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Identifying Potential Excavation Hazards in Foundation Repair

Okay, so you're digging around a foundation, right? House settling can cause visible cracks that require immediate repair [professional slab foundation repair service](#) power tool. That's already a recipe for things getting tricky. OSHA's got rules about excavation for a reason, and when you're dealing with foundation repair, identifying potential hazards *before* you even break ground is absolutely critical. Think of it like this: your foundation is the backbone of the house, and you're messing with the ground around it. You need to know what's lurking down there.

First, there's the obvious stuff: utilities. Gas lines, water pipes, electrical conduits – hitting any of those is a major problem, from a safety standpoint and a cost standpoint. Before you even think about excavating, you've gotta call 811. They'll mark the locations of underground utilities, so you know where to steer clear. Don't just assume they're where you think they should be. Trust me, surprises underground are rarely good.

Then, think about the soil itself. Is it stable? Is it sandy and likely to collapse? Are you digging near existing structures that could be undermined? Soil type is a huge factor in determining what kind of shoring or sloping you'll need to prevent cave-ins. Cave-ins are the biggest killer in excavation work, so you need to take soil analysis seriously. A competent person (someone trained and qualified) needs to be on site to inspect the excavation and make sure it's safe.

Beyond utilities and soil, consider the environment. Is there heavy equipment operating nearby? Are there overhead power lines? Are you working in an area with a lot of pedestrian traffic? All of these are potential hazards that need to be addressed. You might need to put up barriers, reroute traffic, or implement specific safety procedures to protect workers and the public.

Finally, don't forget about the foundation itself. Is it already damaged? Is it unstable? Digging around a compromised foundation can make things even worse, potentially leading to collapse. You might need to provide additional support to the foundation before you even start excavating.

Basically, identifying potential hazards in foundation repair excavations is all about being thorough and thinking ahead. It's about asking "what could go wrong?" and then taking steps to prevent it. It's not just about following the rules; it's about keeping everyone safe.

Safe Excavation Practices: Soil Testing and Protective Systems

Okay, so you're digging a hole, right? Sounds simple, but OSHA's got thoughts, and those thoughts are basically about keeping you alive. We're talking about excavation projects, and

that means potentially dangerous situations. The first thing is understanding what kind of dirt you're dealing with. Soil testing isn't just some academic exercise; it tells you how likely that wall of earth is to come crashing down on your head. Is it solid rock? Great. Is it something resembling damp sugar? Not so great. You need to know, and that's where soil testing comes in.

Then comes the fun part: protective systems. Think of these as your safety net, or maybe a very sturdy shield against tons of collapsing earth. We're talking about shoring, sloping, and shielding. Shoring is like building a fortress inside the excavation, using timbers or metal supports to hold the walls back. Sloping involves cutting the sides of the excavation at an angle, so gravity is less likely to cause a collapse. Shielding, or trench boxes, are essentially giant metal boxes you put in the trench to protect workers inside.

Choosing the right system isn't a guessing game. OSHA has rules, and you need to follow them. They're not just being annoying; they're based on years of experience and, unfortunately, accidents. Meeting these regulations isn't just about avoiding fines (though that's a nice bonus). It's about making sure everyone goes home safe at the end of the day. It's about respecting the power of the earth and taking the necessary precautions to work safely within it. Ignoring OSHA on an excavation project? You're not just rolling the dice; you're betting lives. And that's a bet nobody should be willing to make.

Competent Person Requirements and Responsibilities

Okay, so you're digging a hole, right? No big deal, maybe for a new fence or something. But OSHA, they're all about making sure that hole doesn't turn into a disaster. And a big part of that is having a "Competent Person" on site. Think of them as your excavation safety guru.

This Competent Person, they're not just some random dude with a hard hat. They've got to have the training, the knowledge, and the experience to spot potential hazards in and around the excavation. We're talking things like unstable soil, underground utilities (nobody wants to hit a gas line!), hazardous atmospheres, and even just the right way to shore up the sides so the whole thing doesn't collapse.

Their responsibilities are pretty serious. They're the ones who inspect the excavation daily, or even more often if conditions change. They're looking for anything that could compromise safety. Found a crack in the soil that wasn't there yesterday? That's the Competent Person's job to notice it and figure out what to do. They have the authority to stop work if something's not right. Their decisions are about keeping people safe, period.

They also have to make sure protective systems, like trench boxes or sloping, are designed and installed correctly. And they're responsible for classifying the soil type, which is crucial for determining what kind of protection is even needed in the first place. It's not just guesswork; there are tests and procedures they need to know.

Basically, the Competent Person is the safety backbone of any excavation project that wants to stay on the right side of OSHA. They're there to identify, evaluate, and control hazards, making sure everyone goes home safe at the end of the day. It's a critical role, and it's a big reason why OSHA puts so much emphasis on having a qualified individual in that position. So if you're digging, make sure you've got a competent person watching your back – and the sides of that hole!

Equipment Safety and Inspection Protocols

Okay, let's talk about keeping everyone safe when we're digging holes, and how OSHA wants us to do it. Excavation projects, even seemingly small ones, can be seriously dangerous if we don't follow the rules. We're talking cave-ins, utility strikes, falls – stuff nobody wants to deal with. That's where Equipment Safety and Inspection Protocols come in.

Think of it like this: before you even fire up that backhoe, you need a plan. Part of that plan is making sure all your equipment is up to snuff. Are the brakes working? Are the seatbelts intact? Are the warning lights bright and clear? We're talking about everything from the big excavators to the smaller power tools and even the ladders. Regular, documented inspections are key. It's not enough to just glance at it and say, "Yeah, looks good." We need checklists, records, and someone designated to be responsible for making sure this stuff actually happens.

And it's not just about the equipment itself. It's about how we **use** it. Is the operator properly trained and certified? Are we following safe operating procedures? Are we using the right equipment for the job? For example, you wouldn't use a garden shovel to dig a trench that's four feet deep, right? Common sense, but you'd be surprised.

Then there's the whole "utilities" thing. Before you dig **anything**, you **have** to call 811 (or your local one-call number). You absolutely **must** know where those underground pipes and cables are. Striking a gas line or a power cable isn't just inconvenient; it's potentially fatal. The equipment you use for locating these utilities needs to be properly maintained and the people using it need to know exactly what they're doing.

OSHA has specific regulations covering all of this – everything from shoring and sloping to atmospheric testing. But honestly, it boils down to this: take the time to assess the risks, make sure your equipment is safe and functioning, train your people properly, and follow the rules. It's not just about avoiding fines; it's about making sure everyone goes home safe at the end of the day. Because at the end of the day, that's what really matters.

Trenching and Shoring Best Practices for Foundation Work

Okay, so you're digging a foundation, right? That's awesome, new building, new dreams. But hold on a sec – before you get too carried away, let's talk about keeping everyone safe, and by that, specifically, let's talk about trenching and shoring. OSHA doesn't mess around when it comes to excavations, and for good reason. A collapse in a trench can be absolutely devastating, even fatal. We're talking tons of soil here, and it happens faster than you can blink.

Think of it like this: you wouldn't drive a car without brakes, would you? Well, digging deep without proper trenching and shoring is just as risky. Best practices aren't just suggestions; they're the brakes on your excavation project.

What exactly are we talking about? Well, trenching is the actual digging, creating that narrow underground space. Shoring is the system you put in place to support the sides of the excavation, preventing them from collapsing. There are a few options here, like sloping or benching the sides, which means creating a gradual slope or steps to reduce the pressure. Or, you can use support systems like trench boxes, which are basically giant steel coffins that protect workers inside the trench. Sometimes, you'll use hydraulic shoring, which uses pressurized jacks to hold the walls in place. The best choice depends on the soil type, the depth of the excavation, and other site-specific factors.

Now, "best practices" aren't just about picking a system and hoping for the best. It starts with a competent person – someone who's trained and experienced in excavation safety – inspecting the trench daily, and ideally before each shift. They're looking for signs of instability: cracks in the soil, water seeping in, vibrations from nearby traffic. They're also making sure the shoring system is installed correctly and that workers are trained on how to use it safely.

Beyond just the physical elements, it's about communication, too. Everyone on the site needs to know the potential hazards and what to do in case of an emergency. Clear procedures need to be in place, and everyone needs to follow them. Ignoring a small crack or rushing the shoring process can have catastrophic consequences, so it's important to foster a culture of safety.

Meeting OSHA regulations isn't some optional extra; it's absolutely essential. It's not just about avoiding fines (though those can be hefty!), it's about protecting the lives of the people doing the hard work on your project. By implementing trenching and shoring best practices, you're creating a safe work environment, ensuring that everyone goes home safe at the end of the day. And that's something worth investing in.

Emergency Procedures and Hazard Communication

Okay, let's talk about staying safe when digging holes – because that's essentially what excavation is, right? And OSHA, well, they're the folks making sure we don't turn those holes into, you know, accidental graves. So, when we're talking about meeting OSHA

regulations during excavation projects, two big things pop up: Emergency Procedures and Hazard Communication.

Think about it: Excavation is inherently risky. You've got potential cave-ins, underground utilities, heavy machinery rumbling around, and all sorts of other hazards lurking. That's why having a solid plan for emergencies is absolutely critical. What happens if someone gets trapped in a trench? What's the protocol if we hit a gas line? Who's in charge of calling 911 and directing emergency services? These aren't questions you want to be scrambling to answer *after* something goes wrong. A well-defined emergency procedure, practiced and understood by everyone on site, can literally be the difference between life and death.

And then there's Hazard Communication, often shortened to "HazCom." This is all about making sure everyone knows what dangers are present on the job site. Are there unstable soil conditions? Are we working near power lines? Is there a risk of encountering hazardous materials underground? HazCom requires clear communication about these risks, typically through things like safety meetings, warning signs, and proper training. Think of it as keeping everyone in the loop so they can make informed decisions and avoid preventable accidents.

Ultimately, both Emergency Procedures and Hazard Communication are about being proactive. It's about anticipating potential problems and having a plan in place to deal with them. It's not just about ticking boxes to satisfy OSHA; it's about creating a culture of safety where everyone looks out for each other and goes home safe at the end of the day. Because at the end of the day, nobody wants to be a statistic. So, let's dig smart, dig safe, and make sure everyone knows the plan.

Compliance Documentation and Record Keeping

Okay, so you're digging a hole, right? Excavation. It's more than just dirt flying; it's a serious business, especially when OSHA gets involved. And OSHA *will* get involved because, well, digging holes can be surprisingly dangerous. That's where compliance documentation and record keeping come in. Think of it as your "CYA" file, but instead of covering your backside from a personal blunder, it's protecting your entire crew and your company from serious repercussions if something goes wrong – or, even better, preventing something from going wrong in the first place.

Basically, you need to prove you're playing by the rules. What rules? All the OSHA rules about excavation. That means having a competent person (someone who knows their stuff about soil types, shoring, sloping, and all that jazz) inspect the site daily, *before* work starts, and after any event that could mess with the excavation, like rain. And you can't just say they inspected it; you need to document it. Date, time, findings, any corrective actions taken – all written down.

Then there's the training. Did everyone on the crew get the proper training for the tasks they're doing? Proof, please. Training records, certifications, anything that shows they're not just winging it. Permits? Utility locates? Soil classification reports? All that goes in the file.

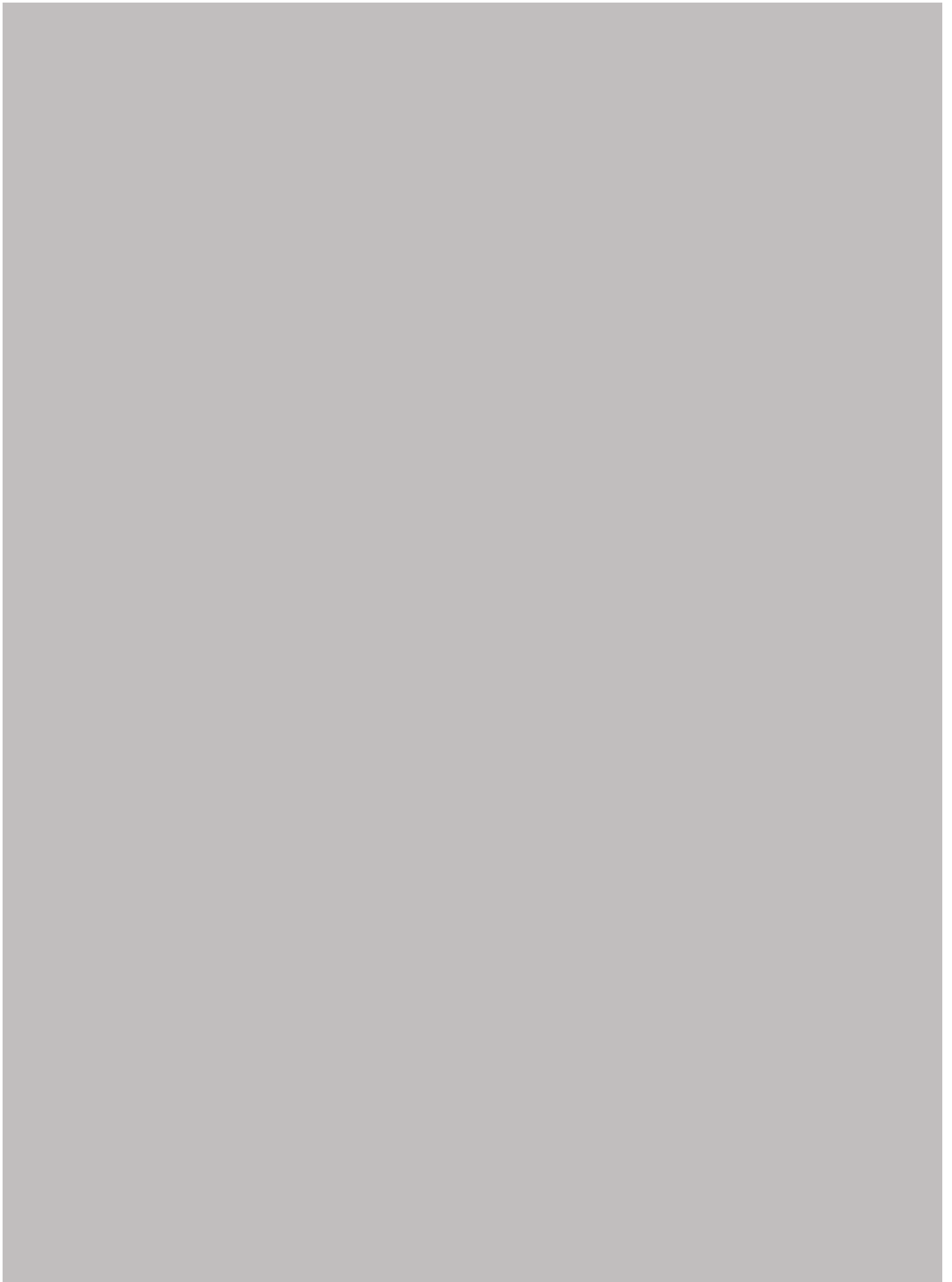
And it's not just about collecting the documents, it's about keeping them organized and easily accessible. Imagine an OSHA inspector shows up and asks to see your shoring plan. You don't want to be scrambling through a pile of papers; you want to pull it out quickly and confidently.

Look, nobody *likes* paperwork. But in excavation, good compliance documentation and record keeping isn't just about avoiding fines; it's about creating a culture of safety. It forces you to think through the potential hazards, plan accordingly, and ensure everyone is on the same page. It's literally the difference between a safe, productive project and a potential disaster. So dig that hole, but also dig into those regulations and keep those records straight. Your crew, and your business, will thank you for it.

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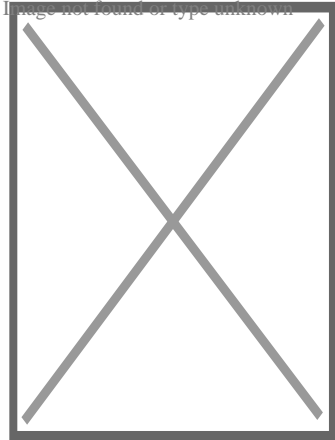
Strong Foundations, Strong Homes



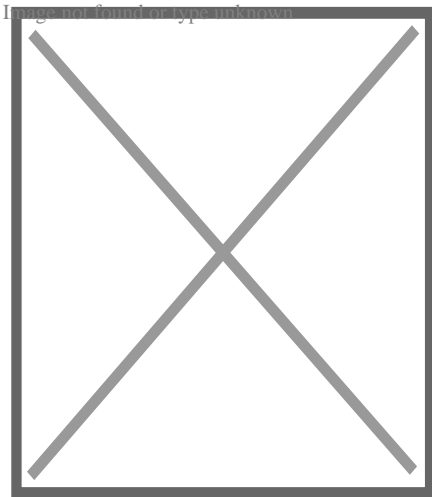
About bedrock

For other uses, see [Bedrock](#) (disambiguation).

"[Subsurface](#)" redirects here. For other uses, see [Subsurface](#) (disambiguation).



Soil with broken rock fragments overlying bedrock, Sandside Bay, Caithness, Scotland



Soil profile with bedrock labeled R

In geology, **bedrock** is solid rock that lies under loose material (regolith) within the crust of Earth or another terrestrial planet.

Definition

[edit]

Bedrock is the solid rock that underlies looser surface material.^[1] An exposed portion of bedrock is often called an outcrop.^[2] The various kinds of broken and weathered rock material, such as

soil and subsoil, that may overlie the bedrock are known as regolith.^{[3][4]}

Engineering geology

[edit]

The surface of the bedrock beneath the soil cover (regolith) is also known as *rockhead* in engineering geology,^{[5][6]} and its identification by digging, drilling or geophysical methods is an important task in most civil engineering projects. Superficial deposits can be very thick, such that the bedrock lies hundreds of meters below the surface.^[7]

Weathering of bedrock

[edit]

Exposed bedrock experiences weathering, which may be physical or chemical, and which alters the structure of the rock to leave it susceptible to erosion. Bedrock may also experience subsurface weathering at its upper boundary, forming saprolite.^[8]





Geologic map

[edit]

A geologic map of an area will usually show the distribution of differing bedrock types, rock that would be exposed at the surface if all soil or other superficial deposits were removed. Where superficial deposits are so thick that the underlying bedrock cannot be reliably mapped, the superficial deposits will be mapped instead (for example, as alluvium).^[9]

See also

[edit]

-  [Geology portal](#)
-  [Geography portal](#)
-  [Maps portal](#)
-  [Minerals portal](#)

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[edit]

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External links

[edit]

-  Media related to Bedrock at Wikimedia Commons





















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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

Soil

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- Sand
- Gravel
- Peat
- Loam
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- Thixotropy
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- Friction angle
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(Interaction)**

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- Erosion control
- Earth structure
- Expanded clay aggregate
- Crushed stone
- Geosynthetics
 - Geotextile
 - Geomembrane
 - Geosynthetic clay liner
 - Cellular confinement
- Infiltration

Foundations

- Shallow
- Deep

Forces

- Effective stress
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- Overburden pressure
- Preconsolidation pressure

Mechanics

Phenomena/ problems

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 - Seismic hazard
 - Shear wave
- Landslide analysis
 - Stability analysis
 - Mitigation
 - Classification
 - Sliding criterion
 - Slab stabilisation
- Bearing capacity * Stress distribution in soil

Numerical analysis software

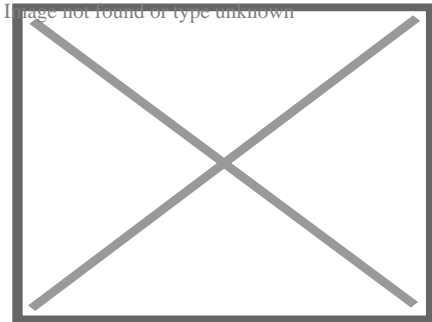
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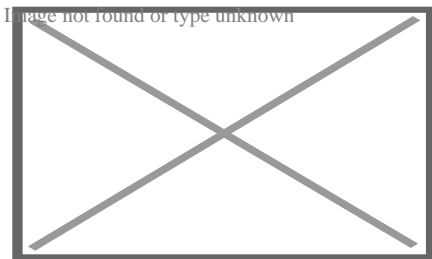
- Geology
- Geochemistry
- Petrology
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- Soil science
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- Hydrogeology
- Biogeography
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About concrete slab



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 $2.0 \text{ W m}^{-1} \text{ K}^{-1}$. [⁸] This is relatively high when compared to other materials, for example the conductivity of wood may be as low as $0.04 \text{ W m}^{-1} \text{ K}^{-1}$. 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]

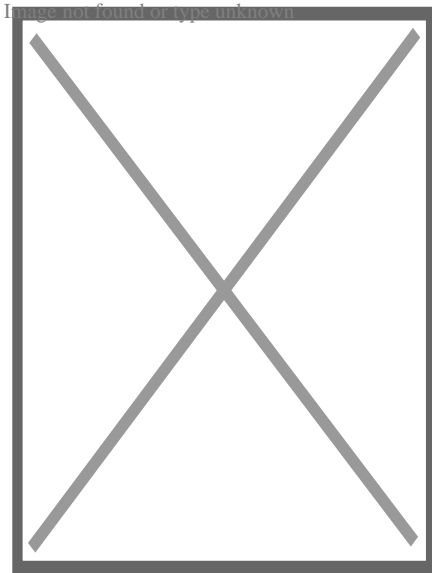
Insulation

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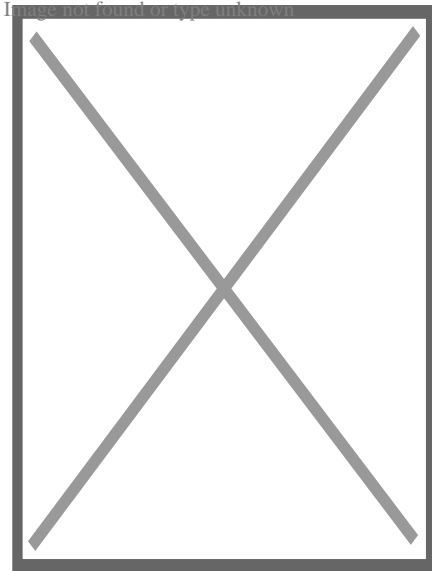
Without insulation, concrete slabs cast directly on the ground can cause a significant amount of extraneous energy transfer by conduction, resulting in either lost heat or unwanted heat. In modern construction, concrete slabs are usually cast above a layer of insulation such as expanded polystyrene, 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.



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 side. 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 (

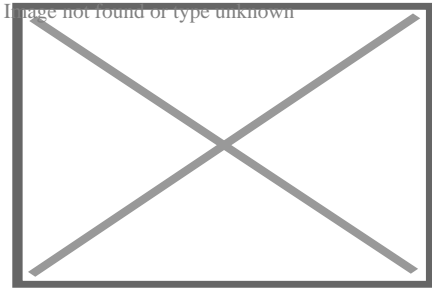
see below).

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]

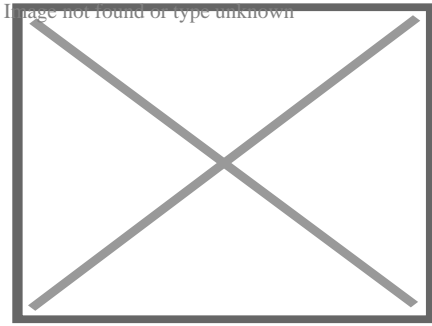
Unreinforced or "plain"^[18] slabs are becoming rare and have limited practical applications, with one exception being the mud slab (

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 $\frac{l_1}{l_2} \geq 2$, the short dimension and $\frac{l_1}{l_2} < 2$, 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

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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

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

Composition

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

Production

- o Plant
- o Concrete mixer
- o Volumetric mixer
- o Reversing drum mixer
- o Slump test
- o Flow table test
- o Curing
- o Concrete cover
- o Cover meter
- o 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

-  Category:Concrete

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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

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Driving Directions in Cook County

Driving Directions From Palmisano (Henry) Park to

Driving Directions From Lake Katherine Nature Center and Botanic Gardens to

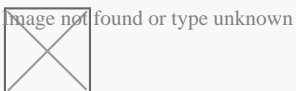
Driving Directions From Navy Pier to

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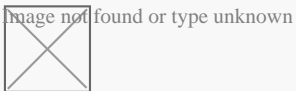
Reviews for



Jeffery James

(5)

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

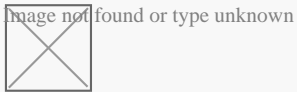


Sarah McNeily

(5)

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

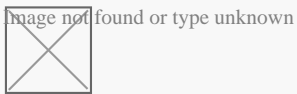
job site meticulously clean. The crew was on time and friendly. I'd recommend them any day! Thanks to Jessie and crew.



Jim de Leon

(5)

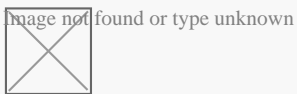
It was a pleasure to work with Rick and his crew. From the beginning, Rick listened to my concerns and what I wished to accomplish. Out of the 6 contractors that quoted the project, Rick seemed the MOST willing to accommodate my wishes. His pricing was definitely more than fair as well. I had 10 push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



Chris Abplanalp

(5)

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



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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