Foundation Work

- **Evaluating Structural Policy Coverage in Home Insurance**
  Evaluating Structural Policy Coverage in Home Insurance Understanding the Scope of Foundation Repair Guarantees Reviewing Contractor Backed Warranty Provisions Examining Conditions That Void Certain Warranties Checking if Homeowner Policies Cover Soil Movement Considering Add On Insurance for Extended Protection Determining Coverage Limitations for Pier Systems Clarifying Fine Print in Repair Service Agreements Seeking Assurance Through Third Party Backed Guarantees Exploring Extended Coverage for Unexpected Repair Costs Exploring Available Options for Warranty Transfers
- **Visual Inspection Methods for Early Problem Detection**
  Visual Inspection Methods for Early Problem Detection Using Laser Level Surveys to Track Floor Movement Applying Ground Penetrating Radar for Subsurface Clarity Establishing Baselines with Digital Crack Gauges Harnessing Infrared Thermography for Hidden Moisture Installing Wireless Tilt Meters for Continuous Monitoring Scheduling Routine Evaluations of Structural Support Identifying Early Shifts with Smart Sensor Technology Analyzing Data from Remote Monitoring Systems Assessing Elevation Changes with Precision Tools Reviewing Signs of Deterioration in Hard to Reach Areas Interpreting Detailed Reports from Third Party Engineers
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Understanding the risks and unexpected costs associated with foundation repairs.

Foundation repairs can be an unwelcome surprise for any homeowner. Water pooling around a home signals the need for drainage and foundation repair **foundation repair expert service** porch. The risks and unexpected costs associated with them can quickly turn a simple maintenance issue into a financial nightmare. To truly understand these risks, it's essential to explore the various factors that contribute to the complexity and cost of foundation repairs, as well as the importance of extended coverage options.

Firstly, it's crucial to recognize that foundation issues often go unnoticed until they become severe. Minor cracks can escalate into significant structural problems over time if left unaddressed-leading to costly repairs that involve excavation, lifting, and stabilization. These processes require specialized equipment and skilled labor, which can drive up prices significantly.

Secondly-the extent-and cost-of foundation repairs can vary widely depending on several factors such as soil conditions surrounding properties; regional weather patterns leading towards shifting foundations due heavy rainfall followed by drought periods; even poor initial construction quality being discovered after years later causing sudden damages without warning signs earlier visible during regular maintanance checks . There are multiple risks associated including environmental hazards especially toxic mold growth resulting from water intrusion through foundation cracks poses health risks requiring immediate intervention adding further expenses beyond repair costs alone . All these elements combine making accurate predictions difficult leading towards facing sudden financial burden which might not be anticipated earlier . This uncertainty highlights why having extended coverage becomes essential providing financial cushion against unexpected expenses arising out from such situations . Extended coverages typically include thorough inspections alongside preventive measures reducing likelihood occurrences hence saving long term expenditures . Moreover , many policies offer assistance covering temporary relocation costs during extensive repair works ensuring minimal disruption everyday life activities while maintaining peace mind homeowners facing stressful times already . Therefore , investing time understanding different types extended coverage available market comparing options selecting suitable plan tailored specific needs becomes vital step towards safeguarding investment biggest asset ie home itself . In conclusion , comprehend risks involved alongside exploring extended coverage plans enables better preparation handling unexpected foundation repair costs ensuring financial stability long run .

The concept of extended coverage and its relevance to foundation repair services.

In the world of homeownership, few things are as unsettling as the thought of foundation problems. The foundation is, after all, the very base upon which our homes sit, and any issues with it can have serious implications for the rest of the structure. This is where the

concept of extended coverage comes into play, offering a financial safety net for homeowners facing unexpected repair costs.

Extended coverage, often referred to as an extended warranty or service plan, goes beyond standard homeowner's insurance to cover repairs typically excluded in basic policies. In the context of foundation repair services, this can be a lifesaver. Foundation issues can arise from various factors such as soil settlement, water damage, or even natural disasters. These problems are usually not covered by standard insurance plans, leaving homeowners to foot the bill for often exorbitant repair costs.

The relevance of extended coverage in foundation repair services is multifold. Firstly, it provides financial protection against high repair costs. Foundation repairs can range from minor cracks to significant structural issues requiring extensive work and expense. Without extended coverage, these costs can quickly become overwhelming. Secondly, it offers peace of mind. Homeowners can rest easy knowing that they have a backup plan in case something goes wrong with their home's foundation.

Moreover, extended coverage can also increase the resale value of a property. Potential buyers are often more inclined to purchase a home with an active warranty or service plan, as it signals that the current owner has taken good care of the property. It also alleviates potential buyers' fears about unexpected repair costs post-purchase.

However, it's essential to understand what exactly your extended coverage entails. Different providers offer varying levels of protection and benefits. Some may cover preventative maintenance, while others might only cover specific types of damage or repairs up to a certain amount. Therefore, it's crucial to thoroughly read and understand your policy to avoid any surprises down the line.

In conclusion, investing in extended coverage for foundation repair services can be incredibly beneficial for homeowners looking to protect their investment and avoid unexpected financial burdens. It serves as a proactive approach to managing potential foundation issues and ensures that homeowners have support when they need it most.

Key components typically included in extended coverage plans for foundation repairs.

When exploring extended coverage for unexpected repair costs, especially for foundation repairs, it's crucial to understand the key components typically included in these plans. Foundation repairs can be extraordinarily expensive and are often not covered by standard homeowners insurance policies. This is where extended coverage plans come into play, offering a financial safety net for homeowners.

One of the primary components of these plans is coverage for structural damage. This includes issues like cracks in foundation walls, settling or sinking foundations, and bowing or leaning walls. These problems can compromise the integrity of the entire house, making

them critical to address promptly. Extended coverage ensures that homeowners aren't left with an enormous bill for these essential repairs.. Another important aspect is coverage for water damage related issues caused by foundation problems .This includes leaks caused by cracks , moisture intrusion leading mold growth . Some plans may also include grading or landscaping corrections if these issues contribute water pooling around foundation causing damage . Plans may offer reimbursement for temporary living expenses if repairs render home temporarily unlivable . Underground plumbing failures due faulty foundations leading leaks sometimes included depending plan features .. Finally ,many extended coverage plans provide access professional assessments regular inspections ensuring early detection prevention potential foundation problems .. However ,its essential review specific policy details since coverage limitations exclusions vary provider basis .. In conclusion ,while extended coverage plans come added cost ,they offer valuable peace mind protecting homeowners financial devastation unexpected foundation repair costs . Investing time research right plan tailored specific needs means safeguarding both home financial future ..Proactive approach extended coverage allows homeowners address foundational issues timely manner preserving overall value safety their property . When considering extended coverage options careful evaluation individual circumstances crucial determine optimal balance between cost comprehensive protection ..

Benefits of having extended coverage for homeowners facing foundation issues.

When it comes to owning a home, few things are as unsettling as discovering foundation issues. These problems can be incredibly costly and complex to repair - Often cost estimators predict foundation repairs range widely - cost million dollars depends upon severity - thus presenting homeowners facing foundation issues with financial challenges. This is where having extended coverage becomes invaluable.

Extended coverage for homeowners insurance can be a lifeline during such stressful times. Standard homeowners insurance policies often fall short covering foundation repairs - typically exclude settlings wear tear & poor construction - leading policyholders bear bulk expense themselves . Extended coverage ensures owners safety net , cushion financial blow . Here several benefits : - Peace Mind : Know foundation repairs covered reduces anxiety stress . Homeowners reassured financial burden mitigated . Financial Protection : Foundation repairs expensive extended coverage prevents costs spiraling wreck havoc family finances . Resale Value Maintained : Address foundation issues prompt timeline preserv property value marketability . Quality Repairs : Extended coverage policies require professional contractors repairs thus guarantee quality works standard practices followed . Prevention Future Issues : Early intervention extended coverage prevent minor problems escal severe ones requiring cost extensive repairs . Enhanced Policy Customization : Extend policy tailored specific requirements properties geographical areas adding endorsements riders accommodates owner priorities . Indeed extended coverage investment securities stability property futures preserv asset values safeguards investment owners pockets . Ultimately , provides pragmatic solution proactive maintenance solid foundation literally figuratively ! Therefore , opt extended coverage mechanism shield protect owners foundation issues wise comprehensive preparation strategy ! - Subject

Expertise Required Before Purchased Coverage Consult Professional Guarantee Policy Meets Requirements Needs Prior Committing Insurance Plan !!!!!! . Thus concludes discussion exploration benefits extended coverage unexpected repair costs !!!!!!!!!!!!!……………….End Discussion…………………….!!!!!!!!!!!!!!!............!!!!!........!!!!.....!!!...............................!!!!!!!!!!!!!!!!.....En Session..Adieu !!////////////////////.///./././././.-.-.-.-.-.-.-.-.- ///////*//////////////**///////////***///////////////////////(///………………

Real-life scenarios where extended coverage has proven advantageous for unexpected repair costs.

In the realm of vehicle ownership, unexpected repair costs can often throw a wrench into even the most carefully planned budgets. This is where extended coverage, often referred to as an extended warranty, comes into play. Unlike standard manufacturer warranties that typically last for a set period or mileage, extended coverage offers a safety net for a longer duration, providing peace of mind and financial protection against unforeseen mechanical breakdown costs associated car ownership brings along its way.. Let' s explore some real life scenarios where extended coverage has proven advantageous : . Imagine driving along peacefully when suddenly ,your check engine light flickers ominously ..Upon taking Your vehicle gets towed due engine failure ..at garage ,you receive jaw dropping repair bill amounting thousands dollars ..With extended coverage plan , however ,most cost would likely absorbed saving huge chunk money otherwise spent out pocket During another instance perhaps transmission fails right after manufacturer warranty expires leaving stuck between paying enormous sum fix issue yourself vs simply utilizing benefits offered through foresight having purchased extended protection earlier Lastly consider scenario electronic components malfunction causing series issues ranging navigation system glitches air conditioning blowing hot air midst summer heatwave ;without extended coverage ,you d find yourself shelling considerable cash resolve each problem individually Instead these incidents covered under comprehensive plan ensuring minimal disruption daily life alongside preventing potential financial strain Such scenarios highlight value investing extended coverage especially used cars older models lacking original warranties Moreover ,even newer vehicles may benefit added protection particularly those driven frequently long distances racking miles quickly thereby increasing likelihood wear tear related issues arising sooner later In essence ,extended coverage serves shield against fiscal surprises stemming from inevitable mechanical troubles arising throughout lifespan automobile Purchasing such plan enables drivers maintain smooth sailing journey free constant worry potential exorbitant expenses lurking around corner awaiting opportune moment strike Investing thoughtfully selected extended coverage today might just save headache heartache tomorrow .

Factors to consider when choosing an extended coverage plan for foundation repairs.

When it comes to protecting your home, one of the most critical aspects to consider is the foundation. Foundation repairs can be unexpected and often come with a hefty price tag. This is where extended coverage plans come into play. Here are some essential factors to consider when choosing an extended coverage plan for foundation repairs:

1. Coverage Scope:
The first thing to look at is what exactly the plan covers. Some plans may only cover specific types of foundation issues, such as cracks or settlement problems, while others might offer comprehensive coverage. Ensure the plan covers the most common foundation issues relevant to your area and home type.

2. Deductible Amount:
Check the deductible amount you'll need to pay before the coverage kicks in. A lower deductible means you'll pay less out of pocket initially, but it might come with higher premiums. Weigh the deductible against your budget and potential repair costs to find a balance that works for you.

3. Premium Costs:
Consider the annual or monthly premium costs of the plan. While a higher premium might mean more comprehensive coverage, it's essential to ensure it fits within your budget. Compare different plans to see which offers the best value for your money.

4. Claim Limits:
Look at the claim limits-both per occurrence and annually. Some plans might have caps on how much they will pay out, which could leave you with significant out-of-pocket expenses if the damage is extensive. Make sure the limits are reasonable and adequate for potential repair costs.

5. Service Response Time:
Foundation issues can escalate quickly, so timely intervention is crucial. Check how quickly the provider can respond to claims and initiate repairs. A fast response time can prevent further damage and save you additional costs down the line.

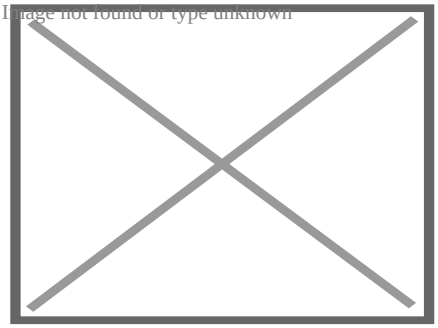
6. Provider Reputation:
The reputation of the provider matters significantly. Look for reviews and testimonials from other homeowners who have used their services. A reliable provider will have a history of timely payments and high-quality service delivery, giving you peace of mind during stressful times.

7. **Plan Exclusions:** Understand what is not covered by the plan as well as what is covered under your policy .Exclusions can vary widely between providers, so it's important to know what scenarios are not covered to avoid any surprises later on . Common exclusions might include damage from natural disasters or pre-existing conditions that were known before purchasing the plan.. It's crucial to read through these exclusions carefully before making a decision..Whether its flood , earthquake or soil related issues take time in understanding these exclusions clearly..This is especially important if you live in an area prone to specific types of foundation problems..It might be worth considering additional

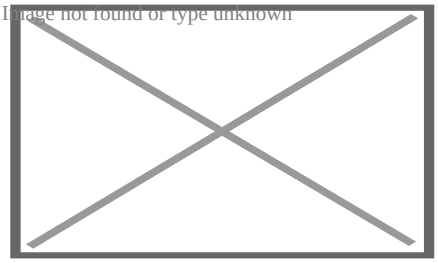
coverage options if needed based on your area's common issues.. Finally , ask questions where ever you have doubts..Ask what happens if you sell your house before plan ends ,what happens if you miss a payment etc..These type questions will help you understand your policy better..

8. **Additional Benefits:** Some extended coverage plans come with added perks such as regular inspections , access to network providers who may offer discounted rates on repair services etc..Evaluate

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

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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

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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

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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

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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.

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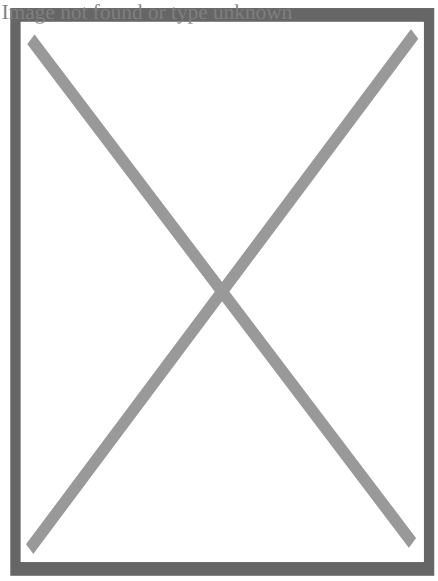

Formwork set for concrete pour.

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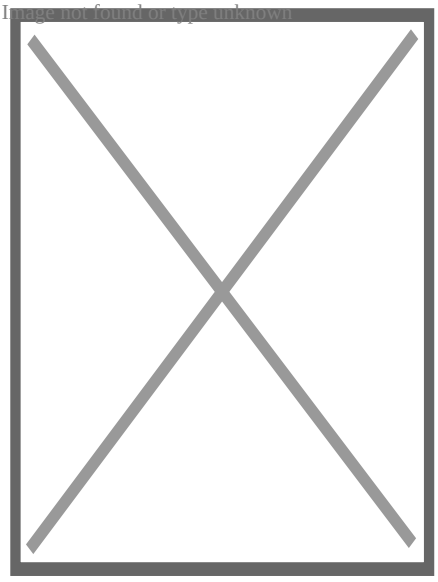

Concrete poured into formwork. This slab is ground-bearing and reinforced with steel rebar.

Design

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Further information: Marcus' method

Ground-bearing slabs

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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

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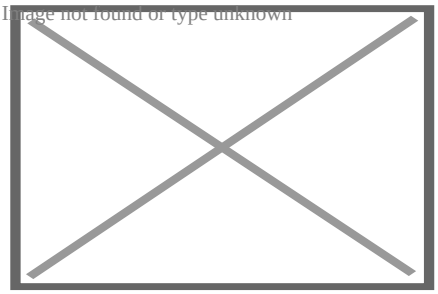
For a suspended slab, there are a number of designs to improve the strength-to-weight ratio. In all cases the top surface remains flat, and the underside is modulated:

- 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

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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

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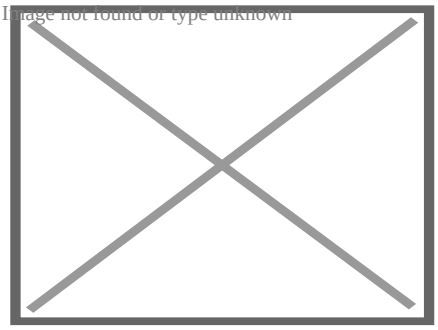
Mud slabs, also known as *rat slabs*, are thinner than the more common suspended or ground-bearing slabs (usually 50 to 150 mm), and usually contain no reinforcement.[21] This makes them economical and easy to install for temporary or low-usage purposes such as subfloors, crawlspaces, pathways, paving, 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

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One-way slabs

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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

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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 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

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

Prefabricated

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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

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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

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- 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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External links

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

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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 soil compaction

For soil compaction in agriculture and compaction effects on soil biology, see soil compaction (agriculture), for natural compaction on a geologic scale, see compaction (geology); for consolidation near the surface, see consolidation (soil).

In geotechnical engineering, **soil compaction** is the process in which stress applied to a soil causes densification as air is displaced from the pores between the soil grains. When stress is applied that causes densification due to water (or other liquid) being displaced from between the soil grains, then consolidation, not compaction, has occurred. Normally, compaction is the result of heavy machinery compressing the soil, but it can also occur due to the passage of, for example, animal feet.

In soil science and agronomy, **soil compaction** is usually a combination of both engineering compaction and consolidation, so may occur due to a lack of water in the soil, the applied stress being internal suction due to water evaporation[1] as well as due to passage of animal feet. Affected soils become less able to absorb rainfall, thus increasing runoff and erosion. Plants have difficulty in compacted soil because the mineral grains are pressed together, leaving little space for air and water, which are essential for root growth. Burrowing animals also find it a hostile environment, because the denser soil is more difficult to penetrate. The ability of a soil to recover from this type of compaction depends on climate, mineralogy and fauna. Soils with high shrink–swell capacity, such as vertisols, recover quickly from compaction where moisture conditions are variable (dry spells shrink the soil, causing it to crack). But clays such as kaolinite, which do not crack as they dry, cannot recover from compaction on their own unless they host ground-dwelling animals such as earthworms—the Cecil soil series is an example.

Before soils can be compacted in the field, some laboratory tests are required to determine their engineering properties. Among various properties, the maximum dry density and the optimum moisture content are vital and specify the required density to be compacted in the field.[2]

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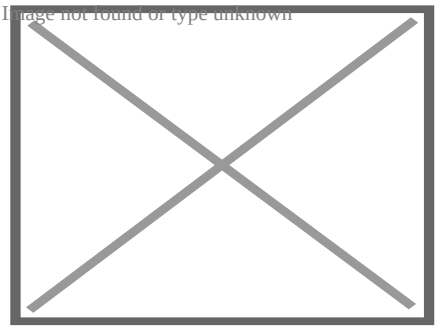

A 10 tonne excavator is here equipped with a narrow sheepsfoot roller to compact the fill over newly placed sewer pipe, forming a stable support for a new road surface.

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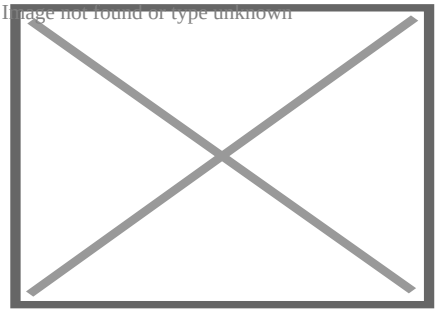

A compactor/roller fitted with a sheepsfoot drum, operated by U.S. Navy Seabees

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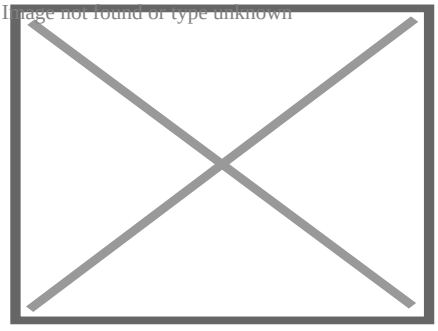

Vibrating roller with plain drum as used for compacting asphalt and granular soils

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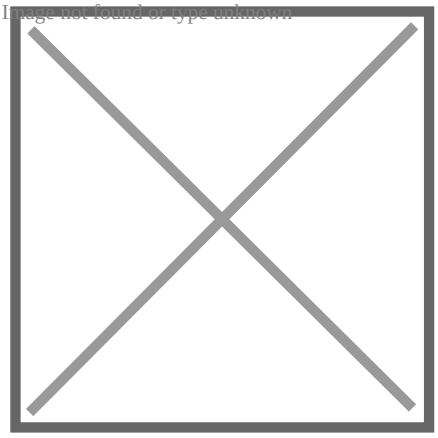

Vibratory rammer in action

In construction

[edit]

Soil compaction is a vital part of the construction process. It is used for support of structural entities such as building foundations, roadways, walkways, and earth retaining structures to name a few. For a given soil type certain properties may deem it more or less desirable to perform adequately for a particular circumstance. In general, the preselected soil should have adequate strength, be relatively incompressible so that future settlement is not significant, be stable against volume change as water content or other factors vary, be durable and safe against deterioration, and possess proper permeability.[3]

When an area is to be filled or backfilled the soil is placed in layers called lifts. The ability of the first fill layers to be properly compacted will depend on the condition of the natural material being covered. If unsuitable material is left in place and backfilled, it may compress over a long period under the weight of the earth fill, causing settlement cracks in the fill or in any structure supported by the fill.[4] In order to determine if the natural soil will support the first fill layers, an area can be proofrolled. Proofrolling consists of utilizing a piece of heavy construction equipment to roll across the fill site and watching for deflections to be revealed. These areas will be indicated by the development of rutting, pumping, or ground weaving.[5]

To ensure adequate soil compaction is achieved, project specifications will indicate the required soil density or degree of compaction that must be achieved. These specifications are generally recommended by a geotechnical engineer in a geotechnical engineering report.

The soil type—that is, grain-size distributions, shape of the soil grains, specific gravity of soil solids, and amount and type of clay minerals, present—has a great influence on the maximum dry unit weight and optimum moisture content.[6] It also has a great influence on how the materials should be compacted in given situations. Compaction is accomplished by use of heavy equipment. In sands and gravels, the equipment usually vibrates, to cause re-orientation of the soil particles into a denser configuration. In silts and clays, a sheepsfoot roller is frequently used, to create small zones of intense shearing, which drives air out of the soil.

Determination of adequate compaction is done by determining the in-situ density of the soil and comparing it to the maximum density determined by a laboratory test. The most commonly used laboratory test is called the Proctor compaction test and there are two different methods in obtaining the maximum density. They are the **standard Proctor** and **modified Proctor** tests; the modified Proctor is more commonly used. For small dams, the standard Proctor may still be the reference.[5]

While soil under structures and pavements needs to be compacted, it is important after construction to decompact areas to be landscaped so that vegetation can grow.

Compaction methods

[edit]

There are several means of achieving compaction of a material. Some are more appropriate for soil compaction than others, while some techniques are only suitable for particular soils or soils in particular conditions. Some are more suited to compaction of non-soil materials such as asphalt. Generally, those that can apply significant amounts of shear as well as compressive stress, are most effective.

The available techniques can be classified as:

1. Static – a large stress is slowly applied to the soil and then released.
2. Impact – the stress is applied by dropping a large mass onto the surface of the soil.
3. Vibrating – a stress is applied repeatedly and rapidly via a mechanically driven plate or hammer. Often combined with rolling compaction (see below).
4. Gyrating – a static stress is applied and maintained in one direction while the soil is a subjected to a gyratory motion about the axis of static loading. Limited to laboratory applications.
5. Rolling – a heavy cylinder is rolled over the surface of the soil. Commonly used on sports pitches. Roller-compactors are often fitted with vibratory devices to enhance their effectiveness.
6. Kneading – shear is applied by alternating movement in adjacent positions. An example, combined with rolling compaction, is the 'sheepsfoot' roller used in waste compaction at landfills.

The construction plant available to achieve compaction is extremely varied and is described elsewhere.

Test methods in laboratory

[edit]

Soil compactors are used to perform test methods which cover laboratory compaction methods used to determine the relationship between molding water content and dry unit weight of soils. Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties such as, shear strength, compressibility, or permeability. In addition, foundation soils are often compacted to improve their engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and molding water content needed to achieve the required engineering properties, and for controlling construction to assure that the required compaction and water contents are achieved. Test methods such as EN 13286-2, EN 13286-47, ASTM D698, ASTM D1557, AASHTO T99, AASHTO T180, AASHTO T193, BS 1377:4 provide soil compaction testing procedures.[7]

See also

[edit]

- Soil compaction (agriculture)

- Soil degradation
- Compactor
- Earthwork
- Soil structure
- Aeration
- Shear strength (soil)

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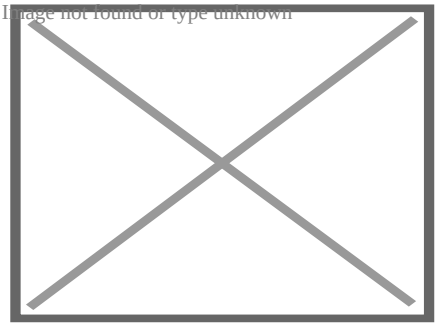

Multiquip RX1575 Rammax Sheepsfoot Trench Compaction Roller on the jobsite in San Diego, California

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[edit]

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5. ^ ***a b*** *McCarthy, David F. (2007). Essentials of Soil Mechanics and Foundations. Upper Saddle River, NJ: Pearson Prentice Hall. p. 602. ISBN 978-0-13-114560-3.*
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Geotechnical engineering

Offshore geotechnical engineering

Investigation and instrumentation

Field (*in situ*)

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

Soil	Types	○ Clay ○ Silt ○ Sand ○ Gravel ○ Peat ○ Loam ○ Loess
	Properties	○ Hydraulic conductivity ○ Water content ○ Void ratio ○ Bulk density ○ Thixotropy ○ Reynolds' dilatancy ○ Angle of repose ○ Friction angle ○ Cohesion ○ Porosity ○ Permeability ○ Specific storage ○ Shear strength ○ Sensitivity

Structures (Interaction)	Natural features	○ Topography ○ Vegetation ○ Terrain ○ Topsoil ○ Water table ○ Bedrock ○ Subgrade ○ Subsoil

	Earthworks	○ Shoring structures
		  ○ Retaining walls
		  ○ Gabion
		  ○ Ground freezing
		  ○ Mechanically stabilized earth
		  ○ Pressure grouting
		  ○ Slurry wall
		  ○ Soil nailing
		  ○ Tieback
		○ Land development
		○ Landfill
		○ Excavation
		○ Trench
		○ Embankment
		○ Cut
		○ Causeway
		○ Terracing
		○ Cut-and-cover
		○ Cut and fill
		○ Fill dirt
		○ Grading
		○ Land reclamation
		○ Track bed
		○ Erosion control
		○ Earth structure
		○ Expanded clay aggregate
		○ Crushed stone
		○ Geosynthetics
		  ○ Geotextile
		  ○ Geomembrane
		  ○ Geosynthetic clay liner
		  ○ Cellular confinement
		○ Infiltration

	Foundations	○ Shallow ○ Deep

Mechanics	Forces	○ Effective stress ○ Pore water pressure ○ Lateral earth pressure ○ Overburden pressure ○ Preconsolidation pressure

	Phenomena/ problems	○ Permafrost
		○ Frost heaving
		○ Consolidation
		○ Compaction
		○ Earthquake
		  ○ Response spectrum
		  ○ Seismic hazard
		  ○ Shear wave
		○ Landslide analysis
		  ○ Stability analysis
		  ○ Mitigation
		  ○ Classification
		  ○ Sliding criterion
		  ○ Slab stabilisation
		○ Bearing capacity * Stress distribution in soil

Numerical analysis software	○ SEEP2D ○ STABL ○ SVFlux ○ SVSlope ○ UTEXAS ○ Plaxis	

Related fields

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

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Soil science

- History
- Index

Main fields

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

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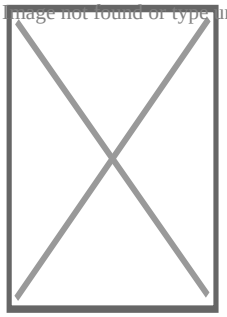

Soil topics

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

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- **t**
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Soil classification

World Reference Base for Soil Resources (1998–)	○ Acrisols ○ Alisols ○ Andosols ○ Anthrosols ○ Arenosols ○ Calcisols ○ Cambisols ○ Chernozem ○ Cryosols ○ Durisols ○ Ferralsols ○ Fluvisols ○ Gleysols ○ Gypsisols ○ Histosol ○ Kastanozems ○ Leptosols ○ Lixisols ○ Luvisols ○ Nitisols ○ Phaeozems ○ Planosols ○ Plinthosols ○ Podzols ○ Regosols ○ Retisols ○ Solonchaks ○ Solonetz ○ Stagnosol ○ Technosols ○ Umbrisols ○ Vertisols
USDA soil taxonomy	○ Alfisols ○ Andisols ○ Aridisols ○ Entisols ○ Gelisols ○ Histosols ○ Inceptisols ○ Mollisols

Applications

- Soil conservation
- Soil management
- 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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- Category soil science
- Image not found or type unknown List of soil scientists

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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

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Reviews for

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Jeffery James

(5)

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

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Sarah McNeily

(5)

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

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Jim de Leon

(5)

It was a pleasure to work with Rick and his crew. From the beginning, Rick listened to my concerns and what I wished to accomplish. Out of the 6 contractors that quoted the project, Rick seemed the MOST willing to accommodate my wishes. His pricing was definitely more than fair as well. I had 10 push piers installed to stabilize and lift an addition of my house. The project commenced at the date that Rick had disclosed initially and it was completed within the same time period expected (based on Rick's original assessment). The crew was well informed, courteous, and hard working. They were not loud (even while equipment was being utilized) and were well spoken. My neighbors were very impressed on how polite they were when they entered / exited my property (saying hello or good morning each day when they crossed paths). You can tell they care about the customer concerns. They ensured that the property would be put back as clean as possible by placing MANY sheets of plywood down prior to excavating. They compacted the dirt back in the holes extremely well to avoid large stock piles of soils. All the while, the main office was calling me to discuss updates and expectations of completion. They provided waivers of lien, certificates of insurance, properly acquired permits, and JULIE locates. From a construction background, I can tell you that I did not see any flaws in the way they operated and this an extremely professional company. The pictures attached show the push piers added to the foundation (pictures 1, 2 & 3), the amount of excavation (picture 4), and the restoration after dirt was placed back in the pits and compacted (pictures 5, 6 & 7). Please notice that they also sealed two large cracks and steel plated these cracks from expanding further (which you can see under my sliding glass door). I, as well as my wife, are extremely happy that we chose United Structural Systems for our contractor. I would happily tell any of my friends and family to use this contractor should the opportunity arise!

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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.

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