehole for direct visual and manual examination of the soil and rock stratigraphy.

Various soil samplers exist to meet the needs of different engineering projects. The standard penetration test, which uses a thick-walled split spoon sampler, is the most common way to collect disturbed samples. Piston samplers, employing a thin-walled tube, are most commonly used to collect less disturbed samples. More advanced methods, such as the Sherbrooke block sampler, are superior but expensive. Coring frozen ground provides high-quality undisturbed samples from ground conditions, such as fill, sand, moraine, and rock fracture zones.^[10]

Geotechnical centrifuge modeling is another method of testing physical-scale models of geotechnical problems. The use of a centrifuge enhances the similarity of the scale model tests involving soil because soil's strength and stiffness are susceptible to the confining pressure. The centrifugal acceleration allows a researcher to obtain large (prototype-scale) stresses in small physical models.

Foundation design

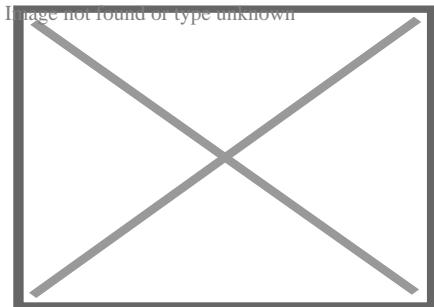
[\[edit\]](#)

Main article: Foundation (engineering)

The foundation of a structure's infrastructure transmits loads from the structure to the earth. Geotechnical engineers design foundations based on the load characteristics of the structure and the properties of the soils and bedrock at the site. Generally, geotechnical engineers first estimate the magnitude and location of loads to be supported before developing an investigation plan to explore the subsurface and determine the necessary soil parameters through field and lab testing. Following this, they may begin the design of an engineering foundation. The primary considerations for a geotechnical engineer in foundation design are bearing capacity, settlement, and ground movement beneath the foundations.^[11]

Earthworks

[edit]



A compactor/roller operated by U.S. Navy Seabees

See also: Earthworks (engineering)

Geotechnical engineers are also involved in the planning and execution of earthworks, which include ground improvement,[¹¹] slope stabilization, and slope stability analysis.

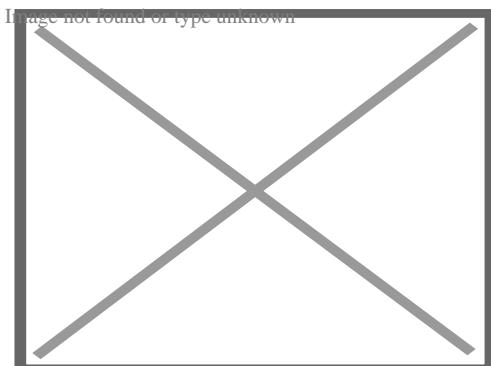
Ground improvement

[edit]

Various geotechnical engineering methods can be used for ground improvement, including reinforcement geosynthetics such as geocells and geogrids, which disperse loads over a larger area, increasing the soil's load-bearing capacity. Through these methods, geotechnical engineers can reduce direct and long-term costs.[¹²]

Slope stabilization

[edit]



Simple slope slip section.

Main article: Slope stability

Geotechnical engineers can analyze and improve slope stability using engineering methods. Slope stability is determined by the balance of shear stress and shear strength. A previously stable slope may be initially affected by various factors, making it unstable. Nonetheless, geotechnical engineers can design and implement engineered slopes to increase stability.

Slope stability analysis

[\[edit\]](#)

Main article: Slope stability analysis

Stability analysis is needed to design engineered slopes and estimate the risk of slope failure in natural or designed slopes by determining the conditions under which the topmost mass of soil will slip relative to the base of soil and lead to slope failure.^[13] If the interface between the mass and the base of a slope has a complex geometry, slope stability analysis is difficult and numerical solution methods are required. Typically, the interface's exact geometry is unknown, and a simplified interface geometry is assumed. Finite slopes require three-dimensional models to be analyzed, so most slopes are analyzed assuming that they are infinitely wide and can be represented by two-dimensional models.

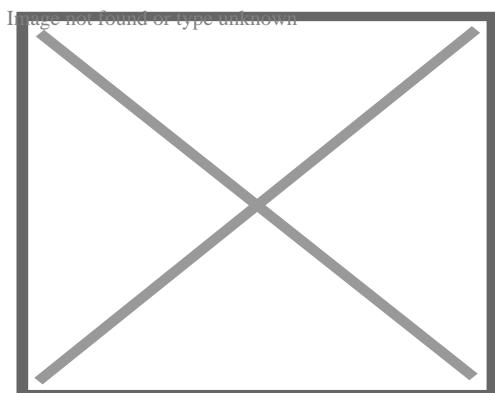
Sub-disciplines

[\[edit\]](#)

Geosynthetics

[\[edit\]](#)

Main article: Geosynthetics



A collage of geosynthetic products.

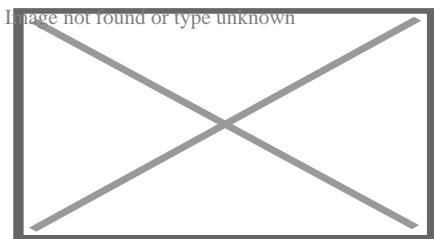
Geosynthetics are a type of plastic polymer products used in geotechnical engineering that improve engineering performance while reducing costs. This includes geotextiles, geogrids, geomembranes, geocells, and geocomposites. The synthetic nature of the products make them suitable for use in the ground where high levels of durability are required. Their main functions include drainage, filtration, reinforcement, separation, and containment.

Geosynthetics are available in a wide range of forms and materials, each to suit a slightly different end-use, although they are frequently used together. Some reinforcement geosynthetics, such as geogrids and more recently, cellular confinement systems, have shown to improve bearing capacity, modulus factors and soil stiffness and strength.^[14] These products have a wide range of applications and are currently used in many civil and geotechnical engineering applications including roads, airfields, railroads, embankments, piled embankments, retaining structures, reservoirs, canals, dams, landfills, bank protection and coastal engineering.^[15]

Offshore

[edit]

Main article: Offshore geotechnical engineering



Platforms offshore Mexico.

Offshore (or marine) geotechnical engineering is concerned with foundation design for human-made structures in the sea, away from the coastline (in opposition to *onshore* or *nearshore* engineering). Oil platforms, artificial islands and submarine pipelines are examples of such structures.^[16]

There are a number of significant differences between onshore and offshore geotechnical engineering.^{[16][17]} Notably, site investigation and ground improvement on the seabed are more expensive; the offshore structures are exposed to a wider range of geohazards; and the environmental and financial consequences are higher in case of failure. Offshore structures are exposed to various environmental loads, notably wind, waves and currents. These phenomena may affect the integrity or the serviceability of the structure and its foundation during its operational lifespan and need to be taken into account in offshore design.

In subsea geotechnical engineering, seabed materials are considered a two-phase material composed of rock or mineral particles and water.^{[18][19]} Structures may be fixed in place in the seabed—as is the case for piers, jetties and fixed-bottom wind turbines—or may comprise

a floating structure that remains roughly fixed relative to its geotechnical anchor point. Undersea mooring of human-engineered floating structures include a large number of offshore oil and gas platforms and, since 2008, a few floating wind turbines. Two common types of engineered design for anchoring floating structures include tension-leg and catenary loose mooring systems.[²⁰]

Observational method

[edit]

First proposed by Karl Terzaghi and later discussed in a paper by Ralph B. Peck, the observational method is a managed process of construction control, monitoring, and review, which enables modifications to be incorporated during and after construction. The method aims to achieve a greater overall economy without compromising safety by creating designs based on the most probable conditions rather than the most unfavorable.[²¹] Using the observational method, gaps in available information are filled by measurements and investigation, which aid in assessing the behavior of the structure during construction, which in turn can be modified per the findings. The method was described by Peck as "learn-as-you-go".[²²]

The observational method may be described as follows:[²²]

1. General exploration sufficient to establish the rough nature, pattern, and properties of deposits.
2. Assessment of the most probable conditions and the most unfavorable conceivable deviations.
3. Creating the design based on a working hypothesis of behavior anticipated under the most probable conditions.
4. Selection of quantities to be observed as construction proceeds and calculating their anticipated values based on the working hypothesis under the most unfavorable conditions.
5. Selection, in advance, of a course of action or design modification for every foreseeable significant deviation of the observational findings from those predicted.
6. Measurement of quantities and evaluation of actual conditions.
7. Design modification per actual conditions

The observational method is suitable for construction that has already begun when an unexpected development occurs or when a failure or accident looms or has already happened. It is unsuitable for projects whose design cannot be altered during construction.[²²]

See also

[edit]

o  [Engineering portal](#)

- o Civil engineering
- o Deep Foundations Institute
- o Earthquake engineering
- o Earth structure
- o Effective stress
- o Engineering geology
- o Geological Engineering
- o Geoprocesses
- o Hydrogeology
- o International Society for Soil Mechanics and Geotechnical Engineering
- o Karl von Terzaghi
- o Land reclamation
- o Landfill
- o Mechanically stabilized earth
- o Offshore geotechnical engineering
- o Rock mass classifications
- o Sediment control
- o Seismology
- o Soil mechanics
- o Soil physics
- o Soil science

Notes

[edit]

1. ^ **a b c d** Das, Braja (2006). *Principles of Geotechnical Engineering*. Thomson Learning.
2. ^ **a b** Budhu, Muni (2007). *Soil Mechanics and Foundations*. John Wiley & Sons, Inc. ISBN 978-0-471-43117-6.
3. ^ **a b** Disturbed soil properties and geotechnical design, Schofield, Andrew N., Thomas Telford, 2006. ISBN 0-7277-2982-9
4. ^ Guerriero V., Mazzoli S. (2021). "Theory of Effective Stress in Soil and Rock and Implications for Fracturing Processes: A Review". *Geosciences*. 11 (3): 119. Bibcode:2021Geosc..11..119G. doi:10.3390/geosciences11030119.
5. ^ Soil Mechanics, Lambe, T.William and Whitman, Robert V., Massachusetts Institute of Technology, John Wiley & Sons., 1969. ISBN 0-471-51192-7
6. ^ Soil Behavior and Critical State Soil Mechanics, Wood, David Muir, Cambridge University Press, 1990. ISBN 0-521-33782-8

7. ^ Terzaghi, K., Peck, R.B. and Mesri, G. (1996), *Soil Mechanics in Engineering Practice* 3rd Ed., John Wiley & Sons, Inc. ISBN 0-471-08658-4
8. ^ Holtz, R. and Kovacs, W. (1981), *An Introduction to Geotechnical Engineering*, Prentice-Hall, Inc. ISBN 0-13-484394-0
9. ^ Deep Scan Tech (2023): Deep Scan Tech uncovers hidden structures at the site of Denmark's tallest building.
10. ^ "Geofrost Coring". *GEOFROST*. Retrieved 20 November 2020.
11. ^ **a b** Han, Jie (2015). *Principles and Practice of Ground Improvement*. Wiley. ISBN 9781118421307.
12. ^ RAJU, V. R. (2010). *Ground Improvement Technologies and Case Histories*. Singapore: Research Publishing Services. p. 809. ISBN 978-981-08-3124-0. *Ground Improvement – Principles And Applications In Asia*.
13. ^ Pariseau, William G. (2011). *Design analysis in rock mechanics*. CRC Press.
14. ^ Hegde, A.M. and Palsule P.S. (2020), Performance of Geosynthetics Reinforced Subgrade Subjected to Repeated Vehicle Loads: Experimental and Numerical Studies. *Front. Built Environ.* 6:15. <https://www.frontiersin.org/articles/10.3389/fbuil.2020.00015/full>.
15. ^ Koerner, Robert M. (2012). *Designing with Geosynthetics* (6th Edition, Vol. 1 ed.). Xlibris. ISBN 9781462882892.
16. ^ **a b** Dean, E.T.R. (2010). *Offshore Geotechnical Engineering – Principles and Practice*. Thomas Telford, Reston, VA, 520 p.
17. ^ Randolph, M. and Gourvenec, S., 2011. *Offshore geotechnical engineering*. Spon Press, N.Y., 550 p.
18. ^ Das, B.M., 2010. *Principles of geotechnical engineering*. Cengage Learning, Stamford, 666 p.
19. ^ Atkinson, J., 2007. *The mechanics of soils and foundations*. Taylor & Francis, N.Y., 442 p.
20. ^ Floating Offshore Wind Turbines: Responses in a Sea state – Pareto Optimal Designs and Economic Assessment, P. Sclavounos et al., October 2007.
21. ^ Nicholson, D, Tse, C and Penny, C. (1999). The Observational Method in ground engineering – principles and applications. Report 185, CIRIA, London.
22. ^ **a b c** Peck, R.B (1969). Advantages and limitations of the observational method in applied soil mechanics, *Geotechnique*, 19, No. 1, pp. 171-187.

References

[edit]

- Bates and Jackson, 1980, Glossary of Geology: American Geological Institute.
- Krynine and Judd, 1957, *Principles of Engineering Geology and Geotechnics*: McGraw-Hill, New York.
- Ventura, Pierfranco, 2019, *Fondazioni*, Volume 1, Modellazioni statiche e sismiche, Hoepli, Milano

- Holtz, R. and Kovacs, W. (1981), *An Introduction to Geotechnical Engineering*, Prentice-Hall, Inc. ISBN 0-13-484394-0
- Bowles, J. (1988), *Foundation Analysis and Design*, McGraw-Hill Publishing Company. ISBN 0-07-006776-7
- Cedergren, Harry R. (1977), *Seepage, Drainage, and Flow Nets*, Wiley. ISBN 0-471-14179-8
- Kramer, Steven L. (1996), *Geotechnical Earthquake Engineering*, Prentice-Hall, Inc. ISBN 0-13-374943-6
- Freeze, R.A. & Cherry, J.A., (1979), *Groundwater*, Prentice-Hall. ISBN 0-13-365312-9
- Lunne, T. & Long, M.,(2006), *Review of long seabed samplers and criteria for new sampler design*, Marine Geology, Vol 226, p. 145–165
- Mitchell, James K. & Soga, K. (2005), *Fundamentals of Soil Behavior* 3rd ed., John Wiley & Sons, Inc. ISBN 978-0-471-46302-3
- Rajapakse, Ruwan., (2005), "Pile Design and Construction", 2005. ISBN 0-9728657-1-3
- Fang, H.-Y. and Daniels, J. (2005) *Introductory Geotechnical Engineering : an environmental perspective*, Taylor & Francis. ISBN 0-415-30402-4
- NAVFAC (Naval Facilities Engineering Command) (1986) *Design Manual 7.01, Soil Mechanics*, US Government Printing Office
- NAVFAC (Naval Facilities Engineering Command) (1986) *Design Manual 7.02, Foundations and Earth Structures*, US Government Printing Office
- NAVFAC (Naval Facilities Engineering Command) (1983) *Design Manual 7.03, Soil Dynamics, Deep Stabilization and Special Geotechnical Construction*, US Government Printing Office
- Terzaghi, K., Peck, R.B. and Mesri, G. (1996), *Soil Mechanics in Engineering Practice* 3rd Ed., John Wiley & Sons, Inc. ISBN 0-471-08658-4
- Santamarina, J.C., Klein, K.A., & Fam, M.A. (2001), "Soils and Waves: Particulate Materials Behavior, Characterization and Process Monitoring", Wiley, ISBN 978-0-471-49058-6
- Firuziaan, M. and Estorff, O., (2002), "Simulation of the Dynamic Behavior of Bedding-Foundation-Soil in the Time Domain", Springer Verlag.

External links

[edit]

- Worldwide Geotechnical Literature Database
- v
- t
- e

Engineering

- History
- Outline
- List of engineering branches

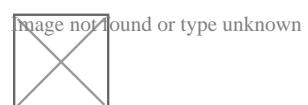
Specialties and interdisciplinarity

- Architectural
- Coastal
- Construction
- Earthquake
- Ecological
- Environmental
 - Sanitary
- Geological
- Geotechnical
- Hydraulic
- Mining
- Municipal/urban
- Offshore
- River
- Structural
- Transportation
 - Traffic
 - Railway

- Acoustic
- Aerospace
- Automotive
- Biomechanical
- Energy
- Manufacturing
- Marine
- Naval architecture
- Railway
- Sports
- Thermal
- Tribology

- Broadcast
 - outline
- Control
- Electromechanics
- Electronics
- Microwaves
- Optical
- Power
- Radio-frequency
- Signal processing
- Telecommunications

Electrical



Engineering education

- Bachelor of Engineering
- Bachelor of Science
- Master's degree
- Doctorate
- Graduate certificate
- Engineer's degree
- Licensed engineer

Related topics

- Engineer

- Engineering
 - A–L
 - M–Z

Glossaries

- Aerospace engineering
- Civil engineering
- Electrical and electronics engineering
- Mechanical engineering
- Structural engineering

- Agricultural
- Audio
- Automation
- Biomedical
 - Bioinformatics
 - Clinical
 - Health technology
 - Pharmaceutical
 - Rehabilitation
- Building services
 - MEP
- Design
- Explosives
- Facilities
- Fire
- Forensic
- Climate
- Geomatics
- Graphics
- Industrial
- Information
- Instrumentation
 - Instrumentation and control
- Logistics
- Management
- Mathematics
- Mechatronics
- Military
- Nuclear
- Ontology
- Packaging
- Physics
- Privacy
- Safety
- Security
- Survey
- Sustainability
- Systems
- Textile

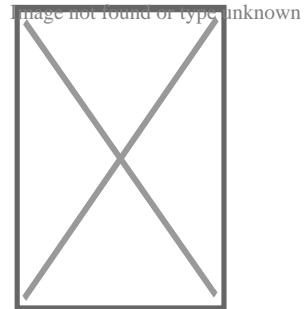
- [Category](#)
- [Commons](#)
- [Wikiproject](#)
- [Portal](#)

- v
- t
- e

Soil science

- History
- Index
- Pedology
- Edaphology
- Soil biology
- Soil microbiology
- Soil zoology
- Soil ecology
- Soil physics
- Soil mechanics
- Soil chemistry
- Environmental soil science
- Agricultural soil science

Main fields



Soil topics

- Soil
- Pedosphere
 - Soil morphology
 - Pedodiversity
 - Soil formation
- Soil erosion
- Soil contamination
- Soil retrogression and degradation
- Soil compaction
 - Soil compaction (agriculture)
- Soil sealing
- Soil salinity
 - Alkali soil
- Soil pH
 - Soil acidification
- Soil health
- Soil life
- Soil biodiversity
- Soil quality
- Soil value
- Soil fertility
- Soil resilience
- Soil color
- Soil texture
- Soil structure
 - Pore space in soil
 - Pore water pressure
- Soil crust
- Soil horizon
- Soil biomantle
- Soil carbon
- Soil gas
 - Soil respiration
- Soil organic matter
- Soil moisture
 - Soil water (retention)

- **v**
- **t**
- **e**

Soil classification

**World
Reference
Base
for Soil
Resources
(1998–)**

- Acrisols
- Alisols
- Andosols
- Anthrosols
- Arenosols
- Calcisols
- Cambisols
- Chernozem
- Cryosols
- Durisols
- Ferralsols
- Fluvisols
- Gleysols
- Gypsisols
- Histosol
- Kastanozems
- Leptosols
- Lixisols
- Luvisols
- Nitisols
- Phaeozems
- Planosols
- Plinthosols
- Podzols
- Regosols
- Retisols
- Solonchaks
- Solonetz
- Stagnosol
- Technosols
- Umbrisols
- Vertisols

**USDA soil
taxonomy**

- Alfisols
- Andisols
- Aridisols
- Entisols
- Gelisols
- Histosols
- Inceptisols

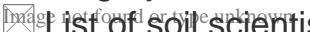
- Soil conservation
- Soil management
- Soil guideline value
- Soil survey
- Soil test
- Applications**
 - Soil governance
 - Soil value
 - Soil salinity control
 - Erosion control
 - Agroecology
 - Liming (soil)
- Related fields**
 - Geology
 - Geochemistry
 - Petrology
 - Geomorphology
 - Geotechnical engineering
 - Hydrology
 - Hydrogeology
 - Biogeography
 - Earth materials
 - Archaeology
 - Agricultural science
 - Agrology
- Societies, Initiatives**
 - Australian Society of Soil Science Incorporated
 - Canadian Society of Soil Science
 - Central Soil Salinity Research Institute (India)
 - German Soil Science Society
 - Indian Institute of Soil Science
 - International Union of Soil Sciences
 - International Year of Soil
 - National Society of Consulting Soil Scientists (US)
 - OPAL Soil Centre (UK)
 - Soil Science Society of Poland
 - Soil and Water Conservation Society (US)
 - Soil Science Society of America
 - World Congress of Soil Science

**Scientific
journals**

- *Acta Agriculturae Scandinavica B*
- *Journal of Soil and Water Conservation*
- *Plant and Soil*
- *Pochvovedenie*
- *Soil Research*
- *Soil Science Society of America Journal*

See also

- Land use
- Land conversion
- Land management
- Vegetation
- Infiltration (hydrology)
- Groundwater
- Crust (geology)
- Impervious surface/Surface runoff
- Petrichor

-  [WikiProject Soil](#)
-  [Category soil](#)
- [Category soil science](#)
-  [List of soil scientists](#)

- v
- t
- e

Geotechnical engineering

Offshore geotechnical engineering

Investigation and instrumentation

-  **Core drill**
-  **Cone penetration test**
-  **Geo-electrical sounding**
-  **Permeability test**
-  **Load test**
 - Static
 - Dynamic
 - Statnamic
-  **Pore pressure measurement**
 - Piezometer
 - Well
-  **Ram sounding**
-  **Rock control drilling**
-  **Rotary-pressure sounding**
-  **Rotary weight sounding**
-  **Sample series**
-  **Screw plate test**
-  **Deformation monitoring**
 -  **Inclinometer**
 -  **Settlement recordings**
-  **Shear vane test**
-  **Simple sounding**
-  **Standard penetration test**
-  **Total sounding**
-  **Trial pit**
-  **Visible bedrock**
- **Nuclear densometer test**
- **Exploration geophysics**
- **Crosshole sonic logging**

Field (*in situ*)

- Clay
- Silt
- Sand
- Gravel
- Peat
- Loam
- Loess

Types

- Hydraulic conductivity
- Water content
- Void ratio
- Bulk density
- Thixotropy
- Reynolds' dilatancy
- Angle of repose
- Friction angle
- Cohesion
- Porosity
- Permeability
- Specific storage
- Shear strength
- Sensitivity

Soil

Properties

Structures (Interaction)

- Natural features
 - Topography
 - Vegetation
 - Terrain
 - Topsoil
 - Water table
 - Bedrock
 - Subgrade
 - Subsoil
- Earthworks
 - Shoring structures
 - Retaining walls
 - Gabion
 - Ground freezing
 - Mechanically stabilized earth
 - Pressure grouting
 - Slurry wall
 - Soil nailing
 - Tieback
 - Land development
 - Landfill
 - Excavation
 - Trench
 - Embankment
 - Cut
 - Causeway
 - Terracing
 - Cut-and-cover
 - Cut and fill
 - Fill dirt
 - Grading
 - Land reclamation
 - Track bed
 - Erosion control
 - Earth structure
 - Expanded clay aggregate
 - Crushed stone
 - Geosynthetics
 - Geotextile
 - Geomembrane
 - Geosynthetic clay liner
 - Cellular confinement
 - Infiltration
- Foundations
 - Shallow
 - Deep

	<ul style="list-style-type: none"> ○ Effective stress ○ Pore water pressure ○ Lateral earth pressure ○ Overburden pressure ○ Preconsolidation pressure
Forces	<ul style="list-style-type: none"> ○ Permafrost ○ Frost heaving ○ Consolidation ○ Compaction ○ Earthquake <ul style="list-style-type: none"> ○ Response spectrum ○ Seismic hazard ○ Shear wave ○ Landslide analysis <ul style="list-style-type: none"> ○ Stability analysis ○ Mitigation ○ Classification ○ Sliding criterion ○ Slab stabilisation ○ Bearing capacity * Stress distribution in soil
Mechanics	
Phenomena/ problems	<ul style="list-style-type: none"> ○ SEEP2D ○ STABL ○ SVFlux ○ SVSlope ○ UTEXAS ○ Plaxis
Numerical analysis software	

- Geology
- Geochemistry
- Petrology
- Earthquake engineering
- Geomorphology
- Soil science
- Hydrology
- Hydrogeology
- Biogeography
- Earth materials
- Archaeology
- Agricultural science
 - Agrology

Related fields

- v
- t
- e

Construction

- Home construction
- Offshore construction
- Underground construction
 - Tunnel construction

Types

- Architecture
- Construction
- Structural engineering
- Timeline of architecture
- Water supply and sanitation

History

- Architect
- Building engineer
- Building estimator
- Building officials
- Chartered Building Surveyor
- Civil engineer
- Civil estimator
- Clerk of works
- Project manager
- Quantity surveyor
- Site manager
- Structural engineer
- Superintendent

Professions

- Banksman
- Boilermaker
- Bricklayer
- Carpenter
- Concrete finisher
- Construction foreman
- Construction worker
- Electrician
- Glazier
- Ironworker
- Millwright
- Plasterer
- Plumber
- Roofer
- Steel fixer
- Welder

Trades workers (List)

- American Institute of Constructors (AIC)
- American Society of Civil Engineers (ASCE)
- Asbestos Testing and Consultancy Association (ATAC)
- Associated General Contractors of America (AGC)
- Association of Plumbing and Heating Contractors (APHC)
- Build UK
- Construction History Society
- Chartered Institution of Civil Engineering Surveyors (CICES)
- Chartered Institute of Plumbing and Heating Engineering (CIPHE)
- Civil Engineering Contractors Association (CECA)
- The Concrete Society
- Construction Management Association of America (CMAA)
- Construction Specifications Institute (CSI)
- FIDIC
- Home Builders Federation (HBF)
- Lighting Association
- National Association of Home Builders (NAHB)
- National Association of Women in Construction (NAWIC)
- National Fire Protection Association (NFPA)
- National Kitchen & Bath Association (NKBA)
- National Railroad Construction and Maintenance Association (NRC)
- National Tile Contractors Association (NTCA)
- Railway Tie Association (RTA)
- Royal Institution of Chartered Surveyors (RICS)
- Scottish Building Federation (SBF)
- Society of Construction Arbitrators

By country

- India
- Iran
- Japan
- Romania
- Turkey
- United Kingdom
- United States

Regulation

- Building code
- Construction law
- Site safety
- Zoning

- Style
 - List
- Industrial architecture
 - British
- Indigenous architecture
- Interior architecture
- Landscape architecture
- Vernacular architecture

- Architectural engineering
- Building services engineering
- Civil engineering
 - Coastal engineering
 - Construction engineering
 - Structural engineering
- Earthquake engineering
- Environmental engineering
- Geotechnical engineering

- List
- Earthbag construction
- Modern methods of construction
- Monoccrete construction
- Slip forming

Architecture

Engineering

Methods

- Building material
 - List of building materials
 - Millwork
- Construction bidding
- Construction delay
- Construction equipment theft
- Construction loan
- Construction management
- Construction waste
- Demolition
- Design-build
- Design–bid–build
- DfMA
- Heavy equipment
- Interior design
- Lists of buildings and structures
 - List of tallest buildings and structures
- Megaproject
- Megastructure
- Plasterwork
 - Damp
 - Proofing
- Parge coat
- Roughcast
 - Harling
- Real estate development
- Stonemasonry
- Sustainability in construction
- Unfinished building
- Urban design
- Urban planning

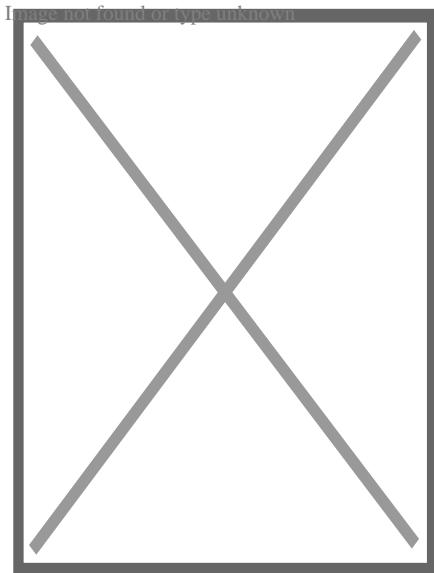
 [Outline](#)  [Category](#)

Authority control databases: National Image not found or type unknown [Edit this at Wikidata](#)

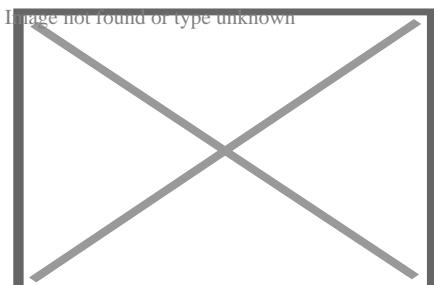
- Germany
- United States
- Czech Republic
- Israel

About Water damage

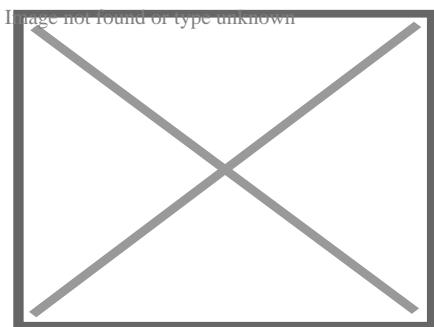
The examples and perspective in this article **may not represent a worldwide view of** ~~Globe~~ **the subject.** You may improve this article, discuss the issue on the talk page, or create Image not found or type unknown a new article, as appropriate. (March 2011) (Learn how and when to remove this message)



Interior of part of a damaged home in New Orleans after Hurricane Katrina



Family photographs damaged by flooding



A smaller and more minor water spot caused by rainwater leaking through a roof

Water damage describes various possible losses caused by water intruding where it will enable attack of a material or system by destructive processes such as rotting of wood, mold

growth, bacteria growth, rusting of steel, swelling of composite woods, de-laminating of materials such as plywood, short-circuiting of electrical devices, etc.

The damage may be imperceptibly slow and minor such as water spots that could eventually mar a surface, or it may be instantaneous and catastrophic such as burst pipes and flooding. However fast it occurs, water damage is a major contributor to loss of property.

An insurance policy may or may not cover the costs associated with water damage and the process of water damage restoration. While a common cause of residential water damage is often the failure of a sump pump, many homeowner's insurance policies do not cover the associated costs without an addendum which adds to the monthly premium of the policy. Often the verbiage of this addendum is similar to "Sewer and Drain Coverage".

In the United States, those individuals who are affected by wide-scale flooding may have the ability to apply for government and FEMA grants through the Individual Assistance program.^[1] On a larger level, businesses, cities, and communities can apply to the FEMA Public Assistance program for funds to assist after a large flood. For example, the city of Fond du Lac Wisconsin received \$1.2 million FEMA grant after flooding in June 2008. The program allows the city to purchase the water damaged properties, demolish the structures, and turn the former land into public green space.^[citation needed]

Causes

[edit]

Water damage can originate by different sources such as a broken dishwasher hose, a washing machine overflow, a dishwasher leakage, broken/leaking pipes, flood waters, groundwater seepage, building envelope failures (leaking roof, windows, doors, siding, etc.) and clogged toilets. According to the Environmental Protection Agency, 13.7% of all water used in the home today can be attributed to plumbing leaks.^[2] On average that is approximately 10,000 gallons of water per year wasted by leaks for each US home. A tiny, 1/8-inch crack in a pipe can release up to 250 gallons of water a day.^[3] According to *Claims Magazine* in August 2000, broken water pipes ranked second to hurricanes in terms of both the number of homes damaged and the amount of claims (on average \$50,000 per insurance claim^[citation needed]) costs in the US.^[4] Experts suggest that homeowners inspect and replace worn pipe fittings and hose connections to all household appliances that use water at least once a year. This includes washing machines, dishwashers, kitchen sinks, and bathroom lavatories, refrigerator icemakers, water softeners, and humidifiers. A few US companies offer whole-house leak protection systems utilizing flow-based technologies. A number of insurance companies offer policyholders reduced rates for installing a whole-house leak protection system.

As far as insurance coverage is concerned, damage caused by surface water intrusion to the dwelling is considered flood damage and is normally excluded from coverage under traditional homeowners' insurance. Surface water is water that enters the dwelling from the surface of the

ground because of inundation or insufficient drainage and causes loss to the dwelling. Coverage for surface water intrusion^[5] to the dwelling would usually require a separate flood insurance policy.

Categories

[edit]

There are three basic categories of water damage, based on the level of contamination.

Category 1 Water - Refers to a source of water that does not pose substantial threat to humans and classified as "**clean water**". Examples are broken water supply lines, tub or sink overflows or appliance malfunctions that involves water supply lines.

Category 2 Water - Refers to a source of water that contains a significant degree of chemical, biological or physical contaminants and causes discomfort or sickness when consumed or even exposed to. Known as "**grey water**". This type carries microorganisms and nutrients of micro-organisms. Examples are toilet bowls with urine (no feces), sump pump failures, seepage due to hydrostatic failure and water discharge from dishwashers or washing machines.

Category 3 Water - Known as "**black water**" and is grossly unsanitary. This water contains unsanitary agents, harmful bacteria and fungi, causing severe discomfort or sickness. Type 3 category are contaminated water sources that affect the indoor environment. This category includes water sources from sewage, seawater, rising water from rivers or streams, storm surge, ground surface water or standing water. Category 2 Water or Grey Water that is not promptly removed from the structure and or have remained stagnant may be re classified as Category 3 Water. Toilet back flows that originates from beyond the toilet trap is considered black water contamination regardless of visible content or color.^[6]

Classes

[edit]

Class of water damage is determined by the probable rate of evaporation based on the type of materials affected, or wet, in the room or space that was flooded. Determining the class of water damage is an important first step, and will determine the amount and type of equipment utilized to dry-down the structure.^[7]

Class 1 - Slow Rate of Evaporation. Affects only a portion of a room. Materials have a low permeance/porosity. Minimum moisture is absorbed by the materials. **IICRC s500 2016 update adds that class 1 be indicated when <5% of the total square footage of a room (ceiling+walls+floor) are affected **

Class 2 - Fast Rate of Evaporation. Water affects the entire room of carpet and cushion. May have wicked up the walls, but not more than 24 inches. **IICRC s500 2016 update adds that class 2 be indicated when 5% to 40% of the total square footage of a room (ceiling+walls+floor) are affected **

Class 3 - Fastest Rate of Evaporation. Water generally comes from overhead, affecting the entire area; walls, ceilings, insulation, carpet, cushion, etc. **IICRC s500 2016 update adds that class 3 be indicated when >40% of the total square footage of a room (ceiling+walls+floor) are affected **

Class 4 - Specialty Drying Situations. Involves materials with a very low permeance/porosity, such as hardwood floors, concrete, crawlspaces, gypcrete, plaster, etc. Drying generally requires very low specific humidity to accomplish drying.

Restoration

[edit]

See also: Convectant drying

Water damage restoration can be performed by property management teams, building maintenance personnel, or by the homeowners themselves; however, contacting a certified professional water damage restoration specialist is often regarded as the safest way to restore water damaged property. Certified professional water damage restoration specialists utilize psychrometrics to monitor the drying process.^[8]

Standards and regulation

[edit]

While there are currently no government regulations in the United States dictating procedures, two certifying bodies, the Institute of Inspection Cleaning and Restoration Certification (IICRC) and the RIA, do recommend standards of care. The current IICRC standard is ANSI/IICRC S500-2021.^[9] It is the collaborative work of the IICRC, SCRT, IEI, IAQA, and NADCA.

Fire and Water Restoration companies are regulated by the appropriate state's Department of Consumer Affairs - usually the state contractors license board. In California, all Fire and Water Restoration companies must register with the California Contractors State License Board.^[10] Presently, the California Contractors State License Board has no specific classification for "water and fire damage restoration."

Procedures

[edit]

Water damage restoration is often prefaced by a loss assessment and evaluation of affected materials. The damaged area is inspected with water sensing equipment such as probes and other infrared tools in order to determine the source of the damage and possible extent of areas affected. Emergency mitigation services are the first order of business. Controlling the source of water, removal of non-salvageable materials, water extraction and pre-cleaning of impacted materials are all part of the mitigation process. Restoration services would then be rendered to the property in order to dry the structure, stabilize building materials, sanitize any affected or cross-contaminated areas, and deodorize all affected areas and materials. After the labor is completed, water damage equipment including air movers, air scrubbers, dehumidifiers, wood floor drying systems, and sub-floor drying equipment is left in the residence. The goal of the drying process is to stabilize the moisture content of impacted materials below 15%, the generally accepted threshold for microbial amplification. Industry standards state that drying vendors should return at regular time intervals, preferably every twenty-four hours, to monitor the equipment, temperature, humidity, and moisture content of the affected walls and contents.[6] In conclusion, key aspects of water damage restoration include fast action, adequate equipment, moisture measurements, and structural drying. Dehumidification is especially crucial for structural components affected by water damage, such as wooden beams, flooring, and drywall.

See also

[edit]

- Indoor mold

References

[edit]

1. ^ "Individual Disaster Assistance". *DisasterAssistance.gov*. Retrieved 2009-09-28.
2. ^ "How We Use Water". 16 January 2017.
3. ^ The University of Maine Corporate Extension – www.umext.maine.edu
4. ^ Herndon Jr., Everette L.; Yang, Chin S. (August 2000). "Mold & Mildew: A Creeping Catastrophe". *Claims Magazine*. Archived from the original on 2000-08-15. Retrieved November 4, 2016.
5. ^ *Moisture Control Guidance for Building Design, Construction and Maintenance*. December 2013.
6. ^ "Water Damage Restoration Guideline" (PDF). Northern Arizona University. Archived from the original (PDF) on 2013-06-26. Retrieved 2 September 2014.
7. ^ "The Basics Of Water Damage Restoration Training". www.iicrc.org. Retrieved 2016-11-03.
8. ^ "Chapter 6: Psychrometry and the Science of Drying". IICRC Standards Subscription Site. Institute of Inspection, Cleaning and Restoration Certification. Retrieved 27 September 2020.

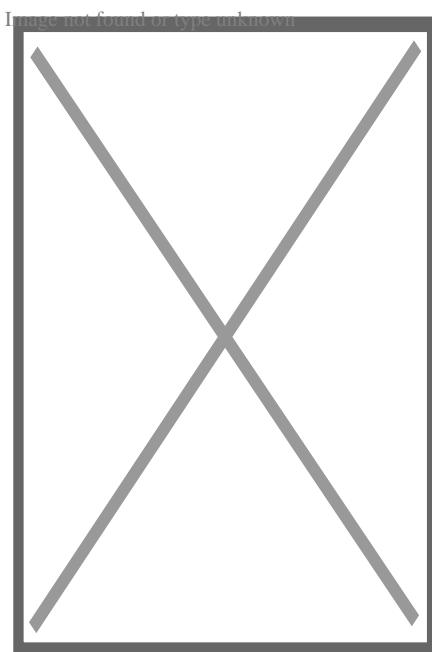
9. ^ "ANSI/IICRC S500 Water Damage Restoration". IICRC. 22 December 2020. Retrieved 14 February 2022.
10. ^ "California Contractors State License Board". State of California. Retrieved 2010-08-29.

About home inspection

This article **uses bare URLs, which are uninformative and vulnerable to link rot.**

Image not found or type unknown

Please consider converting them to full citations to ensure the article remains verifiable and maintains a consistent citation style. Several templates and tools are available to assist in formatting, such as reFill (documentation) and Citation bot (documentation). (August 2022) (Learn how and when to remove this message)



A disaster inspector at work in the United States assessing tornado damage to a house

A **home inspection** is a limited, non-invasive examination of the condition of a home, often in connection with the sale of that home. Home inspections are usually conducted by a **home inspector** who has the training and certifications to perform such inspections. The inspector prepares and delivers to the client a written report of findings. In general, home inspectors recommend that potential purchasers join them during their onsite visits to provide context for the comments in their written reports. The client then uses the knowledge gained to make informed decisions about their pending real estate purchase. The home inspector describes the condition of the home at the time of inspection but does not guarantee future condition, efficiency, or life expectancy of systems or components.

Sometimes confused with a real estate appraiser, a home inspector determines the condition of a structure, whereas an appraiser determines the value of a property. In the United States,

although not all states or municipalities regulate home inspectors, there are various professional associations for home inspectors that provide education, training, and networking opportunities. A professional home inspection is an examination of the current condition of a house. It is not an inspection to verify compliance with appropriate codes; building inspection is a term often used for building code compliance inspections in the United States. A similar but more complicated inspection of commercial buildings is a property condition assessment. Home inspections identify problems but building diagnostics identifies solutions to the found problems and their predicted outcomes. A property inspection is a detailed visual documentation of a property's structures, design, and fixtures. Property Inspection provides a buyer, renter, or other information consumer with valuable insight into the property's conditions prior to purchase. House-hunting can be a difficult task especially when you can't seem to find one that you like. The best way to get things done is to ensure that there is a property inspection before buying a property.

North America

[edit]

In Canada and the United States, a contract to purchase a house may include a contingency that the contract is not valid until the buyer, through a home inspector or other agents, has had an opportunity to verify the condition of the property. In many states and provinces, home inspectors are required to be licensed, but in some states, the profession is not regulated. Typical requirements for obtaining a license are the completion of an approved training course and/or a successful examination by the state's licensing board. Several states and provinces also require inspectors to periodically obtain continuing education credits in order to renew their licenses.^[citation needed] Unless specifically advertised as part of the home inspection, items often needed to satisfy mortgage or tile requirements such as termite ("pest") inspections must be obtained separately from licensed and regulated companies.

In May 2001, Massachusetts became the first state to recognize the potential conflict of interest when real estate agents selling a home also refer or recommend the home inspector to the potential buyer.^[citation needed] As a result, the real estate licensing law in Massachusetts was amended^[1]^[non-primary source needed] to prohibit listing real estate agents from directly referring home inspectors. The law also prohibits listing agents from giving out a "short" name list of inspectors. The only list that can be given out is the complete list of all licensed home inspectors in the state.

In September 2018, the California state legislature passed Senate Bill 721 (SB 721),^[2] which requires buildings with specific conditions, such as having exterior elevated structures, to undergo inspections by licensed professionals. These inspections must be conducted by qualified individuals, such as structural engineering firms,^[3] and a detailed report must be issued. Failure to comply with these requirements can result in penalties for property owners.

Ancillary services such as inspections for wood destroying insects, radon testing, septic tank inspections, water quality, mold, (or excessive moisture which may lead to mold), and private well inspections are sometimes part of home inspector's services if duly qualified.

In many provinces and states, home inspection standards are developed and enforced by professional associations, such as, worldwide, the International Association of Certified Home Inspectors (InterNACHI); in the United States, the American Society of Home Inspectors (ASHI), and the National Association of Home Inspectors (NAHI)(No Longer active 10/2017); and, in Canada, the Canadian Association of Home and Property Inspectors (CAHPI), the Professional Home & Property Inspectors of Canada (PHPIC) and the National Home Inspector Certification Council (NHICC).

Currently, more than thirty U.S. states regulate the home inspection industry in some form.

Canada saw a deviation from this model when in 2016 an association-independent home inspection standard was completed. This was developed in partnership with industry professionals, consumer advocates, and technical experts, by the Canadian Standards Association. The CAN/CSA A770-16 Home Inspection Standard was funded by three provincial governments with the intent to be the unifying standard for home inspections carried out within Canada. It is the only home inspection standard that has been endorsed by the Standards Council of Canada.

In Canada, there are provincial associations which focus on provincial differences that affect their members and consumers. Ontario has the largest population of home inspectors which was estimated in 2013 as part of a government survey at being around 1500.^[4]

To date, Ontario Association of Certified Home Inspectors is the only association which has mandated that its members migrate to the CAN/CSA A770-16 Home Inspection Standard, with a date of migration set as February 28, 2020. Other national and provincial associations have set it as an option to be added to other supported standards.

In Canada, only Alberta and British Columbia have implemented government regulation for the home inspection profession. The province of Ontario has proceeded through the process, with the passage of regulatory procedure culminating in the Home Inspection Act, 2017 to license Home Inspectors in that province. It has received royal assent but is still awaiting the development of regulations and proclamation to become law.

In Ontario, there are two provincial Associations, OAHI (the Ontario Association of Home Inspectors) and OntarioACHI (the Ontario Association of Certified Home Inspectors). Both claim to be the largest association in the province. OAHI, formed by a private member's Bill in the Provincial Assembly, has the right in law to award the R.H.I. (Registered Home Inspector) designation to anyone on its membership register. The R.H.I. designation, however, is a reserved designation, overseen by OAHI under the Ontario Association of Home Inspectors Act, 1994. This Act allows OAHI to award members who have passed and maintained strict criteria set out in their membership bylaws and who operate within Ontario. Similarly,

OntarioACHI requires equally high standards for the award of their certification, the Canadian-Certified Home Inspector (CCHI) designation. To confuse things, Canadian Association of Home and Property Inspectors (CAHPI) own the copyright to the terms Registered Home Inspector and RHI. Outside of Ontario, OAHI Members cannot use the terms without being qualified by CAHPI.

The proclamation of the Home Inspection Act, 2017, requires the dissolution of the Ontario Association of Home Inspectors Act, 1994, which will remove the right to title in Ontario of the RHI at the same time removing consumer confusion about the criteria for its award across Canada.

United Kingdom

[\[edit\]](#)

A home inspector in the United Kingdom (or more precisely in England and Wales), was an inspector certified to carry out the Home Condition Reports that it was originally anticipated would be included in the Home Information Pack.

Home inspectors were required to complete the ABBE Diploma in Home Inspection to show they met the standards set out for NVQ/VRQ competency-based assessment (Level 4). The government had suggested that between 7,500 and 8,000 qualified and licensed home inspectors would be needed to meet the annual demand of nearly 2,000,000 Home Information Packs. In the event, many more than this entered training, resulting in a massive oversupply of potential inspectors.

With the cancellation of Home Information Packs by the coalition Government in 2010, the role of the home inspector in the United Kingdom became permanently redundant.

Inspections of the home, as part of a real estate transaction, are still generally carried out in the UK in the same manner as they had been for years before the Home Condition Report process. Home Inspections are more detailed than those currently offered in North America. They are generally performed by a chartered member of the Royal Institution of Chartered Surveyors.

India

[\[edit\]](#)

The concept of home inspection in India is in its infancy. There has been a proliferation of companies that have started offering the service, predominantly in Tier-1 cities such as Bangalore, Chennai, Kolkata, Pune, Mumbai, etc. To help bring about a broader understanding among the general public and market the concept, a few home inspection companies have come together and formed the Home Inspection Association of India.^[5]

After RERA came into effect, the efficacy and potency of home inspection companies has increased tremendously. The majority of homeowners and potential home buyers do not know what home inspection is or that such a service exists.

The way that home inspection is different in India^[6] than in North America or United Kingdom is the lack of a government authorised licensing authority. Apart from the fact that houses in India are predominantly built with kiln baked bricks, concrete blocks or even just concrete walls (predominantly in high rise apartments) this means the tests conducted are vastly different. Most home inspection companies conduct non-destructive testing of the property, in some cases based on customer requirement, tests that require core-cutting are also performed.

The majority of homeowners are not aware of the concept of home inspection in India. The other issue is that the balance of power is highly tilted toward the builder; this means the home buyers are stepping on their proverbial toes, because in most cases, the home is the single most expensive purchase in their lifetime, and the homeowners do not want to come across as antagonising the builders.

Home inspection standards and exclusions

[\[edit\]](#)

Some home inspectors and home inspection regulatory bodies maintain various standards related to the trade. Some inspection companies offer 90-day limited warranties to protect clients from unexpected mechanical and structural failures; otherwise, inspectors are not responsible for future failures.^[a] A general inspection standard for buildings other than residential homes can be found at the National Academy of Building Inspection Engineers.

Many inspectors may also offer ancillary services such as inspecting pools, sprinkler systems, checking radon levels, and inspecting for wood-destroying organisms. The CAN/CSA-A770-16 standard allows this (in-fact it demands swimming pool safety inspections as a requirement) and also mandates that the inspector be properly qualified to offer these. Other standards are silent on this.

Types of inspections

[\[edit\]](#)

Home buyers and home sellers inspections

[\[edit\]](#)

Home inspections are often used by prospective purchasers of the house in question, in order to evaluate the condition of the house prior to the purchase. Similarly, a home seller can elect to have an inspection on their property and report the results of that inspection to the

prospective buyer.

Foreclosure inspection

[\[edit\]](#)

Recently foreclosed properties may require home inspections.

Four point inspection

[\[edit\]](#)

An inspection of the house's roof, HVAC, and electrical and plumbing systems is often known as a "four-point inspection", which insurance companies may require as a condition for homeowner's insurance.

Disaster inspection

[\[edit\]](#)

Home inspections may occur after a disaster has struck the house. A disaster examination, unlike a standard house inspection, concentrates on damage rather than the quality of everything visible and accessible from the roof to the basement.

Inspectors go to people's homes or work places who have asked for FEMA disaster aid.

Section 8 inspection

[\[edit\]](#)

In the United States, the federal and state governments provide housing subsidies to low-income people through the Section 8 program. The government expects that the housing will be "fit for habitation" so a Section 8 inspection identifies compliance with HUD's Housing Quality Standards (HQS).

Pre-delivery inspection

[\[edit\]](#)

See also: Pre-delivery inspection

An inspection may occur in a purchased house prior to the deal's closure, in what is known as a "pre-delivery" inspection.

Structural inspection

[edit]

The house's structure may also be inspected. When performing a structural inspection, the inspector will look for a variety of distress indications that may result in repair or further evaluation recommendations.

In the state of New York, only a licensed professional engineer or a registered architect can render professional opinions as to the sufficiency structural elements of a home or building.^[11] Municipal building officials can also make this determination, but they are not performing home inspections at the time they are rendering this opinion. Municipal officials are also not required to look out for the best interest of the buyer. Some other states may have similar provisions in their licensing laws. Someone who is not a licensed professional engineer or a registered architect can describe the condition of structural elements (cracked framing, sagged beams/roof, severe rot or insect damage, etc.), but are not permitted to render a professional opinion as to how the condition has affected the structural soundness of the building.

Various systems of the house, including plumbing and HVAC, may also be inspected.^[12]

Thermal imaging Inspection

[edit]

A thermal imaging inspection using an infrared camera can provide inspectors with information on home energy loss, heat gain/loss through the exterior walls and roof, moisture leaks, and improper electrical system conditions that are typically not visible to the naked eye. Thermal imaging is not considered part of a General Home Inspection because it exceeds the scope of inspection Standards of Practice.

Pool and spa inspection

[edit]

Inspection of swimming pools and spas is not considered part of a General Home Inspection because their inspection exceeds the scope of inspection Standards of Practice. However, some home inspectors are also certified to inspect pools and spas and offer this as an ancillary service.^[13]

Tree health inspection

[edit]

Inspection of trees on the property is not considered part of a General Home Inspection because their inspection exceeds the scope of inspection Standards of Practice. This type of inspection is typically performed by a Certified Arborist and assesses the safety and condition of the trees on a property before the sales agreement is executed.^[14]

Property inspection report for immigration

[edit]

The UKVI (United Kingdom Visa and Immigration) issued guidance on the necessity of ensuring that properties must meet guidelines so that visa applicants can be housed in properties which meet environmental and health standards. Part X of the Housing Act 1985 provides the legislative grounding for the reports - primarily to ensure that a property is not currently overcrowded, that the inclusion of further individuals as a result of successful visa applications - whether spouse visa, dependent visa, indefinite leave to remain or visitor visa, can house the applicants without the property becoming overcrowded. Reports are typically prepared by environmental assessors or qualified solicitors in accordance with HHSRS (Housing Health and Safety Rating Scheme). Property inspection reports are typically standard and breakdown the legal requirements.

Pre-Listing Home Inspection

[edit]

A pre-listing inspection focuses on all major systems and components of the house including HVAC, electrical, plumbing, siding, doors, windows, roof and structure. It's a full home inspection for the seller to better understand the condition of their home prior to the buyer's own inspection.

See also

[edit]

- List of real estate topics
- Real estate appraisal

Notes

[edit]

1. ^ A general list of exclusions include but are not limited to: code or zoning violations, permit research, property measurements or surveys, boundaries, easements or right of way, conditions of title, proximity to environmental hazards, noise interference, soil or

geological conditions, well water systems or water quality, underground sewer lines, waste disposal systems, buried piping, cisterns, underground water tanks and sprinkler systems. A complete list of standards and procedures for home inspections can be found at NAHI,[7] ASHI,[8] InterNACHI,[9] or IHINA[10] websites.

References

[edit]

1. ^ "General Laws: CHAPTER 112, Section 87YY1/2". [Malegislation.gov](http://malegislation.gov). Archived from the original on 2012-04-27. Retrieved 2012-05-29.
2. ^ "SB 721- CHAPTERED". leginfo.legislature.ca.gov. Retrieved 2025-02-13.
3. ^ "SB721 Inspection California | DRBalcony". 2024-09-12. Retrieved 2025-02-13.
4. ^ <http://www.ontariocanada.com/registry/showAttachment.do?postingId=14645&attachmentId=22> Archived 2017-06-27 at the Wayback Machine [bare URL PDF]
5. ^ "Home Inspection Association of India". Archived from the original on 2019-09-07. Retrieved 2019-08-30.
6. ^ "End-to-End Expert Property Inspection Services". Archived from the original on 2022-08-26. Retrieved 2022-08-26.
7. ^ "NAHI". Archived from the original on 1998-01-29. Retrieved 2011-02-05.
8. ^ "ASHI". Archived from the original on 2008-05-09. Retrieved 2009-12-11.
9. ^ "InterNACHI". Archived from the original on 2010-08-30. Retrieved 2010-08-27.
10. ^ "IHINA". Archived from the original on 2012-01-07. Retrieved 2012-02-09.
11. ^ "NYS Professional Engineering & Land Surveying:Laws, Rules & Regulations:Article 145". www.op.nysesd.gov. Archived from the original on 2018-02-27. Retrieved 2018-04-04.
12. ^ "Material Defects & Useful Remaining Life of Home Systems". Archived from the original on 2019-02-02. Retrieved 2019-02-01.
13. ^ "InterNACHI's Standards of Practice for Inspecting Pools & Spas - InterNACHI". www.nachi.org. Archived from the original on 2019-03-21. Retrieved 2019-04-09.
14. ^ "Property Inspection Report | From £80". [Property Inspection Report - Immigration & Visa](http://www.property-inspection-report.com). Archived from the original on 2022-05-19. Retrieved 2022-05-12.

About Cook County

Photo

Image not found or type unknown

Photo

Image not found or type unknown

Photo

Image not found or type unknown

Photo

Image not found or type unknown

Things To Do in Cook County

Photo

Image not found or type unknown

Sand Ridge Nature Center

4.8 (96)

Photo

Image not found or type unknown

River Trail Nature Center

4.6 (235)

Photo

Palmisano (Henry) Park

4.7 (1262)

Driving Directions in Cook County

Driving Directions From Palmisano (Henry) Park to

Driving Directions From Lake Katherine Nature Center and Botanic Gardens to

Driving Directions From Navy Pier to

<https://www.google.com/maps/dir/Navy+Pier/United+Structural+Systems+of+Illinois%2C 87.6050944,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.6050944!2d41.8918633!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e0>

<https://www.google.com/maps/dir/Lake+Katherine+Nature+Center+and+Botanic+Gardens 87.8010774,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.8010774!2d41.6776048!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e2>

<https://www.google.com/maps/dir/Palmisano+%28Henry%29+Park/United+Structural+Systems+of+Illinois%2C 87.6490151,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.6490151!2d41.8429903!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e1>

Reviews for



Image not found or type unknown

Jeffery James

(5)

Very happy with my experience. They were prompt and followed through, and very helpful in fixing the crack in my foundation.

Image not found or type unknown

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.

Image not found or type unknown

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!

Image not found or type unknown

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

Image not found or type unknown



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.

Identifying Areas Vulnerable to Soil Erosion [View GBP](#)

United Structural Systems of Illinois, Inc

Phone : +18473822882

City : Hoffman Estates

State : IL

Zip : 60169

Address : 2124 Stonington Ave

Google Business Profile

Company Website : <https://www.unitedstructuralsystems.com/>

USEFUL LINKS

Residential Foundation Repair Services

home foundation repair service

Foundation Repair Service

Sitemap

Privacy Policy

About Us

