Residential Foundation

- **Recognizing Shifts in the Home Foundation**
  Recognizing Shifts in the Home Foundation Subtle Clues That Indicate Structural Changes Early Indicators of Potential Foundation Damage Observing Signs of Settlement in Floors Identifying Hairline Cracks and Surface Gaps Evaluating Tilted Door Frames and Window Alignment Understanding Bowed Wall Patterns in Basements Detecting Weak Spots Beneath Interior Flooring Uncovering Gradual Shifts in Support Beams Pinpointing Areas Prone to Moisture Intrusion Checking for Stair-Step Cracks Along Walls Preventing Growth of Small Foundation Cracks
- **Exploring Slab on Grade Construction Details**
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residential foundation repair service soil mechanics.

In the vast and intricate world of architecture and construction, the ability to recognize subtle clues that indicate structural changes is a valuable skill. These clues, often overlooked by the untrained eye, can provide critical insights into the health and stability of a building. Understanding these signs not only helps in maintaining the integrity of structures but also in preventing potential disasters.

One of the most common yet overlooked indicators of structural changes is the appearance of cracks. While minor cracks might be dismissed as mere cosmetic issues, they can often be the first sign of more serious underlying problems. For instance, vertical cracks in walls might suggest foundation settlement, whereas horizontal cracks could indicate lateral pressure, possibly due to soil expansion or water pressure. Paying close attention to the pattern, width, and location of these cracks can help in early diagnosis and timely intervention.

Another subtle clue to watch for is the shifting of door and window frames. If doors and windows suddenly become difficult to open or close, it may signal that the building's structure is shifting. This could be due to subsidence, where the ground beneath the building sinks, or it might be a result of expansive soil movements. Regular checks on the ease of operation of these fixtures can serve as an early warning system for structural changes.

Changes in the building's floors can also provide important clues. Uneven floors, where certain areas seem to slope or dip, can indicate foundation issues. Similarly, if tiles or floorboards start to buckle or lift, it might suggest that the ground beneath is shifting. Walking through a building and paying attention to any changes in the levelness of the floor can help in identifying these subtle signs of structural change.

Water stains and dampness are other telltale signs that should not be ignored. While these might initially appear as mere maintenance issues, they can often be symptoms of structural problems. For example, water stains on ceilings or walls might indicate a leaking roof, but they could also suggest that the building's structure is allowing water to penetrate in ways it shouldn't. Persistent dampness can lead to the deterioration of building materials, further exacerbating structural issues.

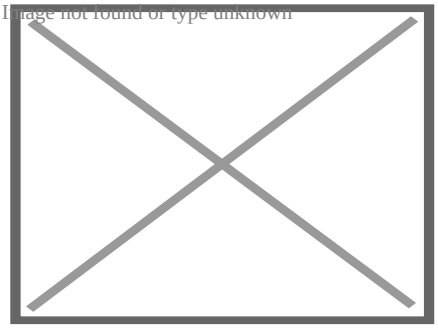
The sound of a building can also offer clues about its structural integrity. A building that creaks or groans more than usual might be experiencing stress or movement within its structure. While some sounds are normal, especially in older buildings, a change in the

usual noise level or type can indicate that something is amiss. Listening to the building, especially during different weather conditions, can help in detecting these subtle changes.

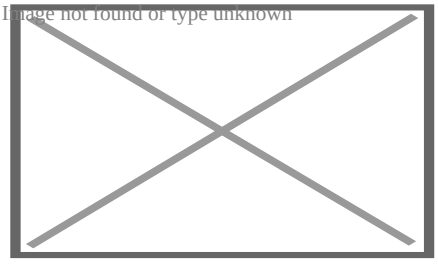
Finally, changes in the building's exterior, such as the leaning of chimneys or the shifting of gutters, can also indicate structural changes. A chimney that appears to be leaning more than usual might suggest foundation movement, while gutters that no longer drain properly could be a sign of settling or shifting of the building's frame.

In conclusion, recognizing the subtle clues that indicate structural changes requires a keen eye and a thorough understanding of building dynamics. By paying attention to cracks, the operation of doors and windows, the condition of floors, signs of water and dampness, unusual sounds, and changes in the building's exterior, one can stay ahead of potential structural issues. These subtle signs, when heeded, can make the difference between a safe, stable building and one that is at risk of failure.

About concrete slab



Suspended slab under construction, with the formwork still in place



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

A **concrete slab** is a common structural element of modern buildings, consisting of a flat, horizontal surface made of cast concrete. Steel-reinforced slabs, typically between 100 and 500 mm thick, are most often used to construct floors and ceilings, while thinner *mud slabs*

may be used for exterior paving (see below).[1][2]

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

see § Design for more types):

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

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

Thermal performance

[edit]

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

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

Thermal conductivity

[edit]

Thermal conductivity of a concrete slab indicates the rate of heat transfer through the solid mass by conduction, usually in regard to heat transfer to or from the ground. The coefficient of thermal conductivity, *k*, is proportional to density of the concrete, among other factors.[5] The primary influences on conductivity are moisture content, type of aggregate, type of cement,

constituent proportions, and temperature. These various factors complicate the theoretical evaluation of a *k*-value, since each component has a different conductivity when isolated, and the position and proportion of each components affects the overall conductivity. To simplify this, particles of aggregate may be considered to be suspended in the homogeneous cement. Campbell-Allen and Thorne (1963) derived a formula for the theoretical thermal conductivity of concrete.[6] In practice this formula is rarely applied, but remains relevant for theoretical use. Subsequently, Valore (1980) developed another formula in terms of overall density.[7] However, this study concerned hollow concrete blocks and its results are unverified for concrete slabs.

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

see § Insulation).

Thermal mass

[edit]

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

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

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

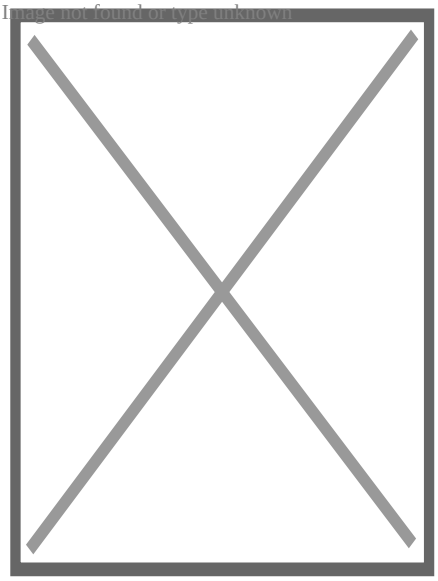
Insulation

[edit]

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

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

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



Formwork set for concrete pour.

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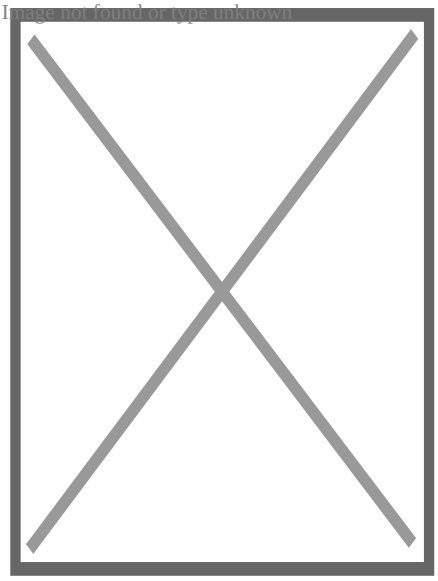

Concrete poured into formwork. This slab is ground-bearing and reinforced with steel rebar.

Design

[edit]
Further information: Marcus' method

Ground-bearing slabs

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

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

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

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

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

support the curing concrete and its reinforcement.

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

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

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

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

see below).

Suspended slabs

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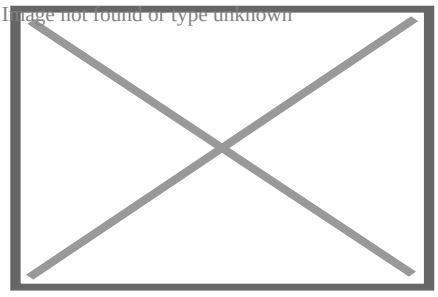
For a suspended slab, there are a number of designs to improve the strength-to-weight ratio. In all cases the top surface remains flat, and the underside is modulated:

- 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

[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]

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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 $\displaystyle L_x$, $\displaystyle L_y$ where $\displaystyle L_x$ is

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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

[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

References

[edit]

1. **^** Garber, G. Design and Construction of Concrete Floors. 2nd ed. Amsterdam: Butterworth-Heinemann, 2006. 47. Print.
2. **^** Duncan, Chester I. Soils and Foundations for Architects and Engineers. New York: Van Nostrand Reinhold, 1992. 299. Print.
3. **^** *"Ground slabs - Introduction". www.dlsweb.rmit.edu.au. Archived from the original on 2019-11-18. Retrieved 2017-12-07.*
4. **^** *"What is a rib and block slab?". www.royalconcreteslabs.co.za. Royal concrete slabs.*
5. ^ ***a b c d e*** *Cavanaugh, Kevin; et al. (2002). Guide to Thermal Properties of Concrete and Masonry Systems: Reported by ACI Committee 122. American Concrete Institute.*
6. ^ ***a b*** *Campbell-Allen, D.; Thorne, C.P. (March 1963). "The thermal conductivity of concrete". Magazine of Concrete Research.* ***15*** *(43): 39–48. doi:10.1680/macr.1963.15.43.39. UDC 691.32.001:536.21:691.322.*
7. **^** *Valore, R.C. Jr. (February 1980). "Calculation of U-values of Hollow Concrete Masonry". Concrete International.* ***2****: 40–63.*
8. **^** *Young, Hugh D. (1992). "Table 15.5". University Physics (7th ed.). Addison Wesley. ISBN 0201529815.*
9. **^** *Sabnis, Gajanan M.; Juhl, William (2016). "Chapter 4: Sustainability through Thermal Mass of Concrete". Green Building with Concrete: Sustainable Design and Construction (2nd ed.). Taylor & Francis Group. ISBN 978-1-4987-0411-3.*
10. ^ ***a b c d e*** *Garber, George (2006). Design and Construction of Concrete Floors (2nd ed.). Amsterdam: Butterworth-Heinemann. ISBN 978-0-7506-6656-5.*

11. **^** *"What is a polystyrene concrete slab?". www.royalconcreteslabs.co.za. Royal concrete slabs.*
12. ^ ***a b*** *McKinney, Arthur W.; et al. (2006). Design of Slabs-on-Ground: Reported by ACI Committee 360 (PDF). American Concrete Institute. Archived from the original (PDF) on 2021-05-08. Retrieved 2019-04-04.*
13. ^ ***a b c*** *Staines, Allan (2014). The Australian House Building Manual. Pinedale Press. pp. 40–41. ISBN 978-1-875217-07-6.*
14. **^** *"Concrete in Practice 11 - Curing In-Place Concrete" (PDF). Engineering.com. National Ready Mixed Concrete Association. Archived from the original (PDF) on 4 April 2019. Retrieved 4 April 2019.*
15. **^** *"Ribbed Slabs Datasheet" (PDF). Kaset Kalip. Archived from the original (PDF) on 29 March 2018. Retrieved 4 April 2019.*
16. **^** *"Ribbed and waffle slabs". www.concretecentre.com. Retrieved 2019-04-04.*
17. **^** *Concrete Framed Buildings: A Guide to Design and Construction. MPA The Concrete Centre. 2016. ISBN 978-1-904818-40-3.*
18. **^** *Garrison, Tim (19 February 2014). "Clearing the confusion on 'plain concrete'". Civil & Structural Engineer. Archived from the original on 8 May 2019. Retrieved 8 May 2019.*
19. **^** *Walker, Wayne. "Reinforcement for slabs on ground". Concrete Construction. Retrieved 8 May 2019.*
20. **^** *"Rupture depth of an unreinforced concrete slab on grade" (PDF). Aluminium Association of Florida, Inc. Archived from the original (PDF) on 2020-09-26. Retrieved 2019-05-08.*
21. **^** *Arcoma, Peter. "What is a mud slab?". Builder-Questions.com. Retrieved 8 May 2019.*
22. **^** *Postma, Mark; et al. "Floor Slabs". Whole Building Design Guide. National Institute of Building Sciences. Retrieved 8 May 2019.*
23. **^** *Gilbert, R. I. (1980). UNICIV Report 211 (PDF). University of New South Wales.*
24. **^** *Prieto-Portar, L. A. (2008). EGN-5439 The Design of Tall Buildings; Lecture #14: The Design of Reinforced Concrete Slabs (PDF). Archived from the original (PDF) on 2017-08-29. Retrieved 2019-04-04.*
25. **^** *"What is the difference between one way and two way slab?". Basic Civil Engineering. 16 June 2019. Retrieved 8 July 2019.*
26. **^** *Concrete Basics: A Guide to Concrete Practice (6th ed.). Cement Concrete & Aggregates Australia. 2004. p. 53.*
27. **^** *Nemati, Kamran M. (2005). "Temporary Structures: Formwork for Concrete" (PDF). Tokyo Institute of Technology. Archived from the original (PDF) on 12 July 2018. Retrieved 4 April 2019.*

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

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About ceiling

For other uses, see Ceiling (disambiguation).

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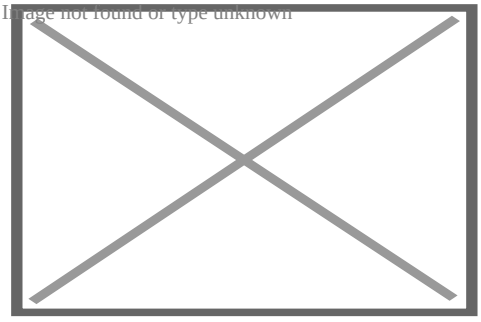

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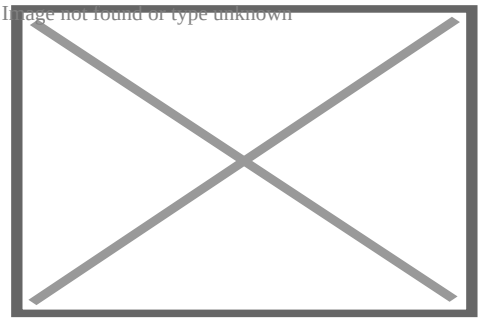

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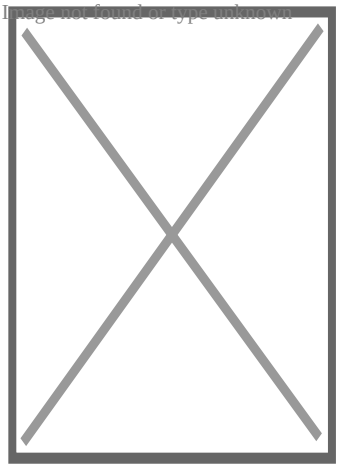

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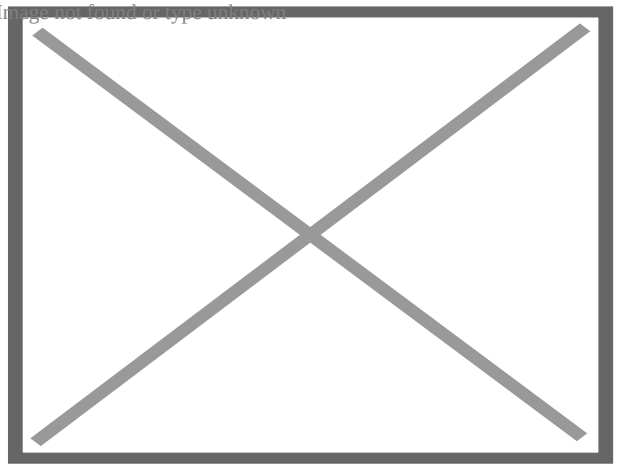

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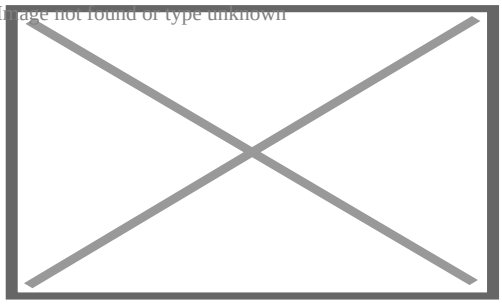

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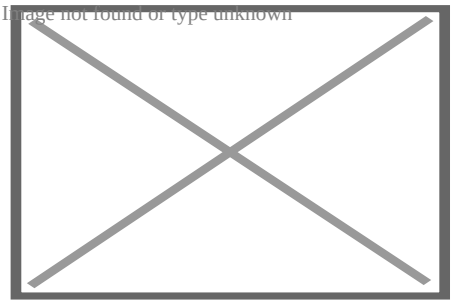


Various examples of ornate ceilings

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

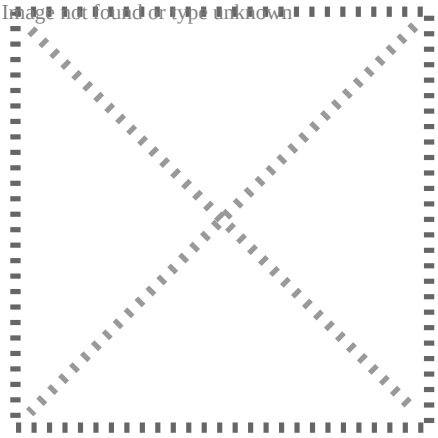
The most common type of ceiling is the dropped ceiling,[*citation needed*] which is suspended from structural elements above. Panels of drywall are fastened either directly to the ceiling joists or to a few layers of moisture-proof plywood which are then attached to the joists. Pipework or ducts can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

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

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

Types

[edit]



California tract home with an open-beam ceiling, 1960

Ceilings are classified according to their appearance or construction. A cathedral ceiling is any tall ceiling area similar to those in a church. A dropped ceiling is one in which the finished surface is constructed anywhere from a few inches or centimeters to several feet or a few meters below the structure above it. This may be done for aesthetic purposes, such as achieving a desirable ceiling height; or practical purposes such as acoustic damping or providing a space for HVAC or piping. An inverse of this would be a raised floor. A concave or barrel-shaped ceiling is curved or rounded upward, usually for visual or acoustical value, while a coffered ceiling is divided into a grid of recessed square or octagonal panels, also called a

"lacunar ceiling". A cove ceiling uses a curved plaster transition between wall and ceiling; it is named for cove molding, a molding with a concave curve.[1] A stretched ceiling (or stretch ceiling) uses a number of individual panels using material such as PVC fixed to a perimeter rail.[2]

Elements

[edit]

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

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

Fire-resistance rated ceilings

[edit]

The most common ceiling that contributes to fire-resistance ratings in commercial and residential construction is the dropped ceiling. In the case of a dropped ceiling, the rating is achieved by the entire system, which is both the structure above, from which the ceilings is suspended, which could be a concrete floor or a timber floor, as well as the suspension mechanism and, finally the lowest membrane or dropped ceiling. Between the structure that the dropped ceiling is suspended from and the dropped membrane, such as a T-bar ceiling or a layer of drywall, there is often some room for mechanical and electrical piping, wiring and ducting to run.

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

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

- Image not found or type unknown

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

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

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

Gallery

[edit]

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

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

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

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

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

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

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

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

- Neoclassical ceiling of the Salle Duchâtel in the Louvre Palace, with The Triumph of French Pai

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Neoclassical ceiling of the Salle Duchâtel in the Louvre Palace, with The Triumph of French Painting. Apotheosis of Poussin, Le Sueur and Le Brun in the centre, by

Charles Meynier, 1822, and ceilings panels with medallion portraits of French painters, 1828-1833[8]

- Neoclassical ceiling of the Mollien staircase in the Louvre Palace, designed by Hector Lefuel in

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

Moorish Revival ceiling in the Nicolae T. Filitti/Nae Filitis House (Calea Doroban?ilor no. 18), Bu

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

Demonstrative reconstruction of a Roman suspended ceiling in an Imperial palace of circa AD 3

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  Demonstrative reconstruction of a Roman suspended ceiling in an Imperial palace of circa AD 306 at Trier, Italy
- Part of the ceiling of the Sistine Chapel in Vatican City in Rome, showing the ceiling in relation t

Image not found or type unknown
Part of the ceiling of the Sistine Chapel in Vatican City in Rome, showing the ceiling in relation to the other frescoes

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

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

- Painted ceiling in Liège, Belgium

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Painted ceiling in Liège, Belgium

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

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Traditional Chinese ceiling of Dayuan Renshou Temple at Taoyuan, Taiwan

- Dropped ceiling

Image not found or type unknown

Dropped ceiling

- Wooden beam ceiling

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Wooden beam ceiling

See also

[edit]

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

References

[edit]

1. **^** *"Casa de las Ratas 2/2/2003". Archived from the original on September 29, 2008. Retrieved September 14, 2008.*
2. **^** *Corky Binggeli (2011). Interior Graphic Standards: Student Edition. John Wiley & Sons. p. 220. ISBN 978-1-118-09935-3.*
3. **^** *Meyers-Levy, Joan; Zhu, Rui (Juliet) (August 2007). "The Influence of Ceiling Height: The Effect of Priming on the Type of Processing That People Use". Journal of Consumer Research.* ***34*** *(2): 174–186. doi:10.1086/519146. JSTOR 10.1086/519146. S2CID 16607244.*
4. **^** *Melvin, Jeremy (2006). …isme S? În?elegem Stilurile Arhitecturale (in Romanian). Enciclopedia RAO. p. 39. ISBN 973-717-075-X.*
5. **^** *Bresc-Bautier, Geneviève (2008). The Louvre, a Tale of a Palace. Musée du Louvre Éditions. p. 26. ISBN 978-2-7572-0177-0.*
6. **^** *Bresc-Bautier, Geneviève (2008). The Louvre, a Tale of a Palace. Musée du Louvre Éditions. p. 30. ISBN 978-2-7572-0177-0.*
7. **^** *Bresc-Bautier, Geneviève (2008). The Louvre, a Tale of a Palace. Musée du Louvre Éditions. p. 55. ISBN 978-2-7572-0177-0.*
8. **^** *Bresc-Bautier, Geneviève (2008). The Louvre, a Tale of a Palace. Musée du Louvre Éditions. p. 106. ISBN 978-2-7572-0177-0.*
9. **^** *Bresc-Bautier, Geneviève (2008). The Louvre, a Tale of a Palace. Musée du Louvre Éditions. p. 138. ISBN 978-2-7572-0177-0.*
10. **^** *Marinache, Oana (2015). Ernest Donaud - visul liniei (in Romanian). Editura Istoria Artei. p. 79. ISBN 978-606-94042-8-7.*

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

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Rooms and spaces of a house

Shared rooms

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

Private rooms

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

Spaces

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

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

Great house areas

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

Other

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

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

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- Home repair
- Shed
- Tree house

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River Trail Nature Center

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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

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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.

Subtle Clues That Indicate Structural Changes**View GBP**

Frequently Asked Questions

What are the most common subtle signs of foundation issues?

The most common subtle signs include small cracks in walls or floors, doors and windows that stick or dont close properly, and slight unevenness in the floor.

How can I differentiate between normal settling and serious foundation problems?

Normal settling typically results in minor cracks and slight unevenness, whereas serious foundation problems often show larger cracks, significant floor slopes, and multiple issues like sticking doors and windows across different areas of the home.

When should I seek professional help for these subtle clues?

Seek professional help if you notice multiple signs, if the signs are worsening over time, or if youre unsure about the severity of the issues. Early intervention can prevent more costly repairs later.

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