- **Identifying Common Issues and Symptoms of residential foundations**
  Identifying Common Issues and Symptoms of residential foundations Spotting Early Warning Signs of Foundation Stress Recognizing Cracks and Shifts in Concrete Floors Understanding Sticky Doors and Window Alignment Pinpointing Sinking Spots around the Foundation Perimeter Tracking Water Intrusion as a Contributor to Structural Damage How Uneven Floors Reveal Deeper Foundation Concerns Identifying Subtle Changes in Exterior Walls When Hairline Drywall Cracks Indicate Movement Monitoring Seasonal Soil Movement for Foundation Clues Evaluating Soil Erosion and Its Impact on Stability Noting Shifting Porches and Deck Attachments Examining Sloping Floors for Underlying Settlement
- **Soil and Environmental Factors influencing home foundations**
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*** Understanding the impact of seasonal changes on coastal soils.**

Okay, so you're looking at coastal soils, right? Bowed basement walls can be stabilized with expert foundation wall repair service foundation crack repair service structural failure. And thinking about how they move around across the year. It's not like these soils just sit still. They're actually pretty dynamic, especially when you factor in the seasons. Think about it: summer's scorching sun bakes the soil, sucking out moisture and potentially causing it to crack and shrink. Then winter rolls in, bringing rain, maybe even freezing temperatures. That water seeps into the cracks, freezes, expands, and suddenly you've got even more movement.

Understanding this seasonal dance is crucial. It's not just some academic exercise. Imagine you're building a sea wall, or even just a house near the coast. If you don't know how the soil is going to shift and settle throughout the year, you're basically building on shaky ground. You could end up with cracks in your foundation, erosion undermining your structures, or even landslides if the soil becomes saturated and unstable.

Different types of coastal soils will react differently, too. Sandy soils drain quickly, so they might be less prone to waterlogging in the winter, but more susceptible to wind erosion in the dry summer months. Clay soils, on the other hand, hold onto water like crazy, making them more vulnerable to frost heave and expansion/contraction cycles.

So, when you're trying to identify seasonal soil movement, you're not just looking for a single snapshot. You need to consider the whole year, the typical weather patterns, the specific soil type, and how all those factors interact. It's a complex picture, but understanding it is essential for responsible coastal management and development. It's about respecting the natural rhythms of the earth, and building with them, not against them.

*** Recognizing common signs of soil movement affecting residential foundations.**

Okay, so you're living near the coast, right? Beautiful views, ocean breezes... but also, shifting soil. And that shifting soil can be a real pain for your home's foundation. We're talking about seasonal soil movement, and a big part of understanding that is recognizing the early warning signs that your foundation is feeling the pressure.

Think of it like this: your house is sitting on the ground, and that ground isn't always stable. Coastal areas often deal with things like high water tables, fluctuating rain patterns, and even the type of soil itself – maybe it's sandy, maybe it's clay-rich. All of these things can cause the soil to expand when it's wet and shrink when it dries out. That expansion and contraction puts stress on your foundation.

What are the clues that something's up? Start by looking closely at the outside of your house. Are there new cracks in the brickwork or siding? Maybe they're hairline cracks at first, but if you see them getting wider or longer, that's a red flag. Check around windows and doors. Are they sticking? Are there gaps forming around the frames? These can be subtle signs that the foundation is shifting and warping the structure.

Inside, keep an eye out for similar things. Cracks in drywall, especially around doorframes and windows, are common indicators. Uneven floors are another big one. If you feel like you're walking uphill in your living room, it's probably not your imagination. Doors that swing open or closed on their own can also point to foundation problems.

And don't forget the little things! Sometimes a small change, like a crack in the tile or a noticeable gap between the wall and the floorboards, can be an early indicator.

The key is to be observant and proactive. The sooner you spot these signs, the sooner you can get a professional to take a look and figure out what's going on. Ignoring these signs won't make them go away; it'll just give the problem more time to get worse (and more expensive to fix). Pay attention to your house, it's trying to tell you something!

*** Investigating the link between coastal erosion and foundation instability.**

Okay, so we're talking about seasonal soil shifts by the coast, right? Imagine your house is built near the beach. Sounds idyllic, but there's a hidden drama unfolding beneath your feet. We're not just worried about the tide coming in, but what's happening to the ground itself, and how that's connected to the land practically dissolving into the sea.

The thing is, coastal erosion isn't just waves dramatically eating away at cliffs. It's a slower, sneakier process too, directly impacting the soil your house sits on. Think about it: rain saturates the soil during wetter seasons. That waterlogged ground becomes heavier, pushing and shifting. Then, in drier months, that same soil shrinks as the water evaporates. This constant expansion and contraction, this seasonal dance of moisture, weakens the soil structure.

Now, consider coastal erosion removing support from the base of a cliff or dune. That loss of support puts added stress on the remaining soil further inland, intensifying the already existing problems caused by seasonal moisture changes. It's like pulling a brick from the bottom of a wall – the whole thing becomes less stable.

So, how does this link to foundation instability? Well, your foundation is designed to sit on stable ground. But if the soil is constantly moving, expanding, and contracting, and also losing support due to erosion, it's going to put immense pressure on the foundation. You might see cracks appearing in your walls, doors and windows sticking, or even more serious structural problems.

Investigating this link requires a multi-pronged approach. We need to understand the rate of coastal erosion, the type of soil involved, and the specific seasonal weather patterns. We also need to study the foundations themselves, looking for signs of stress and movement. It's a complex puzzle, but understanding how these factors interact is crucial for protecting coastal properties and ensuring the safety and stability of homes built near our eroding coastlines. It's not just about pretty beaches; it's about the ground beneath our feet and the houses we build on it.

*** Assessing the role of drainage systems in mitigating soil movement.**

Alright, so we're poking around at how the ground shifts and slides along the coast, right? And specifically, we're trying to figure out how much of that movement is tied to the time of year. That's the big picture. But underneath that, there's this whole question of what we can *do* about it. That's where drainage systems come into play.

Think about it: coastal soil, especially the sandy or silty stuff, is often practically swimming in water, especially after a good soaking rain or a high tide creeping further inland than usual. And when soil is saturated like that, it loses its strength. It becomes heavier, more prone to flow, and generally less stable. It's like trying to build a sandcastle with really, really wet sand – it just slumps and falls apart.

Now, drainage systems, whether they're simple ditches, underground pipes, or even more sophisticated engineered solutions, are all about pulling that excess water out of the soil. By doing that, they essentially make the soil stronger and more resistant to movement. They're like giving that soggy sandcastle a fighting chance.

But it's not a magic bullet. The effectiveness of drainage depends on a bunch of factors. What kind of soil are we dealing with? How much rainfall are we getting during those seasonal wet periods? How well-designed and maintained is the drainage system itself? A poorly designed system might actually *increase* soil movement by concentrating water in certain areas.

So, when we're assessing the role of drainage, we need to look at the whole picture. Are we seeing a reduction in landslides or slumping in areas with good drainage compared to areas without? Are the drainage systems actually functioning as intended, or are they clogged with sediment and debris? Are they appropriately sized for the amount of rainfall and the type of soil?

Ultimately, understanding how drainage systems affect soil movement is crucial for managing coastal erosion and protecting infrastructure. It's not just about building a wall to hold back the sea; it's about understanding the underlying processes that cause the ground to move and finding ways to work *with* nature to stabilize the land. Because a dry, stable piece of land is a happy piece of land, especially when the ocean's nipping at its heels.

*** Exploring foundation repair techniques tailored for coastal environments.**

Okay, so we're talking about coastal soil, right? And how it messes with foundations, especially depending on the time of year. Think of it like this: You've got your house sitting pretty, maybe with a nice ocean view. But underneath all that is the ground, and near the coast, that ground is doing its own thing, influenced by the seasons in a big way.

Now, what's the big deal? Well, coastal soils are often sandy or silty, and they're right next to the ocean – which means they're constantly dealing with water. In the wetter months, like during hurricane season or heavy winter rains, that soil gets saturated. It swells. It becomes almost like a sponge, pushing against your foundation. This creates hydrostatic pressure, which is just a fancy way of saying "water's pushing hard." Over time, this can cause cracks, settling, and all sorts of foundation problems.

Then, the opposite happens. Come summertime, or during prolonged dry spells, that saturated soil starts to dry out. It shrinks. As it shrinks, it pulls away from your foundation. That creates voids, or empty spaces, and removes support. So, your foundation, which was being pushed on before, is now kind of hanging in the balance, unsupported in places. This shrinking and swelling cycle is especially brutal on coastal foundations, because it's often more extreme than what you'd see inland.

So, what can we do about it, in terms of foundation repair? Well, it's not a one-size-fits-all solution. We need to consider techniques designed for these coastal challenges. Things like installing deep foundation piers that go way beyond the active soil layer to reach stable ground. Or maybe using chemical grouting to fill those voids created by soil shrinkage. Proper drainage is also crucial, directing water away from the foundation in the first place. And sometimes, it's about reinforcing the existing foundation with carbon fiber straps or other materials to strengthen it against the constant movement.

Ultimately, understanding how seasonal changes affect the soil around your coastal home is the first step. It lets you catch problems early and choose the right foundation repair method to keep your house safe and sound, year after year. It's all about working with the soil, not against it.

*** Highlighting the importance of professional foundation inspections.**

Coastal regions, with their fluctuating weather patterns and proximity to water, present unique challenges when it comes to soil stability. Seasonal shifts in moisture content cause the ground to expand and contract, a phenomenon we call soil movement. While often subtle, this movement can exert significant pressure on building foundations, particularly in coastal areas where soil composition can vary drastically. Ignoring these forces is like ignoring a slow-growing threat to the very structure that protects your home.

That's why professional foundation inspections are absolutely critical in coastal regions. Think of it like this: your foundation is the unsung hero, constantly bearing the weight of your house and battling the elements. A professional inspection, conducted by a qualified structural engineer or foundation specialist, is like giving that hero a regular check-up. They can identify early warning signs of soil movement-related damage, signs that might be invisible to the untrained eye. These signs could include hairline cracks in the foundation walls, uneven floors, sticking doors and windows, or even subtle shifts in landscaping.

These inspections aren't just about spotting existing problems; they're about preventing future ones. A good inspector will assess the soil type around your home, analyze drainage patterns, and evaluate the overall condition of the foundation. They can then recommend preventative measures, such as improved drainage systems, soil stabilization techniques, or even foundation reinforcement, to mitigate the effects of seasonal soil movement.

Investing in regular foundation inspections is an investment in the long-term health and stability of your home. It's about being proactive, not reactive, and protecting your biggest asset from the potentially devastating consequences of unchecked soil movement. In coastal regions, where the ground is constantly shifting and changing, a professional foundation inspection isn't just a good idea, it's a necessity. It's peace of mind, knowing that your home is built on a solid, well-maintained foundation.

*** Detailing preventative measures to protect residential foundations from seasonal soil shifts.**

Okay, so we're talking about coastal regions, right? And how the ground kinda...wiggles around depending on the season. That's seasonal soil movement. And if you've got a house sitting on that ground, well, you want to keep it from becoming a wiggling house! That means thinking about preventative measures.

The big culprit in coastal areas is usually moisture, or the lack thereof. Think about it: rainy season comes, the soil gets saturated, swells up like a sponge. Dry season hits, the water evaporates, and the soil shrinks. This expansion and contraction puts a lot of stress on foundations.

So, what can you do? First, drainage is your best friend. Make sure rainwater is directed *away* from your foundation. Gutters and downspouts are crucial, and make sure they're actually working! The ground should slope away from the house too. You don't want water pooling up against the foundation wall.

Next up, consider the vegetation around your house. Trees are great, but their roots can suck up a lot of moisture, especially during a dry spell, leading to uneven soil shrinkage. Be smart about where you plant. Think about drought-tolerant landscaping, too. This can help stabilize the soil moisture levels.

Another important thing is maintaining a consistent moisture level around your foundation. This might sound counterintuitive, but in super dry areas, a soaker hose system placed around the perimeter of your house can actually help. It keeps the soil from drying out and shrinking excessively. Of course, you need to be careful not to overdo it and create the opposite problem!

Finally, consider the construction of your foundation itself. If you're building new, invest in a solid foundation design that takes into account the specific soil conditions in your area. If you already have a house, regular inspections are key. Look for cracks, both inside and outside. Catching problems early can save you a ton of money and headache down the road.

Ultimately, protecting your foundation from seasonal soil shifts in coastal regions is about understanding the specific challenges of your location and taking proactive steps to manage moisture levels. It's not a one-size-fits-all solution, but a combination of good drainage, smart landscaping, and diligent maintenance can go a long way in keeping your house on solid ground, no matter the season.

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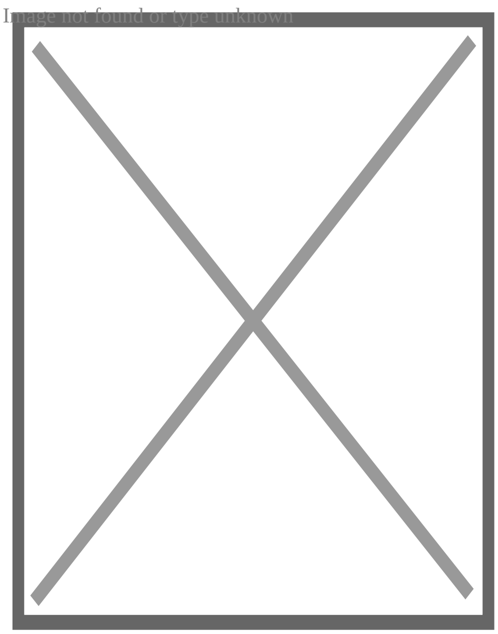
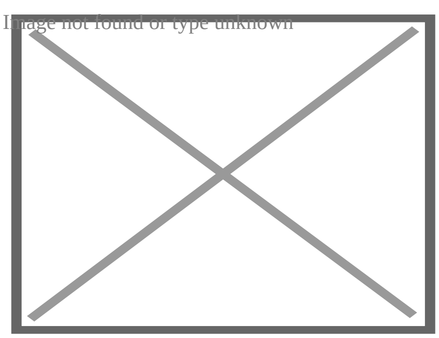
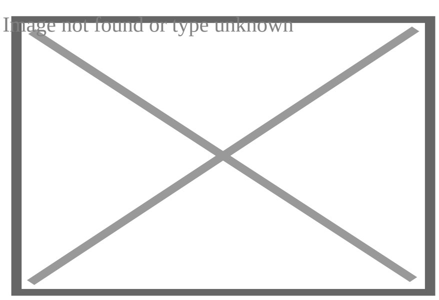
About geotechnical engineering



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

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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, $\displaystyle c$, and friction $\displaystyle \sigma\tan(\phi\,\!)$, where $\displaystyle \sigma\,\!$ is the normal stress on the slip plane and $\displaystyle \phi\,\!$ 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 $\displaystyle c$ 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.

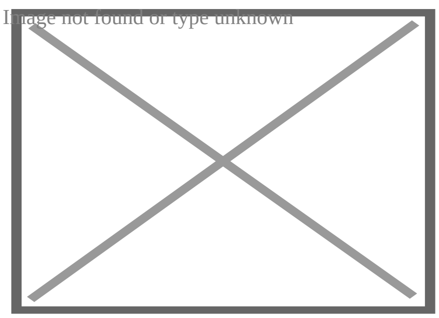
Foundation design

[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.

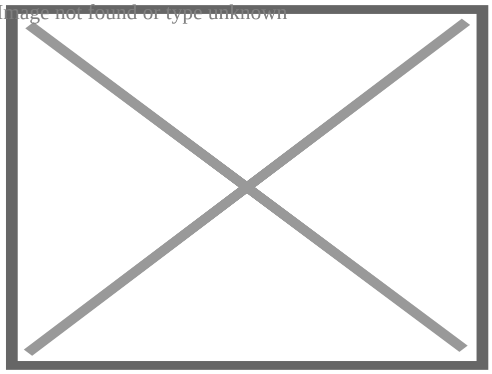
Ground improvement

[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

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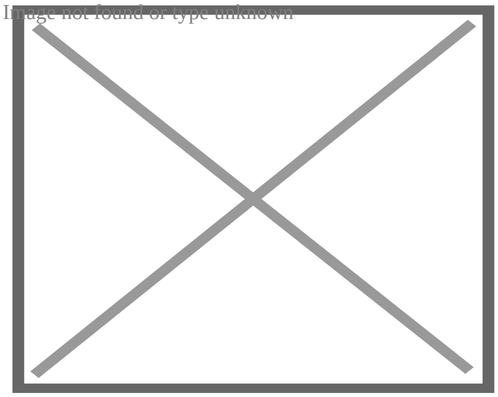
Geosynthetics

[edit]
Main article: Geosynthetics



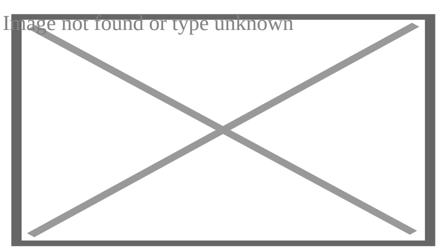
A collage of geosynthetic products.

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]

- icon Image not found or type unknown 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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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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Trades workers (List)	○ Banksman ○ Boilermaker ○ Bricklayer ○ Carpenter ○ Concrete finisher ○ Construction foreman ○ Construction worker ○ Electrician ○ Glazier ○ Ironworker ○ Millwright ○ Plasterer ○ Plumber ○ Roofer ○ Steel fixer ○ Welder

Organizations	◦ 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
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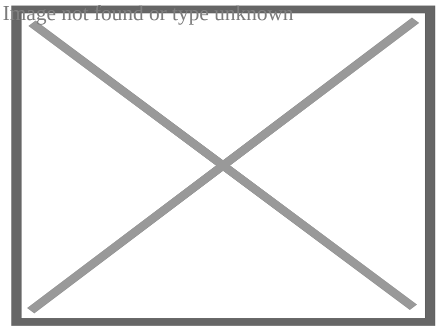
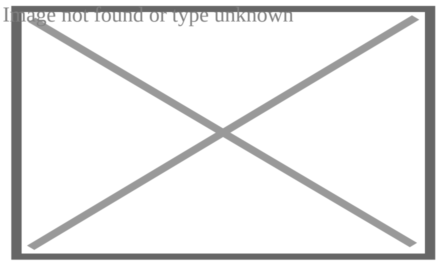
- Israel

About concrete slab



Suspended slab under construction, with the formwork still in place



Suspended slab formwork and rebar in place, ready for concrete pour.

A **concrete slab** is a common structural element of modern buildings, consisting of a flat, horizontal surface made of cast concrete. Steel-reinforced slabs, typically between 100 and 500 mm thick, are most often used to construct floors and ceilings, while thinner *mud slabs* may be used for exterior paving (see below).[1][2]

In many domestic and industrial buildings, a thick concrete slab supported on foundations or directly on the subsoil, is used to construct the ground floor. These slabs are generally classified as *ground-bearing* or *suspended*. A slab is ground-bearing if it rests directly on the foundation, otherwise the slab is suspended.[3] For multi-story buildings, there are several common slab designs (

see § Design for more types):

- Beam and block, also referred to as *rib and block*, is mostly used in residential and industrial applications. This slab type is made up of pre-stressed beams and hollow blocks and are temporarily propped until set, typically after 21 days.[4]
- A hollow core slab which is precast and installed on site with a crane
- In high rise buildings and skyscrapers, thinner, pre-cast concrete slabs are slung between the steel frames to form the floors and ceilings on each level. Cast in-situ slabs are used in high rise buildings and large shopping complexes as well as houses. These in-situ slabs are cast on site using shutters and reinforced steel.

On technical drawings, reinforced concrete slabs are often abbreviated to "r.c.c. slab" or simply "r.c.". Calculations and drawings are often done by structural engineers in CAD software.

Thermal performance

[edit]

Energy efficiency has become a primary concern for the construction of new buildings, and the prevalence of concrete slabs calls for careful consideration of its thermal properties in order to minimise wasted energy.[5] Concrete has similar thermal properties to masonry products, in that it has a relatively high thermal mass and is a good conductor of heat.

In some special cases, the thermal properties of concrete have been employed, for example as a heatsink in nuclear power plants or a thermal buffer in industrial freezers.[6]

Thermal conductivity

[edit]

Thermal conductivity of a concrete slab indicates the rate of heat transfer through the solid mass by conduction, usually in regard to heat transfer to or from the ground. The coefficient of thermal conductivity, *k*, is proportional to density of the concrete, among other factors.[5] The primary influences on conductivity are moisture content, type of aggregate, type of cement, constituent proportions, and temperature. These various factors complicate the theoretical evaluation of a *k*-value, since each component has a different conductivity when isolated, and the position and proportion of each components affects the overall conductivity. To simplify this, particles of aggregate may be considered to be suspended in the homogeneous cement. Campbell-Allen and Thorne (1963) derived a formula for the theoretical thermal conductivity of concrete.[6] In practice this formula is rarely applied, but remains relevant for theoretical use. Subsequently, Valore (1980) developed another formula in terms of overall density.[7] However, this study concerned hollow concrete blocks and its results are unverified for concrete slabs.

The actual value of *k* varies significantly in practice, and is usually between 0.8 and 2.0 W m$^{?1}$ K$^{?1}$.[8] This is relatively high when compared to other materials, for example the conductivity of wood may be as low as 0.04 W m$^{?1}$ K$^{?1}$. One way of mitigating the effects of thermal conduction is to introduce insulation (

see § Insulation).

Thermal mass

[edit]

The second consideration is the high thermal mass of concrete slabs, which applies similarly to walls and floors, or wherever concrete is used within the thermal envelope. Concrete has a relatively high thermal mass, meaning that it takes a long time to respond to changes in ambient temperature.[9] This is a disadvantage when rooms are heated intermittently and require a quick response, as it takes longer to warm the entire building, including the slab. However, the high thermal mass is an advantage in climates with large daily temperature swings, where the slab acts as a regulator, keeping the building cool by day and warm by night.

Typically concrete slabs perform better than implied by their R-value.[5] The R-value does not consider thermal mass, since it is tested under constant temperature conditions. Thus, when a concrete slab is subjected to fluctuating temperatures, it will respond more slowly to these changes and in many cases increase the efficiency of a building.[5] In reality, there are many factors which contribute to the effect of thermal mass, including the depth and composition of the slab, as well as other properties of the building such as orientation and windows.

Thermal mass is also related to thermal diffusivity, heat capacity and insulation. Concrete has low thermal diffusivity, high heat capacity, and its thermal mass is negatively affected by insulation (e.g. carpet).[5]

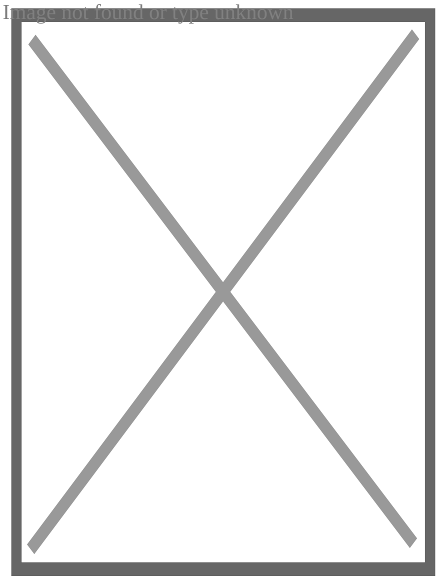
Insulation

[edit]

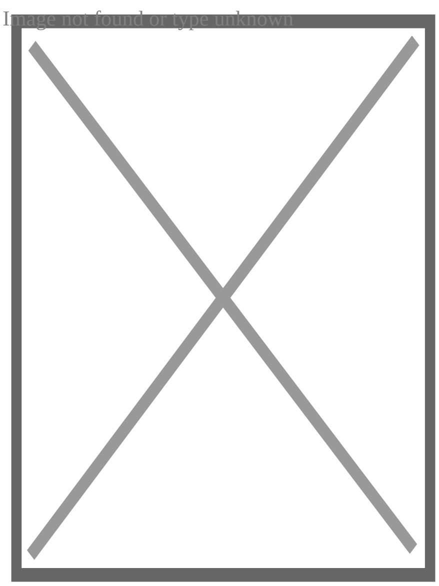
Without insulation, concrete slabs cast directly on the ground can cause a significant amount of extraneous energy transfer by conduction, resulting in either lost heat or unwanted heat. In modern construction, concrete slabs are usually cast above a layer of insulation such as expanded polystyrene, and the slab may contain underfloor heating pipes.[10] However, there are still uses for a slab that is not insulated, for example in outbuildings which are not heated or cooled to room temperature (

see § Mud slabs). In these cases, casting the slab directly onto a substrate of aggregate will maintain the slab near the temperature of the substrate throughout the year, and can prevent both freezing and overheating.

A common type of insulated slab is the beam and block system (mentioned above) which is modified by replacing concrete blocks with expanded polystyrene blocks.[11] This not only allows for better insulation but decreases the weight of slab which has a positive effect on load bearing walls and foundations.



Formwork set for concrete pour.



Concrete poured into formwork. This slab is ground-bearing and reinforced with steel rebar.

Design

[edit]
Further information: Marcus' method

Ground-bearing slabs

[edit]
See also: Shallow foundation § Slab on grade

Ground-bearing slabs, also known as "on-ground" or "slab-on-grade", are commonly used for ground floors on domestic and some commercial applications. It is an economical and quick construction method for sites that have non-reactive soil and little slope.[12]

For ground-bearing slabs, it is important to design the slab around the type of soil, since some soils such as clay are too dynamic to support a slab consistently across its entire area. This results in cracking and deformation, potentially leading to structural failure of any members attached to the floor, such as wall studs.[12]

Levelling the site before pouring concrete is an important step, as sloping ground will cause the concrete to cure unevenly and will result in differential expansion. In some cases, a naturally sloping site may be levelled simply by removing soil from the uphill site. If a site has a more significant grade, it may be a candidate for the "cut and fill" method, where soil from the higher ground is removed, and the lower ground is built up with fill.[13]

In addition to filling the downhill side, this area of the slab may be supported on concrete piers which extend into the ground. In this case, the fill material is less important structurally as the dead weight of the slab is supported by the piers. However, the fill material is still necessary to support the curing concrete and its reinforcement.

There are two common methods of filling - *controlled fill* and *rolled fill*.[13]

- **Controlled fill**: Fill material is compacted in several layers by a vibrating plate or roller. Sand fills areas up to around 800 mm deep, and clay may be used to fill areas up to 400 mm deep. However, clay is much more reactive than sand, so it should be used sparingly and carefully. Clay must be moist during compaction to homogenise it.[13]
- **Rolled fill:** Fill is repeatedly compacted by an excavator, but this method of compaction is less effective than a vibrator or roller. Thus, the regulations on maximum depth are typically stricter.

Proper curing of ground-bearing concrete is necessary to obtain adequate strength. Since these slabs are inevitably poured on-site (rather than precast as some suspended slabs are), it can be difficult to control conditions to optimize the curing process. This is usually aided by a membrane, either plastic (temporary) or a liquid compound (permanent).[14]

Ground-bearing slabs are usually supplemented with some form of reinforcement, often steel rebar. However, in some cases such as concrete roads, it is acceptable to use an unreinforced slab if it is adequately engineered (

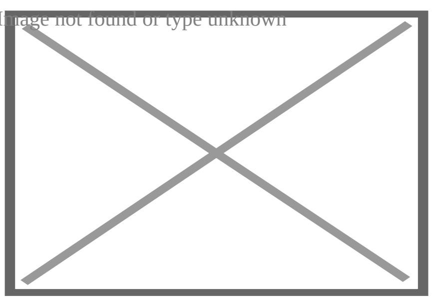
see below).

Suspended slabs

[edit]

For a suspended slab, there are a number of designs to improve the strength-to-weight ratio. In all cases the top surface remains flat, and the underside is modulated:

- A *corrugated slab* is designed when the concrete is poured into a corrugated steel tray, more commonly called decking. This steel tray improves strength of the slab, and prevents the slab from bending under its own weight. The corrugations run in one direction only.
- A *ribbed slab* gives considerably more strength in one direction. This is achieved with concrete beams bearing load between piers or columns, and thinner, integral ribs in the perpendicular direction. An analogy in carpentry would be a subfloor of bearers and joists. Ribbed slabs have higher load ratings than corrugated or flat slabs, but are inferior to waffle slabs.[15]
- A *waffle slab* gives added strength in both directions using a matrix of recessed segments beneath the slab.[16] This is the same principle used in the ground-bearing version, the waffle slab foundation. Waffle slabs are usually deeper than ribbed slabs of equivalent strength, and are heavier hence require stronger foundations. However, they provide increased mechanical strength in two dimensions, a characteristic important for vibration resistance and soil movement.[17]



The exposed underside of a waffle slab used in a multi-storey building

Unreinforced slabs

[edit]

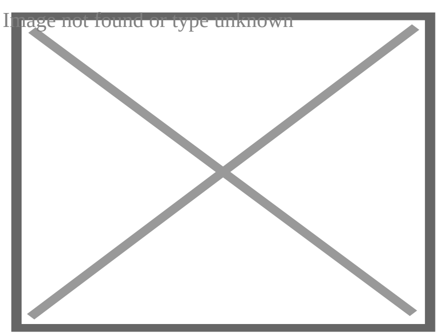
Unreinforced or "plain"[18] slabs are becoming rare and have limited practical applications, with one exception being the mud slab (

see below). They were once common in the US, but the economic value of reinforced ground-bearing slabs has become more appealing for many engineers.[10] Without reinforcement, the entire load on these slabs is supported by the strength of the concrete, which becomes a vital factor. As a result, any stress induced by a load, static or dynamic, must be within the limit of the concrete's flexural strength to prevent cracking.[19] Since unreinforced concrete is relatively very weak in tension, it is important to consider the effects of tensile stress caused by reactive soil, wind uplift, thermal expansion, and cracking.[20] One of the most common applications for unreinforced slabs is in concrete roads.

Mud slabs

[edit]

Mud slabs, also known as *rat slabs*, are thinner than the more common suspended or ground-bearing slabs (usually 50 to 150 mm), and usually contain no reinforcement.[21] This makes them economical and easy to install for temporary or low-usage purposes such as subfloors, crawlspaces, pathways, paving, and levelling surfaces.[22] In general, they may be used for any application which requires a flat, clean surface. This includes use as a base or "sub-slab" for a larger structural slab. On uneven or steep surfaces, this preparatory measure is necessary to provide a flat surface on which to install rebar and waterproofing membranes.[10] In this application, a mud slab also prevents the plastic bar chairs from sinking into soft topsoil which can cause spalling due to incomplete coverage of the steel. Sometimes a mud slab may be a substitute for coarse aggregate. Mud slabs typically have a moderately rough surface, finished with a float.[10]



Substrate and rebar prepared for pouring a mud slab

Axes of support

[edit]

One-way slabs

[edit]

A *one-way slab* has moment-resisting reinforcement only in its short axis, and is used when the moment in the long axis is negligible.[23] Such designs include corrugated slabs and ribbed slabs. Non-reinforced slabs may also be considered one-way if they are supported on only two opposite sides (i.e. they are supported in one axis). A one-way reinforced slab may be stronger than a two-way non-reinforced slab, depending on the type of load.

The calculation of reinforcement requirements for a one-way slab can be extremely tedious and time-consuming, and one can never be completely certain of the best design.[*citation needed*] Even minor changes to the project can necessitate recalculation of the reinforcement requirements. There are many factors to consider during the structural structure design of one-way slabs, including:

- Load calculations
- Bending moment calculation
- Acceptable depth of flexure and deflection
- Type and distribution of reinforcing steel

Two-way slabs

[edit]

A *two-way slab* has moment resisting reinforcement in both directions.[24] This may be implemented due to application requirements such as heavy loading, vibration resistance, clearance below the slab, or other factors. However, an important characteristic governing the requirement of a two-way slab is the ratio of the two horizontal lengths. If $L_x:L_y<2$ where L_x is the short dimension and L_y is the long dimension, then moment in both directions should be considered in design.[25] In other words, if the axial ratio is greater than two, a two-way slab is required.

A non-reinforced slab is two-way if it is supported in both horizontal axes.

Construction

[edit]

A concrete slab may be prefabricated (precast), or constructed on site.

Prefabricated

[edit]

Prefabricated concrete slabs are built in a factory and transported to the site, ready to be lowered into place between steel or concrete beams. They may be pre-stressed (in the factory), post-stressed (on site), or unstressed.[10] It is vital that the wall supporting structure is built to the correct dimensions, or the slabs may not fit.

On-site

[edit]

On-site concrete slabs are built on the building site using formwork, a type of boxing into which the wet concrete is poured. If the slab is to be reinforced, the rebars, or metal bars, are positioned within the formwork before the concrete is poured in.[26] Plastic-tipped metal or plastic bar chairs, are used to hold the rebar away from the bottom and sides of the form-work, so that when the concrete sets it completely envelops the reinforcement. This concept is known as concrete cover. For a ground-bearing slab, the formwork may consist only of side walls pushed into the ground. For a suspended slab, the formwork is shaped like a tray, often supported by a temporary scaffold until the concrete sets.

The formwork is commonly built from wooden planks and boards, plastic, or steel. On commercial building sites, plastic and steel are gaining popularity as they save labour.[27] On low-budget or small-scale jobs, for instance when laying a concrete garden path, wooden planks are very common. After the concrete has set the wood may be removed.

Formwork can also be permanent, and remain in situ post concrete pour. For large slabs or paths that are poured in sections, this permanent formwork can then also act as isolation joints within concrete slabs to reduce the potential for cracking due to concrete expansion or movement.

In some cases formwork is not necessary. For instance, a ground slab surrounded by dense soil, brick or block foundation walls, where the walls act as the sides of the tray and hardcore (rubble) acts as the base.

See also

[edit]

- Shallow foundation (Commonly used for ground-bearing slabs)
- Hollow-core slab (Voided slab, one-way spanning)
- Beam and block (voided slab, one way spanning)
- Voided biaxial slab (Voided slab, two-way spanning)
- Formwork
- Precast concrete
- Reinforced concrete
- Rebar
- Concrete cover

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[edit]

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External links

[edit]

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Wikimedia Commons has media related to ***Concrete slabs***.

- *Concrete Basics: A Guide to Concrete Practice*
- *Super Insulated Slab Foundations*
- *Design of Slabs on Ground* Archived 2021-05-08 at the Wayback Machine

Concrete

History

- Ancient Roman architecture
- Roman architectural revolution
- Roman concrete
- Roman engineering
- Roman technology

Composition	◦ Cement
	  ◦ Calcium aluminate
	  ◦ Energetically modified
	  ◦ Portland
	  ◦ Rosendale
	◦ Water
	◦ Water–cement ratio
	◦ Aggregate
	◦ Reinforcement
	◦ Fly ash
	◦ Ground granulated blast-furnace slag
	◦ Silica fume
	◦ Metakaolin

Production	◦ Plant ◦ Concrete mixer ◦ Volumetric mixer ◦ Reversing drum mixer ◦ Slump test ◦ Flow table test ◦ Curing ◦ Concrete cover ◦ Cover meter ◦ Rebar
Construction	◦ Precast ◦ Cast-in-place ◦ Formwork ◦ Climbing formwork ◦ Slip forming ◦ Screed ◦ Power screed ◦ Finisher ◦ Grinder ◦ Power trowel ◦ Pump ◦ Float ◦ Sealer ◦ Tremie

Science	◦ Properties ◦ Durability ◦ Degradation ◦ Environmental impact ◦ Recycling ◦ Segregation ◦ Alkali–silica reaction

Types	◦ AstroCrete
	◦ Fiber-reinforced
	◦ Filigree
	◦ Foam
	◦ Lunarcrete
	◦ Mass
	◦ Nanoconcrete
	◦ Pervious
	◦ Polished
	◦ Polymer
	◦ Prestressed
	◦ Ready-mix
	◦ Reinforced
	◦ Roller-compacting
	◦ Self-consolidating
	◦ Self-leveling
	◦ Sulfur
	◦ Tabby
	◦ Translucent
	◦ Waste light
	◦ Aerated
	    ◦ AAC
	    ◦ RAAC

Applications

- Slab
  - waffle
  - hollow-core
  - voided biaxial
  - slab on grade
- Concrete block
- Step barrier
- Roads
- Columns
- Structures

Organizations

- American Concrete Institute
- Concrete Society
- Institution of Structural Engineers
- Indian Concrete Institute
- Nanocem
- Portland Cement Association
- International Federation for Structural Concrete

Standards

- Eurocode 2
- EN 197-1
- EN 206-1
- EN 10080

See also

- Hempcrete

- Image not found or type unknown Category:Concrete

About home repair

For the novel by Liz Rosenberg, see Home Repair (novel).
For other uses of "repair", see Maintenance.

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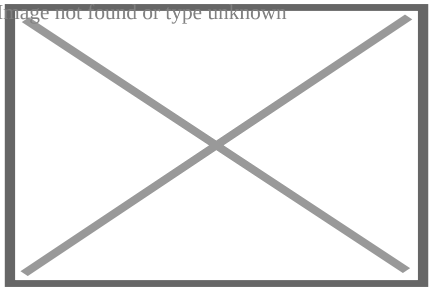

A mobile home being repaired in Oklahoma

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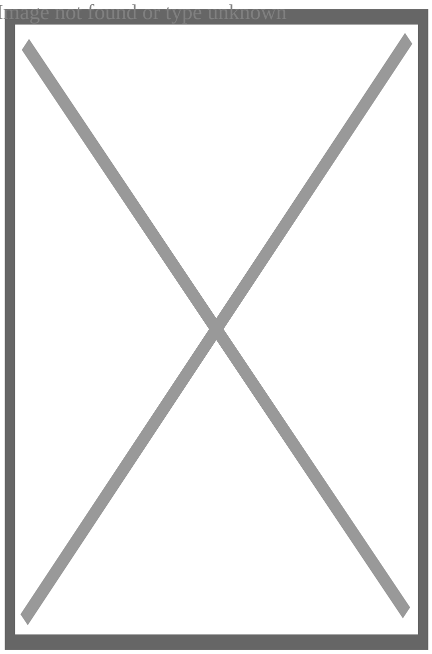

A person making these repairs to a house after a flood

Home repair involves the diagnosis and resolution of problems in a home, and is related to home maintenance to avoid such problems. Many types of repairs are "do it yourself" (DIY) projects, while others may be so complicated, time-consuming or risky as to require the assistance of a qualified handyperson, property manager, contractor/builder, or other professionals.

Home repair is not the same as renovation, although many improvements can result from repairs or maintenance. Often the costs of larger repairs will justify the alternative of investment in full-scale improvements. It may make just as much sense to upgrade a home system (with an improved one) as to repair it or incur ever-more-frequent and expensive maintenance for an inefficient, obsolete or dying system.

Worn, consumed, dull, dirty, clogged

[edit]

Repairs often mean simple replacement of worn or used components intended to be periodically renewed by a home-owner, such as burnt out light bulbs, worn out batteries, or overfilled vacuum cleaner bags. Another class of home repairs relates to restoring something to a useful condition, such as sharpening tools or utensils, replacing leaky faucet washers, cleaning out plumbing traps, rain gutters. Because of the required precision, specialized tools, or hazards, some of these are best left to experts such as a plumber. One emergency repair that may be necessary in this area is overflowing toilets. Most of them have a shut-off valve on a pipe beneath or behind them so that the water supply can be turned off while repairs are made, either by removing a clog or repairing a broken mechanism.

Broken or damaged

[edit]

Perhaps the most perplexing repairs facing a home-owner are broken or damaged things. In today's era of built-in obsolescence for many products, it is often more convenient to replace something rather than attempt to repair it. A repair person is faced with the tasks of accurately identifying the problem, then finding the materials, supplies, tools and skills necessary to sufficiently effect the repair. Some things, such as broken windows, appliances or furniture can be carried to a repair shop, but there are many repairs that can be performed easily enough, such as patching holes in plaster and drywall, cleaning stains, repairing cracked windows and their screens, or replacing a broken electrical switch or outlet. Other repairs may have some urgency, such as broken water pipes, broken doors, latches or windows, or a leaky roof or water tank, and this factor can certainly justify calling for professional help. A home handyperson may become adept at dealing with such immediate repairs, to avoid further damage or loss, until a professional can be summoned.

Emergency repairs

[edit]

Emergencies can happen at any time, so it is important to know how to quickly and efficiently fix the problem. From natural disasters, power loss, appliance failure and no water, emergency repairs tend to be one of the most important repairs to be comfortable and confident with. In most cases, the repairs are DIY or fixable with whatever is around the house. Common repairs would be fixing a leak, broken window, flooding, frozen pipes or clogged toilet. Each problem can have a relatively simple fix, a leaky roof and broken window can be patched, a flood can be pumped out, pipes can be thawed and repaired and toilets can be unclogged with a chemical. For the most part, emergency repairs are not permanent.

They are what you can do fast to stop the problem then have a professional come in to permanently fix it.[1] Flooding as a result of frozen pipes, clogged toilets or a leaky roof can result in very costly water damage repairs and even potential health issues resulting from mold growth if not addressed in a timely manner.

Maintenance

[edit]

Periodic maintenance also falls under the general class of home repairs. These are inspections, adjustments, cleaning, or replacements that should be done regularly to ensure proper functioning of all the systems in a house, and to avoid costly emergencies. Examples include annual testing and adjustment of alarm systems, central heating or cooling systems (electrodes, thermocouples, and fuel filters), replacement of water treatment components or air-handling filters, purging of heating radiators and water tanks, defrosting a freezer, vacuum refrigerator coils, refilling dry floor-drain traps with water, cleaning out rain gutters, down spouts and drains, touching up worn house paint and weather seals, and cleaning accumulated creosote out of chimney flues, which may be best left to a chimney sweep.

Examples of less frequent home maintenance that should be regularly forecast and budgeted include repainting or staining outdoor wood or metal, repainting masonry, waterproofing masonry, cleaning out septic systems, replacing sacrificial electrodes in water heaters, replacing old washing machine hoses (preferably with stainless steel hoses less likely to burst and cause a flood), and other home improvements such as replacement of obsolete or ageing systems with limited useful lifetimes (water heaters, wood stoves, pumps, and asphaltic or wooden roof shingles and siding.

Often on the bottom of people's to-do list is home maintenance chores, such as landscaping, window and gutter cleaning, power washing the siding and hard-scape, etc. However, these maintenance chores pay for themselves over time. Often, injury could occur when operating heavy machinery or when climbing on ladders or roofs around your home, so if an individual is not in the proper physical condition to accomplish these chores, then they should consult a professional. Lack of maintenance will cost more due to higher costs associated with repairs or replacements to be made later. It requires discipline and learning aptitude to repair and maintain the home in good condition, but it is a satisfying experience to perform even seemingly minor repairs.

Good operations

[edit]

Another related issue for avoiding costly repairs (or disasters) is the proper operation of a home, including systems and appliances, in a way that prevents damage or prolongs their usefulness. For example, at higher latitudes, even a clean rain gutter can suddenly build up an ice dam in winter, forcing melt water into unprotected roofing, resulting in leaks or even flooding inside walls or rooms. This can be prevented by installing moisture barrier beneath the roofing tiles. A wary home-owner should be alert to the conditions that can result in larger problems and take remedial action before damage or injury occurs. It may be easier to tack down a bit of worn carpet than repair a large patch damaged by prolonged misuse. Another example is to seek out the source of unusual noises or smells when mechanical, electrical or plumbing systems are operating—sometimes they indicate incipient problems. One should avoid overloading or otherwise misusing systems, and a recurring overload may indicate time for an upgrade.

Water infiltration is one of the most insidious sources of home damage. Small leaks can lead to water stains, and rotting wood. Soft, rotten wood is an inviting target for termites and other wood-damaging insects. Left unattended, a small leak can lead to significant structural damage, necessitating the replacement of beams and framing.

With a useful selection of tools, typical materials and supplies on hand, and some home repair information or experience, a home-owner or handyperson should be able to carry out a large number of DIY home repairs and identify those that will need the specialized attention of others.

Remediation of environmental problems

[edit]

When a home is sold, inspections are performed that may reveal environmental hazards such as radon gas in the basement or water supply or friable asbestos materials (both of which can cause lung cancer), peeling or disturbed lead paint (a risk to children and pregnant women), in-ground heating oil tanks that may contaminate ground water, or mold that can cause problems for those with asthma or allergies. Typically the buyer or mortgage lender will require these conditions to be repaired before allowing the purchase to close. An entire industry of environmental remediation contractors has developed to help home owners resolve these types of problems.

See also

[edit]

- Image not found or type unknown Housing portal

- Electrical wiring
- Handyperson
- Housekeeping

- Home improvement
- Home wiring
- HVAC
- Maintenance, repair, and operations
- Plumbing
- Right to repair
- Smoke alarm
- Winterization

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Rooms and spaces of a house

Shared rooms

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

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

Related

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

- Image not found or type unknown Category: Rooms

About Cook County

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Things To Do in Cook County

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Sand Ridge Nature Center

4.8 (96)

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River Trail Nature Center

4.6 (235)

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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

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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!

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Chris Abplanalp

(5)

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

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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.

Identifying Seasonal Soil Movement in Coastal RegionsView GBP

Check our other pages :

- Pinpointing Sinking Spots around the Foundation Perimeter
- Impact of Freeze Thaw Cycles on Concrete Slabs
- Spotting Early Warning Signs of Foundation Stress

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