



- **Implementing Carbon Fiber Strips for Added Support**
Implementing Carbon Fiber Strips for Added Support Exploring the Function of Steel I Beams in Reinforcement Evaluating Helical Pier Installations for Stability Understanding the Role of Push Piers in Foundation Repair Assessing Poly Foam Injection as a Repair Option Addressing Wall Bowing with Specialized Bracing Systems Incorporating Reinforced Footings in Existing Structures Using Fiber Reinforced Polymers for Structural Upgrades Recognizing Different Methods for Load Bearing Enhancement Integrating Modern Engineering Software for Precise Calculations Exploring Innovative Jacking Mechanisms for Floor Leveling Seeking Guidance from Structural Engineers for Advanced Repairs
- **Obtaining Local Building Permits for Foundation Work**
Obtaining Local Building Permits for Foundation Work Meeting OSHA Regulations During Excavation Projects Understanding City Ordinances That Affect Repair Plans Coordinating Structural Engineer Reviews for Compliance Navigating Inspections from Municipal Authorities Adhering to Safety Protocols on Residential Job Sites Prioritizing Protective Equipment for Repair Crews Managing Noise and Debris Regulations in Urban Areas Recognizing Liability Concerns in Construction Zones Complying with Floodplain Requirements in Vulnerable Regions Satisfying Documentation Requirements for Property Records Maintaining Ethical Practices in Foundation Repair Services
- **About Us**



Plans

* Choosing the Right Contractor for Carbon Fiber Foundation Repair

* **Permitting requirements for foundation repair projects.**

Okay, so you're staring at a crack in your foundation, and suddenly visions of a massive, costly repair dance in your head. Moisture detection tools help prevent further foundation damage in homes [foundation wall repair service](#) concrete slab. But before you even think about jackhammers and contractors, there's something decidedly less exciting but critically important to consider: permits. Yes, **permitting requirements for foundation repair projects**. Sounds thrilling, right?

Honestly, it's probably the least glamorous part of fixing your home, but ignoring it can be a recipe for disaster. Think about it: cities have ordinances for a reason. They want to ensure your repairs are done safely, up to code, and don't inadvertently mess up the neighboring property or the utility lines snaking beneath the ground.

The thing is, the specific permits you need will vary wildly depending on where you live. What might be a simple fix requiring no permit in one town could trigger a full-blown inspection and paperwork frenzy in another. Size matters, too. A hairline crack might be ignored, but if you're talking about significant structural damage requiring underpinning or major excavation, you can bet the city wants a piece of the action.

So, where do you even start? Well, your local building department is your new best friend (or at least, a necessary acquaintance). They'll have the lowdown on exactly what's required for foundation work in your area. Don't be afraid to ask questions! They're usually much happier to help you navigate the process upfront than to deal with unpermitted work later down the line.

And here's a pro tip: a reputable foundation repair contractor should **already** be familiar with the local permitting process. In fact, many will handle the permit application on your behalf. This is a huge weight off your shoulders and a good sign they know what they're doing.

Ultimately, understanding the permitting landscape isn't just about avoiding fines or angry letters from the city. It's about ensuring your foundation repair is done correctly, safely, and in a way that protects your investment and your community. A little upfront research can save you a whole lot of headaches (and money) in the long run. So, breathe deep, make a call to the building department, and get ready to tackle those permits. You got this!

*** Zoning regulations affecting the scope and type of allowed repairs.**

Okay, so you're getting ready to fix up your place, maybe a new roof, a bigger deck, or even just patching up some cracks in the foundation. Hold on a sec! Before you start swinging that hammer, you absolutely **have** to check your city's zoning regulations. Seriously, ignoring these rules can turn your dream renovation into a legal nightmare.

Zoning, at its core, dictates what you can and can't do on your property. It's not just about building new structures; it heavily influences the scope and **type** of repairs you're allowed to make. Think of it this way: your property is in a specific zone – maybe residential, commercial, or mixed-use. Each zone comes with its own set of rules about what's permissible.

For example, let's say you want to replace your old wooden fence with a taller, more secure one. The zoning ordinance might specify maximum fence heights depending on where your property line is. You might be totally cool building a six-foot fence in the backyard, but only allowed a four-foot one in the front. Or, maybe you want to replace some windows, but your house is in a historic district. The zoning regulations could demand that you use historically accurate materials and designs, even if they're more expensive than modern alternatives.

These rules aren't just arbitrary; they're designed to maintain the character of the neighborhood, ensure safety, and prevent conflicts between different land uses. But that doesn't make them any less of a headache if you don't know they exist.

The takeaway? Do your homework! Visit your city's website or the planning department and dig into the zoning regulations that apply to your property. A little research upfront can save you a lot of time, money, and frustration down the road. Ignoring these rules can lead to stop-work orders, fines, or even having to undo all your hard work. Trust me, you don't want that.

*** Building codes related to structural integrity and safety during repair.**

Okay, so you're knee-deep in planning a home repair, maybe patching up some storm damage or finally tackling that leaning fence. But before you even think about picking up a hammer, there's something lurking in the shadows that can completely derail your project: building codes. Specifically, the ones related to structural integrity and safety during repair.

Think of it this way: your city isn't just trying to be a pain. Those codes are there to make sure your repair doesn't accidentally turn your house into a deathtrap. They're the rules designed to keep you, your family, and even future owners safe from things like collapsing roofs, faulty wiring that could lead to fires, or walls that can't withstand a strong gust of wind.

These codes often dictate things like the types of materials you can use. You can't just slap

any old plywood over a hole in your roof. They might specify the grade of lumber, the type of fasteners, or even the way you need to reinforce existing structures. They also cover safety protocols. Are you working on an elevated surface? Expect rules about scaffolding and fall protection. Dealing with electrical wiring? There will be very precise instructions on how to disconnect power and ensure everything is properly grounded.

Ignoring these codes isn't just about risking a fine (though that's definitely a possibility). It's about potentially creating a dangerous situation. Imagine cutting corners on a load-bearing wall repair. You might save a few bucks upfront, but you could be setting yourself up for a structural failure down the line.

So, how do you navigate this maze of regulations? The best approach is to be proactive. Before you even start drawing up your plans, contact your local building department. They can explain the specific codes that apply to your project and even offer guidance on how to comply. Don't be afraid to ask questions! It's much better to be informed from the start than to face costly rework and potential safety hazards later on. Think of them as a resource, not an obstacle. Understanding these building codes is an essential part of responsible homeownership and ensures that your repairs are not only effective but also safe and compliant. It's a little extra legwork that can save you a whole lot of heartache (and money) in the long run.

*** Inspection processes and compliance procedures.**

Understanding City Ordinances That Affect Repair Plans: Inspection Processes and Compliance Procedures

Okay, so you've got a repair plan. Great! You're ready to fix that wonky fence, replace those leaky shingles, or maybe even add a whole new room. But hold on a second. Before you grab your hammer and nails, there's a crucial, often overlooked, step: understanding city ordinances. And a big part of that is navigating the inspection processes and compliance procedures. Think of it this way: ignoring these steps is like baking a cake without checking the oven temperature – you might still get something edible, but chances are it's going to be a bit of a disaster.

City ordinances are essentially the rules of the road when it comes to construction and repairs. They dictate everything from the permissible height of your new fence to the types of materials you can use. And to ensure everyone plays by the rules, cities have inspection processes and compliance procedures. These involve submitting plans, obtaining permits, and undergoing inspections at various stages of your project.

The inspection process is designed to verify that your repair work meets the city's standards for safety, structural integrity, and environmental impact. Think of the inspector as a neutral third party, there to protect everyone involved, including you, your neighbors, and future occupants of the property. They'll check things like proper wiring, adequate insulation, and

adherence to building codes. It might seem like a hassle to schedule and wait for these inspections, but they can actually save you money and headaches in the long run by catching potential problems early.

Compliance procedures, on the other hand, are the steps you need to take to ensure your repair work is legal and up to code. This often involves applying for permits before you even start the work. Permits might seem like just another piece of bureaucratic red tape, but they serve a vital purpose. They ensure that your project is reviewed by the city's planning department, who can identify potential conflicts with zoning regulations or other ordinances. Ignoring the permit process can result in hefty fines, stop-work orders, and even the forced removal of non-compliant structures.

So, before you dive headfirst into that repair project, take the time to familiarize yourself with the relevant city ordinances and understand the inspection and compliance procedures. It might seem daunting at first, but most cities have resources available to help you navigate the process. Check their website, call the planning department, or even consider hiring a contractor who is well-versed in local regulations. Trust me, a little bit of planning and adherence to the rules will save you a whole lot of trouble down the road, and ensure your repair project is a success, not a source of stress.

*** Potential penalties for non-compliance with ordinances.**

Okay, so you're diving into city ordinances to figure out how they'll impact your repair plans. Smart move! But let's talk about the not-so-fun part: what happens if you don't follow the rules. Think of it as a little reality check. Cities aren't just making these ordinances for kicks; they're there to ensure safety, maintain property values, and keep things running smoothly.

Ignoring them can lead to a whole heap of trouble, and that trouble usually comes with a price tag attached. We're talking potential penalties for non-compliance. These can range from a stern warning, which might feel like a slap on the wrist, to much more serious consequences. Fines are common, and they can escalate pretty quickly depending on the severity and frequency of the infraction. Think of it like a parking ticket multiplying exponentially if you keep ignoring it.

But it doesn't stop there. Some violations can lead to legal action, and in extreme cases, even stop-work orders. Imagine getting halfway through a major repair only to have the city shut you down because you didn't pull the right permits or meet a specific code requirement. Ouch. That's not just a financial hit; it's a major delay and a huge headache.

The best way to avoid these penalties is simple: do your homework. Read the ordinances carefully. Talk to city officials or inspectors if you have questions. Make sure your repair plans are fully compliant before you even pick up a hammer. A little bit of upfront effort can save you a ton of grief (and money) down the road. It's all about knowing the rules of the game before you start playing.

*** How to navigate city ordinances for successful repair plans.**

Okay, so you've got a leaky roof, a wonky fence, or maybe you're finally tackling that kitchen remodel you've been dreaming of. Fantastic! But before you swing that hammer or call in the contractors, pause. Take a deep breath. Because lurking behind the drywall and beneath the floorboards are... city ordinances.

Think of them as the uninvited, sometimes grumpy, guests at your home improvement party. Ignoring them can lead to fines, delays, and a whole lot of frustration. Navigating them isn't exactly fun, but it's absolutely crucial for a smooth and successful repair plan.

First, figure out which ordinances even apply. This usually means a trip to your city's website – prepare for some clicking and scrolling. Look for sections on building codes, zoning regulations, permits, and even noise ordinances. Yeah, even how loud you can be hammering at 7 AM might be regulated.

Zoning is a big one. It dictates what you can **do** with your property. Want to add a second story? Build a deck that extends beyond a certain point? Zoning will tell you if it's allowed, and what kind of hoops you need to jump through to make it happen.

Then there's the permit process. Think of a permit as permission from the city to do the work. They want to make sure your project is safe and up to code. Applying usually involves submitting detailed plans, paying a fee, and waiting for approval. It can be a pain, but it's way less painful than getting caught without one mid-construction.

Don't be afraid to call your city's building department. Seriously. They might seem intimidating, but their job is to help you understand the rules. Ask questions, clarify any confusing jargon, and get their advice. A little proactive communication can save you a lot of headaches down the road.

Finally, remember that ignorance is no excuse. Saying "I didn't know" won't get you out of a fine if you violate an ordinance. So, do your research, ask for help when you need it, and treat those city ordinances with the respect they deserve. Your repair plan will thank you for it. And your wallet will too.

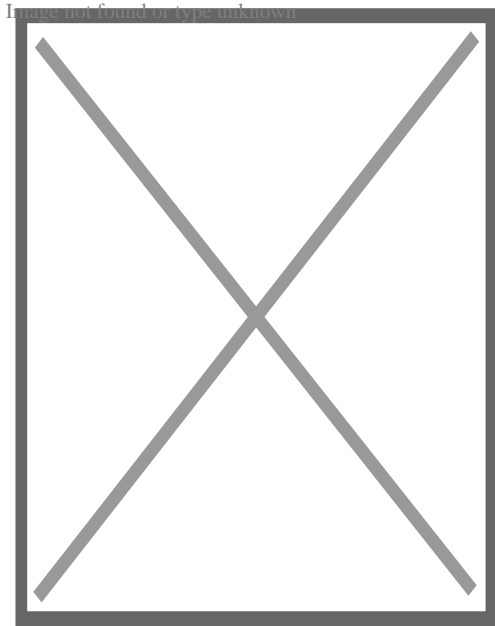
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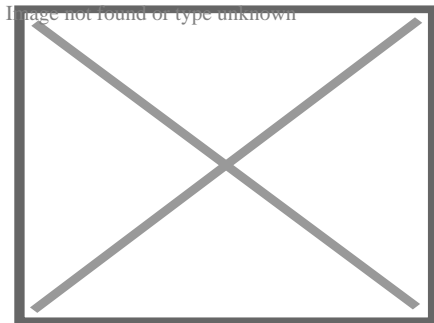
Strong Foundations, Strong Homes



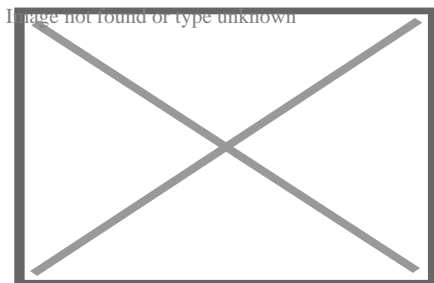
About geotechnical engineering



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



Precast concrete retaining wall



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, $\displaystyle \tau_c$, and the product of the normal stress on the slip plane and $\displaystyle \tan(\phi)$, where ϕ is the angle of internal friction, $\displaystyle \tau = \tau_c + \sigma \tan(\phi)$. 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 $\displaystyle \tau_c$ 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 *Erdbaumechnik* 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

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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

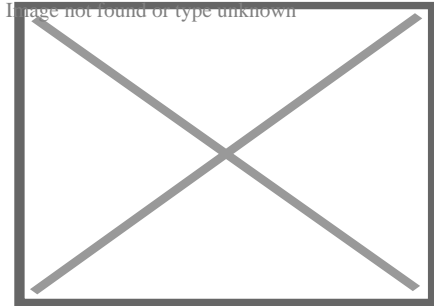
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Main article: Foundation (engineering)

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.

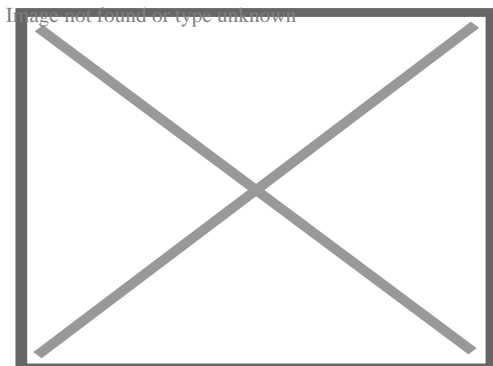
Ground improvement

[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.

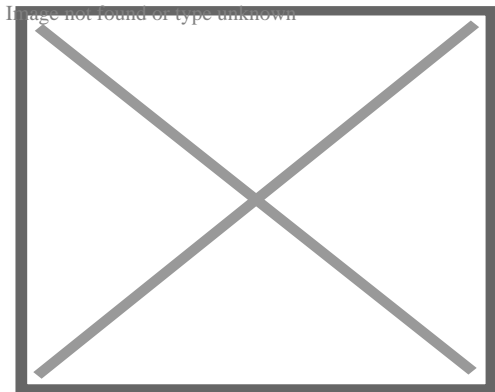
Sub-disciplines

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Geosynthetics

[edit]

Main article: Geosynthetics



A collage of geosynthetic products.

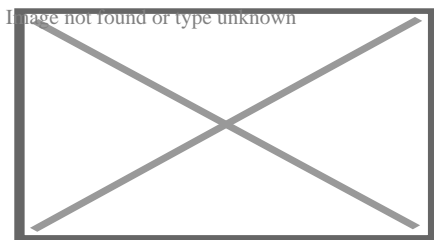
Geosynthetics are a type of plastic polymer products used in geotechnical engineering that improve engineering performance while reducing costs. This includes geotextiles, geogrids, geomembranes, geocells, and geocomposites. The synthetic nature of the products make them suitable for use in the ground 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]

 [Engineering portal](#)

- Civil engineering
- Deep Foundations Institute
- Earthquake engineering

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

Notes

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External links

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Engineering

- History
- Outline
- List of engineering branches

Civil

- Architectural
- Coastal
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- Earthquake
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- Geotechnical
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Mechanical

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- Biomechanical
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- Manufacturing
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Electrical

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- Control
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- Telecommunications



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**Specialties
and
interdisciplinarity**

- Biochemical/bioprocess
- Biological

Engineering education

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

Related topics

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Glossaries

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

Other

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- Audio
- Automation
- Biomedical
 - Bioinformatics
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 - Health technology
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- Systems
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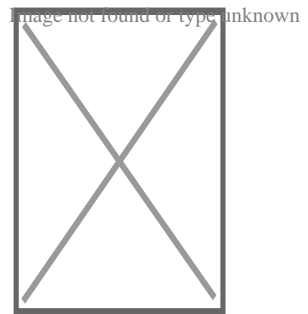
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Soil science

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Main fields

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



Soil topics

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 - Soil formation
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- Soil contamination
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- Soil compaction
 - Soil compaction (agriculture)
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- 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
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 - Soil respiration
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- Soil moisture
 - Soil water (retention)

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World Reference Base for Soil Resources (1998–)

- Acrisols
- Alisols
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- Anthrosols
- Arenosols
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- Cambisols
- Chernozem
- Cryosols
- Durisols
- Ferralsols
- Fluvisols
- Gleysols
- Gypsisols
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- Leptosols
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- Nitisols
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- Podzols
- Regosols
- Retisols
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- Solonetz
- Stagnosol
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- Umbrisols
- Vertisols

USDA soil taxonomy

- Alfisols
- Andisols
- Aridisols
- Entisols
- Gelisols
- Histosols
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- Mollisols
- Oxisols

Applications

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- Soil guideline value
- Soil survey
- Soil test
- 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

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Geotechnical engineering

Offshore geotechnical engineering

Investigation and instrumentation

Field (*in situ*)

-  Core drill
-  Cone penetration test
-  Geo-electrical sounding
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-  Load test
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-  Simple sounding
-  Standard penetration test
-  Total sounding
-  Trial pit
-  Visible bedrock
- Nuclear densometer test
- Exploration geophysics
- Crosshole sonic logging
- Pile integrity test

Soil

Types

- Clay
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Properties

- Hydraulic conductivity
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- Shear strength
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**Structures
(Interaction)**

Natural features

- Topography
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Earthworks

- Shoring structures
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 - Ground freezing
 - Mechanically stabilized earth
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- Causeway
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- Cut-and-cover
- Cut and fill
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- Track bed
- Erosion control
- Earth structure
- Expanded clay aggregate
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 - Cellular confinement
- Infiltration

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- Bearing capacity * Stress distribution in soil

Numerical analysis software

- SEEP2D
- STABL
- SVFlux
- SVSlope
- UTEXAS
- Plaxis

Related fields

- Geology
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- Earthquake engineering
- Geomorphology
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Types

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 - Tunnel construction

History

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- Water supply and sanitation

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- 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

Trades workers (List)

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

Organizations	<ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> ○ India ○ Iran ○ Japan ○ Romania ○ Turkey ○ United Kingdom ○ United States
Regulation	<ul style="list-style-type: none"> ○ Building code ○ Construction law ○ Site safety ○ Zoning

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- Environmental engineering
- Geotechnical engineering

Methods









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- Monocrete construction
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Other topics

  Outline  Category

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-   Israel

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About ceiling

For other uses, see Ceiling (disambiguation).

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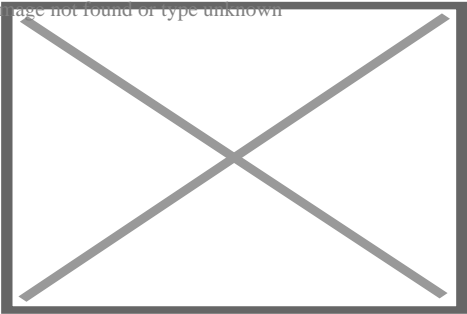


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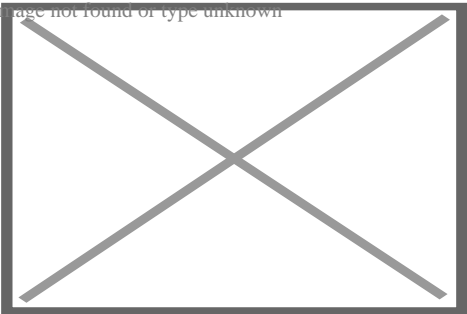


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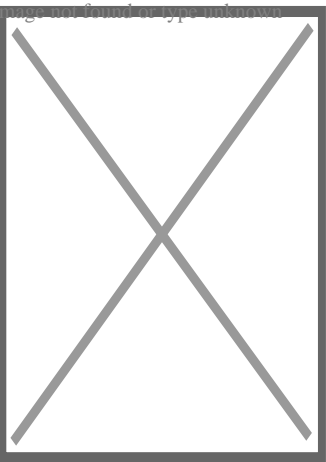
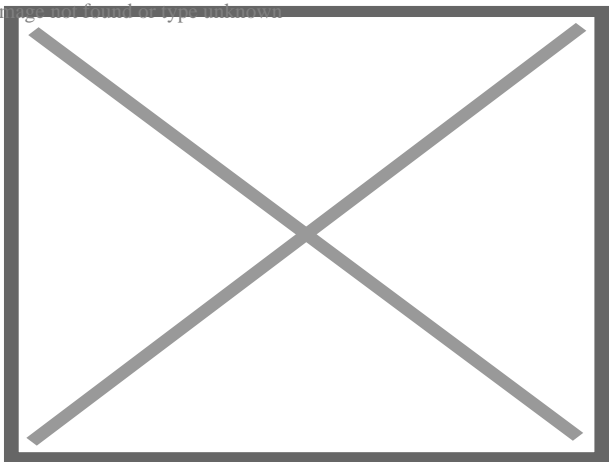
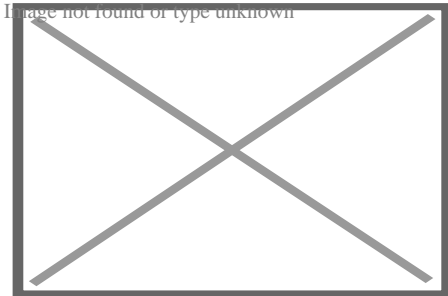
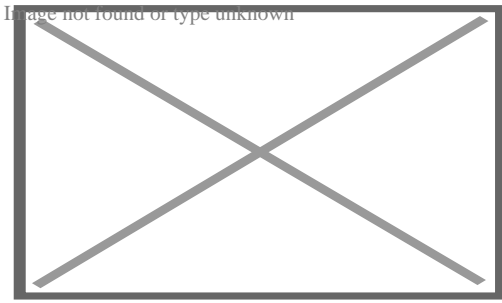


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Various examples of ornate ceilings

A **ceiling** /ˈɛːsiːɪˈɛɪˈɹoʊf/ is an overhead interior roof that covers the upper limits of a room. It is not generally considered a structural element, but a finished surface concealing the underside of the roof structure or the floor of a story above. Ceilings can be decorated to taste, and there are many examples of frescoes and artwork on ceilings, especially within religious buildings. A ceiling can also be the upper limit of a tunnel.

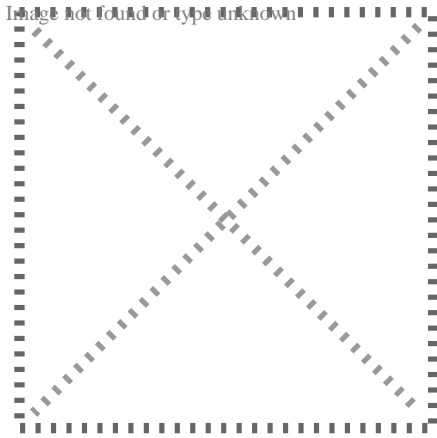
The most common type of ceiling is the dropped ceiling,^[*citation needed*] which is suspended from structural elements above. Panels of drywall are fastened either directly to the ceiling joists or to a few layers of moisture-proof plywood which are then attached to the joists. Pipework or ducts can be run in the gap above the ceiling, and insulation and fireproofing material can be placed here. Alternatively, ceilings may be spray painted instead, leaving the pipework and ducts exposed but painted, and using spray foam.

A subset of the dropped ceiling is the suspended ceiling, wherein a network of aluminum struts, as opposed to drywall, are attached to the joists, forming a series of rectangular spaces. Individual pieces of cardboard are then placed inside the bottom of those spaces so that the outer side of the cardboard, interspersed with aluminum rails, is seen as the ceiling from below. This makes it relatively easy to repair the pipes and insulation behind the ceiling, since all that is necessary is to lift off the cardboard, rather than digging through the drywall and then replacing it.

Other types of ceiling include the cathedral ceiling, the concave or barrel-shaped ceiling, the stretched ceiling and the coffered ceiling. Coving often links the ceiling to the surrounding walls. Ceilings can play a part in reducing fire hazard, and a system is available for rating the fire resistance of dropped ceilings.

Types

[edit]



California tract home with an open-beam ceiling, 1960

Ceilings are classified according to their appearance or construction. A cathedral ceiling is any tall ceiling area similar to those in a church. A dropped ceiling is one in which the finished surface is constructed anywhere from a few inches or centimeters to several feet or a few meters below the structure above it. This may be done for aesthetic purposes, such as achieving a desirable ceiling height; or practical purposes such as acoustic damping or providing a space for HVAC or piping. An inverse of this would be a raised floor. A concave or barrel-shaped ceiling is curved or rounded upward, usually for visual or acoustical value, while a coffered ceiling is divided into a grid of recessed square or octagonal panels, also called a "lacunar ceiling". A cove ceiling uses a curved plaster transition between wall and ceiling; it is named for cove molding, a molding with a concave curve.^[1] A stretched ceiling (or stretch ceiling) uses a number of individual panels using material such as PVC fixed to a perimeter rail.^[2]

Elements

[edit]

Ceilings have frequently been decorated with fresco painting, mosaic tiles and other surface treatments. While hard to execute (at least in place) a decorated ceiling has the advantage that it is largely protected from damage by fingers and dust. In the past, however, this was more than compensated for by the damage from smoke from candles or a fireplace. Many historic buildings have celebrated ceilings. Perhaps the most famous is the Sistine Chapel ceiling by Michelangelo.

Ceiling height, particularly in the case of low ceilings, may have psychological impacts.^[3]

Fire-resistance rated ceilings

[edit]

The most common ceiling that contributes to fire-resistance ratings in commercial and residential construction is the dropped ceiling. In the case of a dropped ceiling, the rating is achieved by the entire system, which is both the structure above, from which the ceiling is suspended, which could be a concrete floor or a timber floor, as well as the suspension mechanism and, finally the lowest membrane or dropped ceiling. Between the structure that the dropped ceiling is suspended

from and the dropped membrane, such as a T-bar ceiling or a layer of drywall, there is often some room for mechanical and electrical piping, wiring and ducting to run.

An independent ceiling, however, can be constructed such that it has a stand-alone fire-resistance rating. Such systems must be tested without the benefit of being suspended from a slab above in order to prove that the resulting system is capable of holding itself up. This type of ceiling would be installed to protect items above from fire.

An unrestrained non-loadbearing ceiling undergoing a 4-hour fire test. Deflection is measured off the

○

Image not found or type unknown

An unrestrained non-loadbearing ceiling undergoing a 4-hour fire test. Deflection is measured off the I-beam.

- Durasteel ceiling after successful fire test, being raised from the furnace and readied for an optional

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Durasteel ceiling after successful fire test, being raised from the furnace and readied for an optional 45PSI (3.1 bar) hose-stream test.

Gallery

[edit]

- Gothic ceiling in the Sainte-Chapelle, Paris, 1243-1248, by Pierre de Montreuil[4]

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Gothic ceiling in the Sainte-Chapelle,
Paris, 1243-1248, by Pierre de Montreuil[4]

Renaissance ceiling of the Henry II staircase in the Louvre Palace, Paris, by Étienne Carmoy, Raymond

○

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Renaissance
ceiling of the
Henry II
staircase in the
Louvre Palace,
Paris, by Étienne
Carmoy,
Raymond
Bidollet, Jean
Chrestien and
François
Lheureux, 1553[5]

Renaissance ceiling of the king's bedroom in the Louvre Palace, by Francisque Scibecq de Carpi, 1

○

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Renaissance ceiling
of the king's
bedroom in the
Louvre Palace, by
Francisque Scibecq
de Carpi, 1556^[6]

- Baroque ceiling of the Salle des Saisons in the Louvre Palace, by Giovanni Francesco Romanelli, M

Image not found or type unknown

Baroque ceiling
of the Salle des
Saisons in the
Louvre Palace,
by Giovanni
Francesco
Romanelli,
Michel Anguier
and Pietro
Sasso, mid
17th century^[7]

- Neoclassical ceiling of the Salle Duch  tel in the Louvre Palace, with The Triumph of French Painti

Image not found or type unknown

Neoclassical
ceiling of the Salle
Duch  tel in the
Louvre Palace,
with The Triumph
of French
Painting.
Apotheosis of
Poussin, Le

Sueur and Le
Brun in the
centre, by Charles
Meynier, 1822,
and ceilings
panels with
medallion
portraits of French
painters, 1828-
1833^[8]

- Neoclassical ceiling of the Mollien staircase in the Louvre Palace, designed by Hector Lefuel in 1857 and painted by Charles Louis Müller in 1868-1870^[9]

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Neoclassical ceiling of the Mollien
staircase in the Louvre Palace, designed
by Hector Lefuel in 1857 and painted by
Charles Louis Müller in 1868-1870^[9]

Moorish Revival ceiling in the Nicolae T. Filitti/Nae Filitis House (Calea Dorobanților no. 18), Bucharest, Romania, de Ernest Doneaud, c.1910^[10]

○

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Moorish Revival ceiling in the
Nicolae T. Filitti/Nae Filitis House
(Calea Dorobanților no. 18),
Bucharest, Romania, de Ernest
Doneaud, c.1910^[10]

Demonstrative reconstruction of a Roman suspended ceiling in an Imperial palace of circa AD 306 a

○

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Demonstrative
reconstruction of a
Roman suspended
ceiling in an Imperial
palace of circa AD
306 at Trier, Italy

○ Part of the ceiling of the Sistine Chapel in Vatican City in Rome, showing the ceiling in relation to the

Image not found or type unknown

Part of the ceiling of the Sistine
Chapel in Vatican City in Rome,
showing the ceiling in relation to the
other frescoes

Ceiling of the Villa Schutzenberger from Strasbourg, France, decorated with Art Nouveau ornament

○

Image not found or type unknown

Ceiling of the Villa Schutzenberger from
Strasbourg, France, decorated with Art
Nouveau ornaments

- Painted ceiling in Liège, Belgium

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Painted ceiling in Liège,
Belgium

- Traditional Chinese ceiling of Dayuan Renshou Temple at Taoyuan, Taiwan

Image not found or type unknown

Traditional Chinese ceiling of
Dayuan Renshou Temple at
Taoyuan, Taiwan

- Dropped ceiling

Image not found or type unknown

Dropped ceiling

- Wooden beam ceiling

Image not found or type unknown

See also

[edit]

- Beam ceiling
- Hammerbeam roof
- Hollow-core slab
- Moulding (decorative)
- Popcorn ceiling
- Scottish Renaissance painted ceilings
- Tin ceiling
- Passive fire protection
- Fire test
- Hy-Rib

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



- Media related to Ceilings at Wikimedia Commons
- "Ceiling". *Encyclopædia Britannica*. Vol. 5 (11th ed.). 1911.
- "Ceiling". *New International Encyclopedia*. 1904.
- Merriam-Webster ceiling definition

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Rooms and spaces of a house

- Bonus room
- Common room
- Den
- Dining room
- Family room
- Garret
- Great room
- Home cinema
- Kitchen
 - dirty kitchen
 - kitchenette
- Living room
- Gynaecium
 - harem
- Andron
 - man cave
- Recreation room
 - billiard room
- Shrine
- Study
- Sunroom

Shared rooms

Private rooms

- Bathroom
 - toilet
- Bedroom / Guest room
 - closet
- Bedsit / Miniflat
- Boudoir
- Cabinet
- Nursery

Spaces

- Atrium
- Balcony
- Breezeway
- Conversation pit
- Cubby-hole
- Deck
- Elevator
 - dumbwaiter
- Entryway/Genkan
- Fireplace
 - hearth
- Foyer
- Hall
- Hallway
- Inglenook
- Lanai
- Loft
- Loggia
- Overhang
- Patio
- Porch
 - screened
 - sleeping
- Ramp
- Secret passage
- Stairs/Staircase
- Terrace
- Veranda
- Vestibule

**Technical, utility
and storage**

- Attic
- Basement
- Carport
- Cloakroom
- Closet
- Crawl space
- Electrical room
- Equipment room
- Furnace room / Boiler room
- Garage
- Janitorial closet
- Larder
- Laundry room / Utility room / Storage room
- Mechanical room / floor
- Pantry
- Root cellar
- Semi-basement
- Storm cellar / Safe room
- Studio
- Wardrobe
- Wine cellar
- Wiring closet
- Workshop

Great house areas

- Antechamber
- Ballroom
- Kitchen-related
 - butler's pantry
 - buttery
 - saucery
 - scullery
 - spicery
 - still room
- Conservatory / Orangery
- Courtyard
- Drawing room
- Great chamber
- Great hall
- Library
- Long gallery
- Lumber room
- Parlour
- Sauna
- Servants' hall
- Servants' quarters
- Smoking room
- Solar
- State room
- Swimming pool
- Turret
- Undercroft

Other

- Furniture
- Hidden room
- House
 - house plan
 - styles
 - types
- Multi-family residential
- Secondary suite
- Duplex
- Terraced
- Detached
- Semi-detached
- Townhouse
- Studio apartment

**Architectural
elements**

- Arch
- Balconet
- Baluster
- Belt course
- Bressummer
- Ceiling
- Chimney
- Colonnade / Portico
- Column
- Cornice / Eaves
- Dome
- Door
- Ell
- Floor
- Foundation
- Gable
- Gate
 - Portal
- Lighting
- Ornament
- Plumbing
- Quoins
- Roof
 - shingles
- Roof lantern
- Sill plate
- Style
 - list
- Skylight
- Threshold
- Transom
- Vault
- Wall
- Window

- Backyard
- Driveway
- Front yard
- Garden
 - roof garden
- Home
- Home improvement
- Home repair
- Shed
- Tree house

Related

-  **Category: Rooms**

- Germany
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About Cook County

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Things To Do in Cook County

Photo

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Sand Ridge Nature Center

4.8 (96)

Photo

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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+Irving+Park/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/United+Structural+Systems+of+Illinois+Park/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+Park/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>

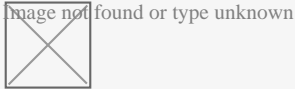
Reviews for



Jeffery James

(5)

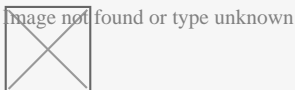
Very happy with my experience. They were prompt and followed through, and very helpful in fixing the crack in my foundation.



Sarah McNeily

(5)

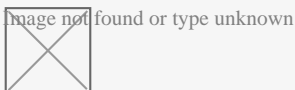
USS was excellent. They are honest, straightforward, trustworthy, and conscientious. They thoughtfully removed the flowers and flower bulbs to dig where they needed in the yard, replanted said flowers and spread the extra dirt to fill in an area of the yard. We've had other services from different companies 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.



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!



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



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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.

Understanding City Ordinances That Affect Repair Plans [View GBP](#)

Frequently Asked Questions

Do I need a permit for foundation repair work on my house?

Generally, yes. Most cities require permits for foundation repair work to ensure it meets safety and building codes. The specific types of repairs requiring a permit, and which do not, will vary from city to city.

What specific city codes or ordinances impact how my foundation can be repaired?

Commonly affected areas include: setback requirements (distance from property lines), drainage regulations (preventing water buildup), soil compaction standards, and requirements for engineered plans if the scope exceeds a certain threshold such as depth or size.

Are there restrictions on the type of materials or methods allowed for foundation repair in my area?

Potentially, yes. Some areas might restrict the use of certain materials due to environmental concerns (e.g., injection materials) or have preferred methods based on local soil conditions (e.g., pier types). Some historical districts may require the use of original materials.

How will these city ordinances affect the cost and timeline of my foundation repair project?

Permit fees will add to the cost. Additionally, complying with specific codes (e.g., special drainage systems, specific pier depth) can increase material and labor expenses. The permit process itself can also add time to the project.

Who is responsible for obtaining the necessary permits and ensuring the repair work complies with city ordinances – me or the foundation repair company?

While the homeowner ultimately bears responsibility for ensuring compliance, reputable foundation repair companies typically handle the permit application process and ensure their work meets all applicable codes. Verify this with the contractor beforehand.

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Company Website : [**https://www.unitedstructuralsystems.com/**](https://www.unitedstructuralsystems.com/)

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