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Understanding Shifting Soils in Changing Seasons Early Signs of Drainage Issues in Wet Climates Identifying Freeze and Thaw Patterns in Foundation Movement Monitoring Summer Drought Effects on Concrete Recognizing the Role of Poor Grading in Soil Settlement Observing Spring Rains That Affect Foundation Stability Evaluating Temperature Fluctuations and Their Impact on Slab Integrity Addressing Expanding Clay in Variable Weather Managing Water Accumulation Around Foundation Walls Tracking Seasonal Rainfall Data for Preventive Measures Comparing Different Regional Climate Patterns for Foundation Health Avoiding Oversaturation With Proper Yard Drainage
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Addressing Expanding Clay in Variable Weather

Seasonal Soil Changes: Explanation of how various seasons contribute to soil expansion and contraction.

Expanding clay, often referred to as expansive soil, presents a significant challenge in many parts of the world due to its unique mechanical properties and its responsiveness to moisture changes.

Addressing Expanding Clay in Variable Weather – waterproofing

1. drainage
2. carbon
3. waterproofing

Understanding the mechanics of expanding clay under variable weather conditions is crucial for civil engineers, architects, and builders who aim to design resilient infrastructures.

Expansive soils contain minerals such as montmorillonite that absorb water and swell. When these clays dry out, they shrink significantly. This characteristic makes them highly susceptible to environmental changes, particularly in regions where weather conditions fluctuate dramatically between wet and dry seasons. The cycles of swelling and shrinking can exert considerable pressure on structures built upon or within these soils, leading to structural damage such as cracked foundations, uneven floors, and distorted walls.

The primary factor influencing the behavior of expansive clay is moisture content. During periods of heavy rainfall or high humidity, these soils absorb water rapidly and expand. Conversely, during droughts or hot weather spells when evaporation rates are high, they lose moisture and contract. Soil settlement is a common cause of cracks **Retrofit Foundation Services** steel. This constant change in volume can destabilize buildings if not properly managed.

Addressing the challenges posed by expanding clay begins with a thorough understanding of local climatic patterns and soil composition. Site assessments should include soil testing for mineral content and plasticity index—a measure of how much a soil can deform before it cracks or breaks. Armed with this data, engineers can predict how the soil will behave under different weather scenarios.

Several strategies exist for mitigating the risks associated with expansive soils. One approach is soil stabilization—modifying the properties of the clay to reduce its expansion potential. This can involve chemical treatment using lime or cement admixtures that alter the soil's structure at a molecular level.

Another technique involves designing flexible foundation systems that accommodate movement without transferring stress into the structure above. For instance, pier-and-beam foundations allow for slight shifts in ground position without causing harm to the building itself.

Moreover, controlling surface water drainage around structures is vital; ensuring proper grading away from foundations minimizes water infiltration into the ground beneath buildings. Additionally, landscaping choices play a role—planting trees with deep roots away from structures helps stabilize moisture levels in surrounding soils.

In conclusion, understanding the mechanics of expanding clay under variable weather conditions necessitates an interdisciplinary approach combining geology, meteorology, engineering design principles, and practical construction techniques. By anticipating how these dynamic materials will respond over time—and planning accordingly—builders can significantly reduce risks associated with expansive soils while ensuring long-term durability and safety of their projects.

Expanding clay soils pose a significant challenge for homeowners and builders, particularly in regions where variable weather is the norm. These soils, known for their ability to swell when wet and shrink when dry, can exert tremendous pressure on building foundations. Understanding the signs of foundation damage due to expanding clay is crucial for early intervention and prevention of severe structural issues.

The impact of expanding clay begins with its interaction with moisture. During periods of heavy rainfall or snowmelt, the soil absorbs water and expands. Conversely, during dry spells, it contracts as the moisture evaporates. This constant expansion and contraction create a phenomenon known as "soil heave," which can lead to substantial stress on building foundations.

One of the primary indicators of foundation damage caused by expanding clay is the appearance of cracks in walls and floors. These cracks often start small but can widen over time if not addressed promptly. They typically manifest in a stair-step pattern along brickwork or at an angle across drywall surfaces. The presence of such cracks should prompt immediate investigation into potential soil movement beneath the foundation.

Another telltale sign is doors and windows that become difficult to open or close properly. As the foundation shifts due to soil movement, frames can become skewed or misaligned, leading to jamming or sticking mechanisms. This symptom not only indicates possible foundation upheaval but also serves as an annoyance in daily life.

Uneven floors are another symptom that may suggest expanding clay is wreaking havoc beneath a home. Homeowners might notice slight dips or slopes in flooring that were previously level, indicating uneven support from below as the foundation adjusts to varying soil pressures.

Moreover, gaps around exterior doors or between bricks may also denote foundation issues linked to expanding clay soils. As these soils move, they can cause parts of a building's structure to pull away from each other, creating visible separations that require attention.

In addressing these challenges posed by expanding clay in variable weather conditions, several preventative measures are advisable. Proper drainage systems around a property are essential; ensuring gutters direct water away from foundations reduces moisture absorption by surrounding soil. Additionally, installing root barriers can prevent trees and large shrubs from extracting excessive moisture near foundations during dry spells.

Regular maintenance checks are vital for spotting early signs of trouble before they escalate into major repairs. Engaging with professionals who specialize in soil analysis and foundation repair can provide homeowners with tailored solutions suited to their specific environmental conditions.

Ultimately, awareness and proactive management are key when dealing with expanding clay soils amidst fluctuating weather patterns. By recognizing early warning signs and implementing strategic measures, homeowners can mitigate risks associated with this natural yet formidable force beneath their homes—ensuring stability and peace of mind despite nature's unpredictability.

Posted by on

Posted by on

Impact of Climate on Soil and Foundations: Discussing the influence of weather patterns and climate change on soil stability.

Expanding clay soils present a unique challenge for homeowners and builders alike, especially in regions where weather conditions fluctuate dramatically. These soil types have the ability to expand when wet and contract when dry, leading to significant stress on building foundations. As a result, cracks can develop in the foundation, posing potential structural risks. To effectively address these issues, it is crucial to employ various techniques for assessing foundation cracks and determining their severity.

One of the primary methods for assessing foundation cracks involves a thorough visual inspection. This initial assessment allows homeowners or inspectors to identify visible signs of distress in the foundation. Cracks can vary greatly in size, from hairline fractures to more pronounced gaps. During a visual inspection, it's essential to note the location, length, width, and pattern of each crack. Horizontal cracks may suggest pressure from expanding soil or water pressure, while vertical cracks might indicate settling issues.

Beyond visual inspections, measuring tools provide more precise data about the state of foundation cracks. Crack monitors or gauges can be installed on existing cracks to track any changes over time. These simple devices measure movement across a crack by providing accurate readings of any widening or shifting that occurs as weather conditions change. By consistently monitoring these measurements over time, it becomes possible to understand whether the cracking is stable or progressing.

Another advanced technique involves employing non-destructive testing (NDT) methods such as ground-penetrating radar (GPR) or ultrasonic testing. These technologies allow inspectors to examine below-the-surface conditions without causing additional damage to the structure. GPR uses radar pulses to image the subsurface and detect voids or changes in material composition that could indicate areas of concern related to expanding clays.

Soil analysis is also an integral part of assessing foundation stability in areas susceptible to expansive clay soils. By examining soil samples taken from around the foundation site, specialists can determine moisture content and clay mineral composition—two critical factors influencing expansion behavior. Understanding these properties helps predict future movements and guide appropriate remediation measures.

Once comprehensive data has been collected through these assessment techniques, evaluating crack severity is crucial for deciding on remedial actions. Minor hairline cracks

might necessitate only routine monitoring and maintenance; however, larger or growing fractures often require immediate attention due to their potential impact on structural integrity.

For severe cases linked with expanding clay issues exacerbated by variable weather patterns—such as intense rainfall followed by drought—a combination approach may be needed: underpinning systems like steel piers stabilize foundations against further movement; installing proper drainage solutions diverts excess water away from vulnerable areas; modifying landscaping practices reduces surface runoff into critical zones near structures.

In conclusion, addressing expanding clay challenges requires diligent application of both traditional inspection methods combined with modern technology-driven approaches tailored specifically towards understanding underlying causes behind observed symptoms like cracked foundations caused primarily due unpredictable climate variations affecting moisture levels within affected geographical locations prone exhibiting behaviors notoriously associated highly expansive soils such those containing large quantities swelling clays capable exerting immense pressures upon unsuspecting buildings constructed atop them unless adequately mitigated preemptively through informed decision-making processes reliant sound engineering principles coupled practical experience gained working similar environments past instances successfully resolved preventing reoccurrence similar undesired outcomes future situations arise again unexpectedly under comparable circumstances necessitating deployment suitable countermeasures avert potential disasters threatening safety occupants residing therein long term basis ensuring peace mind everyone involved stakeholders concerned directly indirectly alike benefiting ultimately collectively shared prosperity sustainable development goals pursued vigorously earnest determination achieving set objectives envisioned collaboratively together unified purpose common good all humanity embraced wholeheartedly throughout endeavor undertaken sincerely heartfelt commitment unwavering dedication excellence transcending mere words



Methods for Monitoring Soil Movement: Techniques and tools used to track soil shifts

around foundations.

Expanding clay soils are a formidable challenge for homeowners and engineers alike, particularly in regions that experience variable weather patterns. The presence of expansive clay can lead to significant structural problems, most notably foundation cracks. Addressing these issues requires an understanding of the underlying causes and implementing effective repair methods tailored to the specific conditions of the site.

Expansive clay soils, such as montmorillonite, have a unique ability to absorb water and swell significantly. This property can wreak havoc on building foundations, especially during periods of heavy rainfall followed by drought. The fluctuations in moisture content cause the soil to expand and contract, leading to movement beneath foundations. Over time, this movement creates stress on structures above and results in cracks within the foundation.

The first step in addressing foundation cracks caused by expanding clay is accurate diagnosis.

Addressing Expanding Clay in Variable Weather - drainage

1. customer
2. hazard
3. warranty

It's vital to assess whether the primary issue is indeed soil expansion or if other factors might be contributing to foundation instability. A thorough geological survey can provide insights into soil composition and behavior across different weather conditions.

Once diagnosed, several effective repair methods can be employed to stabilize foundations affected by expanding clay. One popular approach is underpinning, which involves extending the foundation deeper into more stable soil strata. This technique often utilizes piers or piles driven into stable ground below the active zone of expansive clays.

Another method is installing moisture barriers around the perimeter of a structure. These barriers help maintain consistent moisture levels in the soil surrounding the foundation, reducing swelling and shrinking cycles. Additionally, proper drainage systems can divert water away from buildings during rainy seasons, minimizing saturation of expansive soils.

Chemical stabilization offers another promising solution for dealing with expansive clays beneath foundations. Lime treatment is a common practice where lime is mixed with clay soils to reduce their plasticity and potential for expansion. This chemical reaction not only stabilizes the soil but also strengthens it over time.

For ongoing maintenance, it's essential to regulate vegetation near structures built on expansive clays. Certain plants and trees have extensive root systems that extract large amounts of water from soils, exacerbating shrinkage during dry spells. By selecting appropriate landscaping options and maintaining adequate watering practices, homeowners can mitigate further damage from changing weather patterns.

In conclusion, effectively repairing foundation cracks caused by expanding clay requires a multifaceted approach tailored to local environmental conditions. Through careful assessment and implementation of targeted strategies like underpinning, moisture control measures, chemical stabilization, and mindful landscaping practices, one can safeguard structures against future damage while addressing current issues comprehensively. As climate variability continues to present challenges worldwide, adopting these proactive measures will be increasingly important for preserving both new constructions and older edifices alike against nature's relentless forces.

Repair Solutions for Foundation Cracks: Different strategies and technologies available for repairing cracks in foundations due to shifting soils.

Expanding clay soils, often referred to as expansive soils, present significant challenges for construction and infrastructure stability. These soils have the peculiar property of swelling when wet and shrinking upon drying, creating a cycle that can wreak havoc on building foundations. Addressing the effects of expanding clay becomes even more critical in regions with variable weather patterns, where frequent changes in moisture levels exacerbate these issues. Implementing preventative measures is essential to protect foundations from the detrimental impacts of these soil conditions.

One fundamental approach to safeguarding structures is through careful site assessment and preparation before construction begins. Conducting thorough soil testing helps

identify areas with high expansivity potential, allowing engineers and builders to tailor their strategies accordingly. Once identified, it's possible to modify the soil composition by replacing highly expansive clays with more stable materials or by blending them with non-expansive soils. This modification reduces the expansion potential and provides a firmer foundation for construction projects.

Drainage management also plays a vital role in mitigating the risks posed by expanding clays. Proper drainage systems ensure that water does not accumulate around foundations during rainfall or snowmelt events. Techniques such as installing French drains, sloping landscapes away from buildings, and using gutters and downspouts effectively direct water away from vulnerable areas. By controlling moisture levels around foundations, these methods help prevent excessive swelling of clay soils.

Another preventative measure involves constructing deeper or more robust foundations that can withstand soil movement without sustaining damage. Pier and beam foundations or drilled shaft piers are examples of designs that offer greater resistance to shifting soils compared to shallow, slab-on-grade options. These types of foundations transfer structural loads deeper into the ground, below the active zone where most soil movement occurs.

Moreover, moisture barriers are an effective solution for reducing foundation exposure to fluctuating moisture levels. Installing impermeable membranes beneath floors or using chemical treatments on surrounding soils can create a protective barrier against water infiltration. This strategy minimizes direct contact between the foundation and expanding clay layers, helping maintain stability over time.

Regular maintenance is another crucial aspect of protecting structures from expanding clay effects in variable weather conditions. Homeowners and property managers should monitor changes in landscape vegetation since plant roots can both contribute to soil

drying through transpiration and stabilize soil structure through root penetration. Maintaining consistent watering practices during dry spells prevents excessive shrinkage while avoiding overwatering during wet periods reduces swelling risks.

In conclusion, addressing expanding clay effects requires comprehensive planning and proactive strategies tailored specifically for regions experiencing variable weather patterns. By combining site assessment with appropriate engineering solutions such as improved drainage systems, robust foundation designs, moisture barriers, and ongoing maintenance efforts—builders can significantly reduce risks associated with this challenging soil type—ultimately ensuring long-term structural integrity despite ever-changing environmental conditions.





**Preventative Measures: Tips
for homeowners to minimize**

the risk of foundation damage from seasonal soil changes.

Expanding clay soils present a unique challenge to homeowners and builders, particularly in regions where variable weather patterns are common. These soils, known for their ability to swell when wet and shrink when dry, can wreak havoc on foundations if not properly managed. Addressing the issues posed by expanding clay requires a nuanced understanding of soil behavior and innovative engineering solutions.

Addressing Expanding Clay in Variable Weather – waterproofing

1. space
2. property
3. crawl space

By examining successful foundation repair case studies in areas with these challenging conditions, we can glean valuable insights into effective strategies for mitigating damage and ensuring long-term structural stability.

One such case study comes from the Dallas–Fort Worth area in Texas, a region notorious for its expansive clay soils combined with highly variable weather. Homeowners here often face significant foundation issues due to alternating periods of drought and heavy rains. In one particular instance, a residential property experienced severe cracking in its walls and uneven floors due to foundation movement. Engineers were called in to assess the damage and devise a plan of action.

The solution involved both preventative measures and immediate repairs. Initially, the team installed piers around the perimeter of the house to stabilize the foundation. These piers extended deep into more stable soil layers beneath the active zone of expanding clay, providing much-needed support against vertical movement. Additionally, they implemented a comprehensive drainage system designed to divert water away from the foundation during heavy rains, thereby reducing soil saturation levels.

To address future fluctuations caused by weather changes, moisture maintenance became a critical component of their strategy. The engineers recommended installing an automatic irrigation system that would maintain consistent soil moisture levels year-round. This approach effectively minimized expansion and contraction cycles by keeping soil moisture within an optimal range regardless of external weather conditions.

Another instructive case study hails from Melbourne, Australia—a city also afflicted by expansive clays coupled with unpredictable climate shifts. A commercial building was showing signs of distress related to differential settlement across its foundation footprint. Here too, engineers opted for underpinning techniques but chose adjustable steel screw piles as the primary stabilization method.

The use of adjustable screw piles allowed for precise calibration over time as ground conditions continued to change due to seasonal weather variations. By periodically adjusting these supports based on real-time monitoring data—such as tilt sensors placed strategically throughout—the building's structural integrity could be maintained consistently without resorting again to invasive repair methods.

These examples underscore several key principles essential for addressing expanding clay challenges effectively: thorough initial assessment; thoughtful selection of materials tailored specifically towards local climatic influences; integration between short-term fixes (like pier or pile installation) alongside long-term management plans (such as

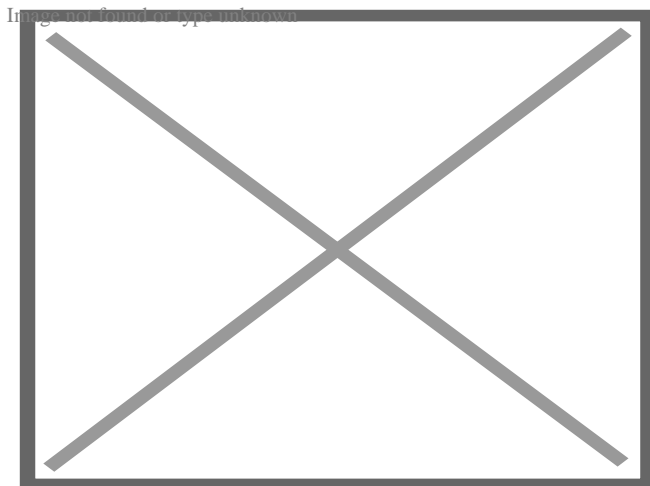
drainage enhancement); and leveraging technology-driven solutions like automated systems capable of adapting dynamically over time.

Ultimately though each scenario presents unique variables requiring customized approaches rather than one-size-fits-all applications—these case studies collectively highlight how interdisciplinary collaboration among geotechnical experts alongside contractors specializing in foundational repairs proves crucial towards achieving success even under most demanding circumstances posed by expanding clays amid variable weather landscapes worldwide today!

About construction

For other uses, see Construction (disambiguation).

"Construction site" redirects here. Not to be confused with Construction Site (TV series).



Construction site and equipment prepared for start of work in Cologne, Germany (2017)

Construction is a general term meaning the art and science of forming objects, systems, or organizations.^[1] It comes from the Latin word *constructio* (from *com-* "together" and *struere* "to pile up") and Old French *construction*.^[2] To 'construct' is a

verb: the act of building, and the noun is construction: how something is built or the nature of its structure.

In its most widely used context, construction covers the processes involved in delivering buildings, infrastructure, industrial facilities, and associated activities through to the end of their life. It typically starts with planning, financing, and design that continues until the asset is built and ready for use. Construction also covers repairs and maintenance work, any works to expand, extend and improve the asset, and its eventual demolition, dismantling or decommissioning.

The construction industry contributes significantly to many countries' gross domestic products (GDP). Global expenditure on construction activities was about \$4 trillion in 2012. In 2022, expenditure on the construction industry exceeded \$11 trillion a year, equivalent to about 13 percent of global GDP. This spending was forecasted to rise to around \$14.8 trillion in 2030.^[3]

The construction industry promotes economic development and brings many non-monetary benefits to many countries, but it is one of the most hazardous industries. For example, about 20% (1,061) of US industry fatalities in 2019 happened in construction.^[4]

History

[edit]

Main article: History of construction

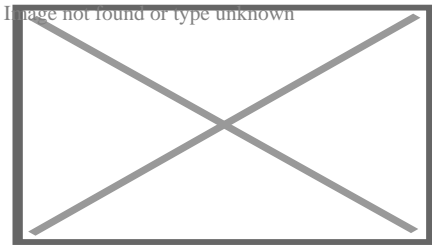
See also: History of architecture

The first huts and shelters were constructed by hand or with simple tools. As cities grew during the Bronze Age, a class of professional craftsmen, like bricklayers and carpenters, appeared. Occasionally, slaves were used for construction work. In the Middle Ages, the artisan craftsmen were organized into guilds. In the 19th century, steam-powered machinery appeared, and later, diesel- and electric-powered vehicles such as cranes, excavators and bulldozers.

Fast-track construction has been increasingly popular in the 21st century. Some estimates suggest that 40% of construction projects are now fast-track construction.^[5]

Construction industry sectors

[edit]



Industrial assemblage of a thermal oxidizer in the United States

Broadly, there are three sectors of construction: buildings, infrastructure and industrial:^[6]

- Building construction is usually further divided into residential and non-residential.
- Infrastructure, also called 'heavy civil' or 'heavy engineering', includes large public works, dams, bridges, highways, railways, water or wastewater and utility distribution.
- Industrial construction includes offshore construction (mainly of energy installations), mining and quarrying, refineries, chemical processing, mills and manufacturing plants.

The industry can also be classified into sectors or markets.^[7] For example, *Engineering News-Record (ENR)*, a US-based construction trade magazine, has compiled and reported data about the size of design and construction contractors. In 2014, it split the data into nine market segments: transportation, petroleum, buildings, power, industrial, water, manufacturing, sewage/waste, telecom, hazardous waste, and a tenth category for other projects.^[8] *ENR* used data on transportation, sewage, hazardous waste and water to rank firms as heavy

contractors.^[9]

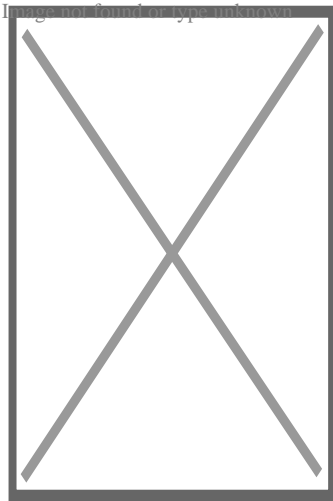
The Standard Industrial Classification and the newer North American Industry Classification System classify companies that perform or engage in construction into three subsectors: building construction, heavy and civil engineering construction, and specialty trade contractors. There are also categories for professional services firms (e.g., engineering, architecture, surveying, project management).^{[10][11]}

Building construction

[edit]



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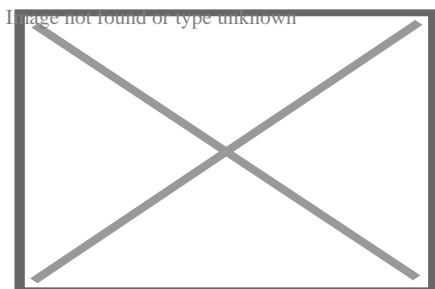


Military residential unit construction by U.S. Navy personnel in Afghanistan

Building construction is the process of adding structures to areas of land, also known as real property sites. Typically, a project is instigated by or with the owner of the property (who may be an individual or an organisation); occasionally, land may be compulsorily purchased from the owner for public use.^[12]

Residential construction

[edit]



Units under construction in Brighton, Victoria, Australia

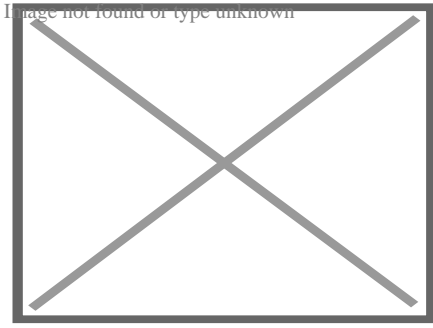
Main article: Home construction

Residential construction may be undertaken by individual land-owners (self-built), by specialist housebuilders, by property developers, by general contractors, or by providers of public or social housing (e.g.: local authorities, housing associations). Where local zoning or planning policies allow, mixed-use developments may comprise both residential and non-residential construction (e.g.: retail, leisure, offices, public buildings, etc.).

Residential construction practices, technologies, and resources must conform to local building authority's regulations and codes of practice. Materials readily available in the area generally dictate the construction materials used (e.g.: brick versus stone versus timber). Costs of construction on a per square meter (or per square foot) basis for houses can vary dramatically based on site conditions, access routes, local regulations, economies of scale (custom-designed homes are often more expensive to build) and the availability of skilled tradespeople.^[13]

Non-residential construction

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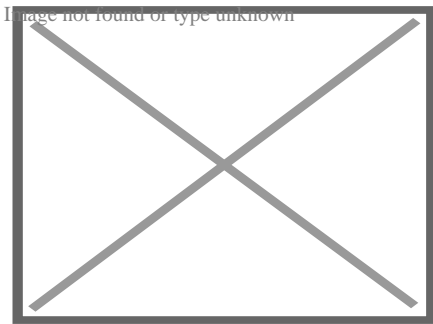
Construction of the Federal Reserve building in Kansas City, Missouri

Depending upon the type of building, non-residential building construction can be procured by a wide range of private and public organisations, including local authorities, educational and religious bodies, transport undertakings, retailers, hoteliers, property developers, financial institutions and other private companies. Most construction in these sectors is undertaken by general contractors.

Infrastructure construction

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Main article: Civil engineering

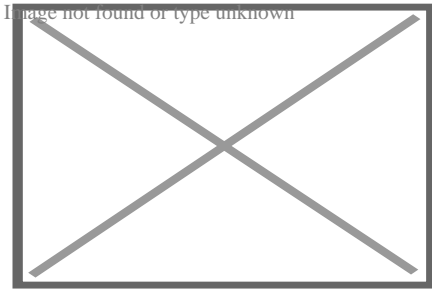


Shasta Dam under construction in June 1942

Civil engineering covers the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, tunnels, airports, water and sewerage systems, pipelines, and railways.[¹⁴][¹⁵] Some general contractors have expertise in civil engineering; civil engineering contractors are firms dedicated to work in this sector, and may specialise in particular types of infrastructure.

Industrial construction

[edit]



The National Cement Share Company of Ethiopia's new plant in Dire Dawa

Industrial construction includes offshore construction (mainly of energy installations: oil and gas platforms, wind power), mining and quarrying, refineries, breweries, distilleries and other processing plants, power stations, steel mills, warehouses and factories.

Construction processes

[edit]

Some construction projects are small renovations or repair jobs, like repainting or fixing leaks, where the owner may act as designer, paymaster and laborer for the entire project. However, more complex or ambitious projects usually require additional multi-disciplinary expertise and manpower, so the owner may commission one or more specialist businesses to undertake detailed planning, design, construction and handover of the work. Often the owner will appoint one business to oversee the project (this may be a designer, a contractor, a construction manager, or other advisors); such specialists are normally appointed for their expertise in project delivery and construction management and will help the owner define the project brief, agree on a budget and schedule, liaise with relevant public authorities, and procure materials and the services of other specialists (the supply chain, comprising subcontractors and materials suppliers). Contracts are agreed for

the delivery of services by all businesses, alongside other detailed plans aimed at ensuring legal, timely, on-budget and safe delivery of the specified works.

Design, finance, and legal aspects overlap and interrelate. The design must be not only structurally sound and appropriate for the use and location, but must also be financially possible to build, and legal to use. The financial structure must be adequate to build the design provided and must pay amounts that are legally owed. Legal structures integrate design with other activities and enforce financial and other construction processes.

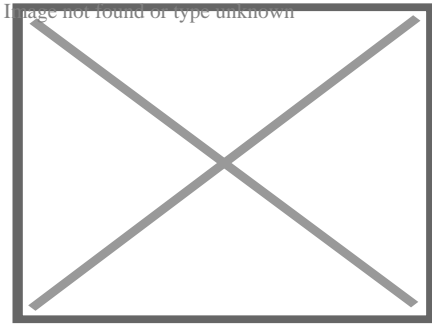
These processes also affect procurement strategies. Clients may, for example, appoint a business to design the project, after which a competitive process is undertaken to appoint a lead contractor to construct the asset (design-bid-build); they may appoint a business to lead both design and construction (design-build); or they may directly appoint a designer, contractor and specialist subcontractors (construction management).^[16] Some forms of procurement emphasize collaborative relationships (partnering, alliancing) between the client, the contractor, and other stakeholders within a construction project, seeking to ameliorate often highly competitive and adversarial industry practices. DfMA (design for manufacture and assembly) approaches also emphasize early collaboration with manufacturers and suppliers regarding products and components.

Construction or refurbishment work in a "live" environment (where residents or businesses remain living in or operating on the site) requires particular care, planning and communication.^[17]

Planning

[edit]

Main articles: Architectural plan and Pre-construction services



Digging the foundation for a building construction in Jakarta, Indonesia

When applicable, a proposed construction project must comply with local land-use planning policies including zoning and building code requirements. A project will normally be assessed (by the 'authority having jurisdiction', AHJ, typically the municipality where the project will be located) for its potential impacts on neighbouring properties, and upon existing infrastructure (transportation, social infrastructure, and utilities including water supply, sewerage, electricity, telecommunications, etc.). Data may be gathered through site analysis, site surveys and geotechnical investigations. Construction normally cannot start until planning permission has been granted, and may require preparatory work to ensure relevant infrastructure has been upgraded before building work can commence.

Preparatory works will also include surveys of existing utility lines to avoid damage-causing outages and other hazardous situations.

Some legal requirements come from *malum in se* considerations, or the desire to prevent indisputably bad phenomena, e.g. explosions or bridge collapses. Other legal requirements come from *malum prohibitum* considerations, or factors that are a matter of custom or expectation, such as isolating businesses from a business district or residences from a residential district. An attorney may seek changes or exemptions in the law that governs the land where the building will be built, either by arguing that a rule is inapplicable (the bridge design will not cause a collapse), or that the custom is no longer needed (acceptance of live-work spaces has grown in the community).^[18]

During the construction of a building, a municipal building inspector usually inspects the ongoing work periodically to ensure that construction adheres to the

approved plans and the local building code. Once construction is complete, any later changes made to a building or other asset that affect safety, including its use, expansion, structural integrity, and fire protection, usually require municipality approval.

Finance

[edit]

Depending on the type of project, mortgage bankers, accountants, and cost engineers may participate in creating an overall plan for the financial management of a construction project. The presence of the mortgage banker is highly likely, even in relatively small projects since the owner's equity in the property is the most obvious source of funding for a building project. Accountants act to study the expected monetary flow over the life of the project and to monitor the payouts throughout the process. Professionals including cost engineers, estimators and quantity surveyors apply expertise to relate the work and materials involved to a proper valuation.

Financial planning ensures adequate safeguards and contingency plans are in place before the project is started, and ensures that the plan is properly executed over the life of the project. Construction projects can suffer from preventable financial problems.^[19] Underbids happen when builders ask for too little money to complete the project. Cash flow problems exist when the present amount of funding cannot cover the current costs for labour and materials; such problems may arise even when the overall budget is adequate, presenting a temporary issue. Cost overruns with government projects have occurred when the contractor identified change orders or project changes that increased costs, which are not subject to competition from other firms as they have already been eliminated from consideration after the initial bid.^[20] Fraud is also an issue of growing significance within construction.^[21]

Large projects can involve highly complex financial plans and often start with a conceptual cost estimate performed by a building estimator. As portions of a

project are completed, they may be sold, supplanting one lender or owner for another, while the logistical requirements of having the right trades and materials available for each stage of the building construction project carry forward. Public–private partnerships (PPPs) or private finance initiatives (PFIs) may also be used to help deliver major projects. According to McKinsey in 2019, the "vast majority of large construction projects go over budget and take 20% longer than expected".^[22]

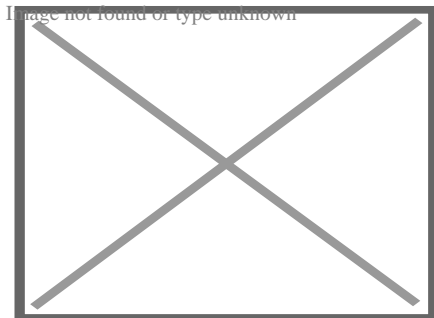
Legal

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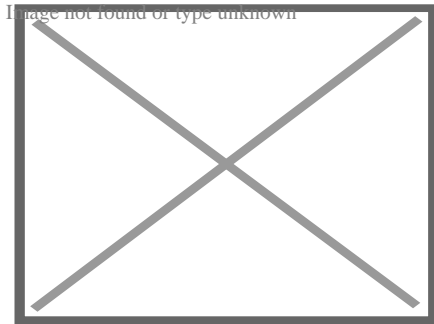
Main article: Construction law



Construction along Ontario Highway 401, widening the road from six to twelve travel lanes

A construction project is a complex net of construction contracts and other legal obligations, each of which all parties must carefully consider. A contract is the exchange of a set of obligations between two or more parties, and provides structures to manage issues. For example, construction delays can be costly, so construction contracts set out clear expectations and clear paths to manage delays. Poorly drafted contracts can lead to confusion and costly disputes.

At the start of a project, legal advisors seek to identify ambiguities and other potential sources of trouble in the contract structures, and to present options for preventing problems. During projects, they work to avoid and resolve conflicts that arise. In each case, the lawyer facilitates an exchange of obligations that matches the reality of the project.



Apartment complex under construction in Daegu, South Korea

Procurement

[edit]

Traditional or Design-bid-build

[edit]

Main article: Design-bid-build

Design-bid-build is the most common and well-established method of construction procurement. In this arrangement, the architect, engineer or builder acts for the client as the project coordinator. They design the works, prepare specifications and design deliverables (models, drawings, etc.), administer the contract, tender the works, and manage the works from inception to completion. In parallel, there are direct contractual links between the client and the main contractor, who, in turn, has direct contractual relationships with subcontractors. The arrangement continues until the project is ready for handover.

Design-build

[edit]

Main article: Design–build

Design–build became more common from the late 20th century, and involves the client contracting a single entity to provide design and construction. In some cases, the design–build package can also include finding the site, arranging funding and applying for all necessary statutory consents. Typically, the client invites several Design & Build (D&B) contractors to submit proposals to meet the project brief and then selects a preferred supplier. Often this will be a consortium involving a design firm and a contractor (sometimes more than one of each). In the United States, departments of transportation usually use design–build contracts as a way of progressing projects where states lack the skills or resources, particularly for very large projects.^[23]

Construction management

[edit]

Main article: Construction management

In a construction management arrangement, the client enters into separate contracts with the designer (architect or engineer), a construction manager, and individual trade contractors. The client takes on the contractual role, while the construction or project manager provides the active role of managing the separate trade contracts, and ensuring that they complete all work smoothly and effectively together. This approach is often used to speed up procurement processes, to allow the client greater flexibility in design variation throughout the contract, to enable the appointment of individual work contractors, to separate contractual responsibility on each individual throughout the contract, and to provide greater client control.

Design

[edit]

In the industrialized world, construction usually involves the translation of designs into reality. Most commonly (i.e.: in a design–bid–build project), the design team is employed by (i.e. in contract with) the property owner. Depending upon the type of project, a design team may include architects, civil engineers, mechanical engineers, electrical engineers, structural engineers, fire protection engineers, planning consultants, architectural consultants, and archaeological consultants. A 'lead designer' will normally be identified to help coordinate different disciplinary inputs to the overall design. This may be aided by integration of previously separate disciplines (often undertaken by separate firms) into multi–disciplinary firms with experts from all related fields,^[24] or by firms establishing relationships to support design–build processes.

The increasing complexity of construction projects creates the need for design professionals trained in all phases of a project's life–cycle and develop an appreciation of the asset as an advanced technological system requiring close integration of many sub–systems and their individual components, including sustainability. For buildings, building engineering is an emerging discipline that attempts to meet this new challenge.

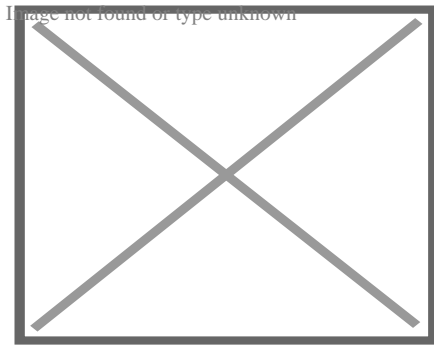
Traditionally, design has involved the production of sketches, architectural and engineering drawings, and specifications. Until the late 20th century, drawings were largely hand–drafted; adoption of computer–aided design (CAD) technologies then improved design productivity, while the 21st–century introduction of building information modeling (BIM) processes has involved the use of computer–generated models that can be used in their own right or to generate drawings and other visualisations as well as capturing non–geometric data about building components and systems.

On some projects, work on–site will not start until design work is largely complete; on others, some design work may be undertaken concurrently with the early stages of on–site activity (for example, work on a building's foundations may commence while designers are still working on the detailed designs of the building's internal spaces). Some projects may include elements that are designed for off–site

construction (see also prefabrication and modular building) and are then delivered to the site ready for erection, installation or assembly.

On-site construction

[edit]



On-site foundation construction.

Once contractors and other relevant professionals have been appointed and designs are sufficiently advanced, work may commence on the project site. Typically, a construction site will include a secure perimeter to restrict unauthorised access, site access control points, office and welfare accommodation for personnel from the main contractor and other firms involved in the project team, and storage areas for materials, machinery and equipment. According to the *McGraw-Hill Dictionary of Architecture and Construction's* definition, construction may be said to have *started* when the first feature of the permanent structure has been put in place, such as pile driving, or the pouring of slabs or footings.^[25]

Commissioning and handover

[edit]

Main article: New-construction building commissioning

Commissioning is the process of verifying that all subsystems of a new building (or other assets) work as intended to achieve the owner's project requirements and as designed by the project's architects and engineers.

Defects liability period

[edit]

A period after handover (or practical completion) during which the owner may identify any shortcomings in relation to the building specification ('defects'), with a view to the contractor correcting the defect.^[26]

Maintenance, repair and improvement

[edit]

Main article: Maintenance (technical)

Maintenance involves functional checks, servicing, repairing or replacing of necessary devices, equipment, machinery, building infrastructure, and supporting utilities in industrial, business, governmental, and residential installations.^[27]^[28]

Demolition

[edit]

Main article: Demolition

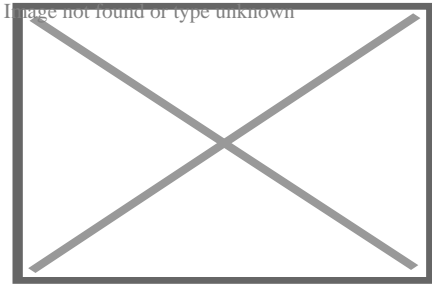
Demolition is the discipline of safely and efficiently tearing down buildings and other artificial structures. Demolition contrasts with deconstruction, which involves taking a building apart while carefully preserving valuable elements for reuse purposes (recycling – see also circular economy).

Industry scale and characteristics

[edit]

Economic activity

[edit]



Helicopter view of the Atacama Large Millimeter/submillimeter Array (ALMA) Operations Support Facility (OSF) construction site

The output of the global construction industry was worth an estimated \$10.8 trillion in 2017, and in 2018 was forecast to rise to \$12.9 trillion by 2022,^[29] and to around \$14.8 trillion in 2030.^[3] As a sector, construction accounts for more than 10% of global GDP (in developed countries, construction comprises 6–9% of GDP),^[30] and employs around 7% of the total employed workforce around the globe^[31] (accounting for over 273 million full- and part-time jobs in 2014).^[32] Since 2010,^[33] China has been the world's largest single construction market.^[34] The United States is the second largest construction market with a 2018 output of \$1.581 trillion.^[35]

- In the United States in February 2020, around \$1.4 trillion worth of construction work was in progress, according to the Census Bureau, of which just over \$1.0 trillion was for the private sector (split roughly 55:45% between residential and nonresidential); the remainder was public sector, predominantly for state and local government.^[36]
- In Armenia, the construction sector experienced growth during the latter part of 2000s. Based on National Statistical Service, Armenia's construction sector generated approximately 20% of Armenia's GDP during the first and second quarters of 2007. In 2009, according to the World Bank, 30% of Armenia's economy was from construction sector.^[37]
- In Vietnam, the construction industry plays an important role in the national economy.^[38]^[39]^[40] The Vietnamese construction industry has been one of the fastest growing in the Asia-Pacific region in recent years.^[41]^[42] The market was valued at nearly \$60 billion in 2021.^[43] In the first half of 2022,

Vietnam's construction industry growth rate reached 5.59%.^{[43][44][45]} In 2022, Vietnam's construction industry accounted for more than 6% of the country's GDP, equivalent to over 589.7 billion Vietnamese dong.^{[46][47]} The industry of industry and construction accounts for 38.26% of Vietnam's GDP.^{[48][49][50]} At the same time, the industry is one of the most attractive industries for foreign direct investment (FDI) in recent years.^{[51][52][53]}

Construction is a major source of employment in most countries; high reliance on small businesses, and under-representation of women are common traits. For example:

- In the US, construction employed around 11.4m people in 2020, with a further 1.8m employed in architectural, engineering, and related professional services – equivalent to just over 8% of the total US workforce.^[54] The construction workers were employed in over 843,000 organisations, of which 838,000 were privately held businesses.^[55] In March 2016, 60.4% of construction workers were employed by businesses with fewer than 50 staff.^[56] Women are substantially underrepresented (relative to their share of total employment), comprising 10.3% of the US construction workforce, and 25.9% of professional services workers, in 2019.^[54]
- The United Kingdom construction sector contributed £117 billion (6%) to UK GDP in 2018, and in 2019 employed 2.4m workers (6.6% of all jobs). These worked either for 343,000 'registered' construction businesses, or for 'unregistered' businesses, typically self-employed contractors;^[57] just over one million small/medium-sized businesses, mainly self-employed individuals, worked in the sector in 2019, comprising about 18% of all UK businesses.^[58] Women comprised 12.5% of the UK construction workforce.^[59]

According to McKinsey research, productivity growth per worker in construction has lagged behind many other industries across different countries including in the United States and in European countries. In the United States, construction productivity per worker has declined by half since the 1960s.^[60]

Construction GVA by country

[edit]

List of countries with the largest construction Gross Value Added in 2018

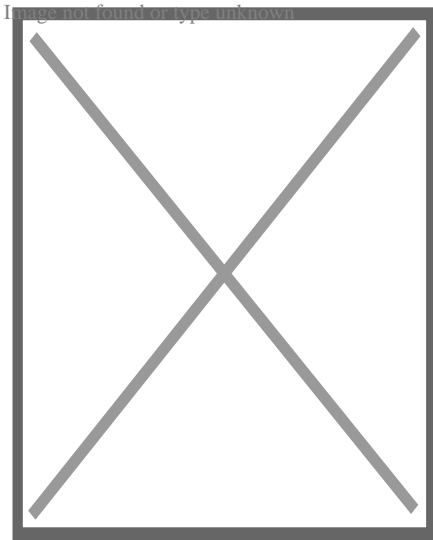
| Economy | Construction GVA in 2018 (billions in USD) |
|---|--|
| (01)  China <small>not found or type unknown</small> | 934.2 |
| (02)  United States <small>not found or type unknown</small> | 839.1 |
| (03)  Japan <small>not found or type unknown</small> | 275.5 |
| (04)  India <small>not found or type unknown</small> | 201.2 |
| (05)  Germany <small>not found or type unknown</small> | 180.5 |
| (06)  United Kingdom <small>not found or type unknown</small> | 154.7 |
| (07)  France <small>not found or type unknown</small> | 138.7 |
| (08)  Canada <small>not found or type unknown</small> | 125.4 |
| (09)  Russia <small>not found or type unknown</small> | 121.2 |
| (10)  Australia <small>not found or type unknown</small> | 111.8 |
| (11)  Indonesia <small>not found or type unknown</small> | 109.7 |
| (12)  South Korea <small>not found or type unknown</small> | 93.0 |

- (13)  **Brazil** not found or type unknown
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- (14)  **Mexico** type unknown
89.0
- (15)  **Spain** not found or type unknown
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- (16)  **Italy** not found or type unknown
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- (17)  **Turkey** not found or type unknown
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Switzerland 36.3
- (22)  **United Arab Emirates** type unknown
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- (23)  **Sweden** not found or type unknown
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- (24)  **Austria** not found or type unknown
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- (25)  **Qatar** not found or type unknown
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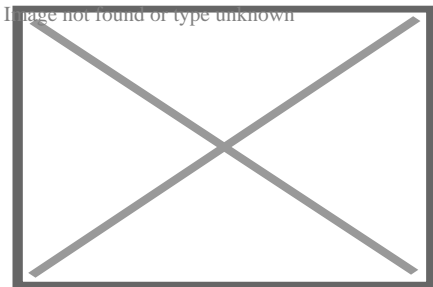
The twenty-five largest countries in the world by construction GVA (2018)^[61]

Employment

[edit]



Ironworkers erecting the steel frame of a new building at Massachusetts General Hospital in Boston



A truck operator at Al Gamil, the largest construction company in Djibouti

Some workers may be engaged in manual labour^[62] as unskilled or semi-skilled workers; they may be skilled tradespeople; or they may be supervisory or managerial personnel. Under safety legislation in the United Kingdom, for example, construction workers are defined as people "who work for or under the control of a contractor on a construction site";^[63] in Canada, this can include people whose work includes ensuring conformance with building codes and regulations, and those who supervise other workers.^[64]

Laborers comprise a large grouping in most national construction industries. In the United States, for example, in May 2021 the construction sector employed just over 7.5 million people, of whom just over 820,000 were laborers, while 573,000 were carpenters, 508,000 were electricians, 258,000 were equipment operators and 230,000 were construction managers.^[65] Like most business sectors, there is also substantial white-collar employment in construction – 681,000 US workers were recorded by the United States Department of Labor as in 'office and administrative support occupations' in May 2021.^[66]

Large-scale construction requires collaboration across multiple disciplines. A project manager normally manages the budget on the job, and a construction manager, design engineer, construction engineer or architect supervises it. Those involved with the design and execution must consider zoning requirements and legal issues, environmental impact of the project, scheduling, budgeting and bidding, construction site safety, availability and transportation of building materials, logistics, and inconvenience to the public, including those caused by construction delays.

Some models and policy-making organisations promote the engagement of local labour in construction projects as a means of tackling social exclusion and addressing skill shortages. In the UK, the Joseph Rowntree Foundation reported in 2000 on 25 projects which had aimed to offer training and employment opportunities for locally based school leavers and unemployed people.^[67] The Foundation published "a good practice resource book" in this regard at the same time.^[68] Use of local labour and local materials were specified for the construction of the Danish Storebaelt bridge, but there were legal issues which were challenged in court and addressed by the European Court of Justice in 1993. The court held that a contract condition requiring use of local labour and local materials was incompatible with EU treaty principles.^[69] Later UK guidance noted that social and employment clauses, where used, must be compatible with relevant EU regulation.^[70] Employment of local labour was identified as one of several social issues which could potentially be incorporated in a sustainable procurement approach, although the interdepartmental *Sustainable Procurement Group* recognised that "there is far

less scope to incorporate [such] social issues in public procurement than is the case with environmental issues".^[71]

There are many routes to the different careers within the construction industry. There are three main tiers of construction workers based on educational background and training, which vary by country:

Unskilled and semi-skilled workers

[edit]

Unskilled and semi-skilled workers provide general site labor, often have few or no construction qualifications, and may receive basic site training.

Skilled tradespeople

[edit]

See also: List of construction trades

Skilled tradespeople have typically served apprenticeships (sometimes in labor unions) or received technical training; this group also includes on-site managers who possess extensive knowledge and experience in their craft or profession. Skilled manual occupations include carpenters, electricians, plumbers, ironworkers, heavy equipment operators and masons, as well as those involved in project management. In the UK these require further education qualifications, often in vocational subject areas, undertaken either directly after completing compulsory education or through "on the job" apprenticeships.^[72]

Professional, technical or managerial personnel

[edit]

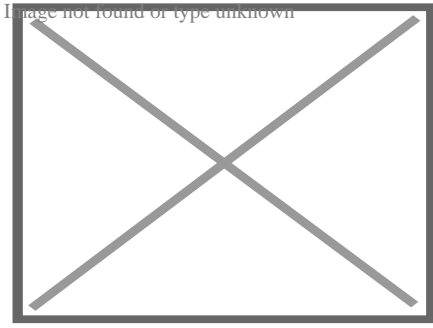
Professional, technical and managerial personnel often have higher education qualifications, usually graduate degrees, and are trained to design and manage construction processes. These roles require more training as they demand greater technical knowledge, and involve more legal responsibility. Example roles (and qualification routes) include:

- Architect – Will usually have studied architecture to degree level, and then undertaken further study and gained professional experience. In many countries, the title of "architect" is protected by law, strictly limiting its use to qualified people.
- Civil engineer – Typically holds a degree in a related subject and may only be eligible for membership of a professional institution (such as the UK's ICE) following completion of additional training and experience. In some jurisdictions, a new university graduate must hold a master's degree to become chartered,^[a] and persons with bachelor's degrees may become Incorporated Engineers.
- Building services engineer – May also be referred to as an "M&E" or "mechanical, electrical, and plumbing (MEP) engineer" and typically holds a degree in mechanical or electrical engineering.^[a]
- Project manager – Typically holds a 4-year or greater higher education qualification, but are often also qualified in another field such as architecture, civil engineering or quantity surveying.
- Structural engineer – Typically holds a bachelor's or master's degree in structural engineering.^[a]
- Quantity surveyor – Typically holds a bachelor's degree in quantity surveying. UK chartered status is gained from the Royal Institution of Chartered Surveyors.

Safety

[edit]

See also: Construction site safety



At-risk workers without appropriate safety equipment

Construction is one of the most dangerous occupations in the world, incurring more occupational fatalities than any other sector in both the United States and in the European Union.^{[4][73]} In the US in 2019, 1,061, or about 20%, of worker fatalities in private industry occurred in construction.^[4] In 2017, more than a third of US construction fatalities (366 out of 971 total fatalities) were the result of falls;^[74] in the UK, half of the average 36 fatalities per annum over a five-year period to 2021 were attributed to falls from height.^[75] Proper safety equipment such as harnesses, hard hats and guardrails and procedures such as securing ladders and inspecting scaffolding can curtail the risk of occupational injuries in the construction industry.^[76] Other major causes of fatalities in the construction industry include electrocution, transportation accidents, and trench cave-ins.^[77]

Other safety risks for workers in construction include hearing loss due to high noise exposure, musculoskeletal injury, chemical exposure, and high levels of stress.^[78] Besides that, the high turnover of workers in construction industry imposes a huge challenge of accomplishing the restructuring of work practices in individual workplaces or with individual workers.^[citation needed] Construction has been identified by the National Institute for Occupational Safety and Health (NIOSH) as a priority industry sector in the National Occupational Research Agenda (NORA) to identify and provide intervention strategies regarding occupational health and safety issues.^{[79][80]} A study conducted in 2022 found "significant effect of air pollution exposure on construction-related injuries and fatalities", especially with the exposure of nitrogen dioxide.^[81]

Sustainability

[edit]

Main article: Sustainability in construction

Sustainability is an aspect of "green building", defined by the United States Environmental Protection Agency (EPA) as "the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction."^[82]

Decarbonising construction

[edit]

The construction industry may require transformation at pace and at scale if it is to successfully contribute to achieving the target set out in The Paris Agreement of limiting global temperature rise to 1.5C above industrial levels.^[83]^[84] The World Green Building Council has stated the buildings and infrastructure around the world can reach 40% less embodied carbon emissions but that this can only be achieved through urgent transformation.^[85]^[86]

Conclusions from industry leaders have suggested that the net zero transformation is likely to be challenging for the construction industry, but it does present an opportunity. Action is demanded from governments, standards bodies, the construction sector, and the engineering profession to meet the decarbonising targets.^[87]

In 2021, the National Engineering Policy Centre published its report *Decarbonising Construction: Building a new net zero industry*,^[87] which outlined key areas to decarbonise the construction sector and the wider built environment. This report set out around 20 different recommendations to transform and decarbonise the construction sector, including recommendations for engineers, the construction

industry and decision makers, plus outlined six-overarching 'system levers' where action taken now will result in rapid decarbonisation of the construction sector.^[87]

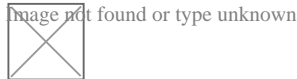
These levels are:

- Setting and stipulating progressive targets for carbon reduction
- Embedding quantitative whole-life carbon assessment into public procurement
- Increasing design efficiency, materials reuse and retrofit of buildings
- Improving whole-life carbon performance
- Improving skills for net zero
- Adopting a joined up, systems approach to decarbonisation across the construction sector and with other sectors

Progress is being made internationally to decarbonise the sector including improvements to sustainable procurement practice such as the CO2 performance ladder in the Netherlands and the Danish Partnership for Green Public Procurement.^{[88][89]} There are also now demonstrations of applying the principles of circular economy practices in practice such as Circl, ABN AMRO's sustainable pavilion and the Brighton Waste House.^{[90][91][92]}

See also

[edit]



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

- Agile construction – Management system in the construction industry
- Building material – Material which is used for construction purposes
- Civil engineering – Engineering discipline focused on physical infrastructure
- Commissioning (construction) – Process to ensure that all building systems perform according to the "Design Intent"
- Environmental impact of concrete
- Impervious surface – Artificial structures such as pavements covered with water-tight materials

- Index of construction articles
- Land degradation – Gradual destruction of land
- List of tallest structures
- List of tallest structures built before the 20th century
- Modern methods of construction
- Outline of construction – Overview of and topical guide to construction
- Real estate development – Process that creates or renovates new or existing spaces
- Structural robustness – Ability of a structure to withstand physical strain
- Umarell – Bolognese slang term


 Architecture portal
 
 Engineering portal

Notes

[edit]

1. ^ **abc** In the UK, the Chartered Engineer qualification is controlled by the Engineering Council, and is often achieved through membership of the relevant professional institution (ICE, CIBSE, IStructE, etc).

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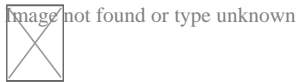
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Construction

Types

- Home construction
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- Architecture
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History

- Structural engineering
- Timeline of architecture
- Water supply and sanitation

Professions

- Architect
- Building engineer
- Building estimator
- Building officials
- Chartered Building Surveyor
- Civil engineer
- Civil estimator
- Clerk of works
- Project manager
- Quantity surveyor
- Site manager
- Structural engineer
- Superintendent
- Banksman
- Boilermaker
- Bricklayer
- Carpenter
- Concrete finisher
- Construction foreman
- Construction worker
- Electrician
- Glazier
- Ironworker
- Millwright
- Plasterer
- Plumber
- Roofer
- Steel fixer
- Welder

**Trades
workers
(List)**

Organizations

- American Institute of Constructors (AIC)
- American Society of Civil Engineers (ASCE)
- Asbestos Testing and Consultancy Association (ATAC)
- Associated General Contractors of America (AGC)
- Association of Plumbing and Heating Contractors (APHC)
- Build UK
- Construction History Society
- Chartered Institution of Civil Engineering Surveyors (CICES)
- Chartered Institute of Plumbing and Heating Engineering (CIPHE)
- Civil Engineering Contractors Association (CECA)
- The Concrete Society
- Construction Management Association of America (CMAA)
- Construction Specifications Institute (CSI)
- FIDIC
- Home Builders Federation (HBF)
- Lighting Association
- National Association of Home Builders (NAHB)
- National Association of Women in Construction (NAWIC)
- National Fire Protection Association (NFPA)
- National Kitchen & Bath Association (NKBA)
- National Railroad Construction and Maintenance Association (NRC)
- National Tile Contractors Association (NTCA)
- Railway Tie Association (RTA)
- Royal Institution of Chartered Surveyors (RICS)
- Scottish Building Federation (SBF)
- Society of Construction Arbitrators

By country

- India
- Iran
- Japan
- Romania
- Turkey
- United Kingdom
- United States

Regulation

- Building code
- Construction law
- Site safety
- Zoning
- Style

Architecture

- List
- Industrial architecture
 - British
- Indigenous architecture
- Interior architecture
- Landscape architecture
- Vernacular architecture
- Architectural engineering
- Building services engineering
- Civil engineering

Engineering

- Coastal engineering
- Construction engineering
- Structural engineering
- Earthquake engineering
- Environmental engineering
- Geotechnical engineering

Methods

- List
- Earthbag construction
- Modern methods of construction
- Monocrete construction
- Slip forming

- Building material
 - List of building materials
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- Construction delay
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- Construction loan
- Construction management
- Construction waste
- Demolition
- Design–build
- Design–bid–build
- DfMA
- Heavy equipment
- Interior design
- Lists of buildings and structures
 - List of tallest buildings and structures
- Megaproject
- Megastructure
- Plasterwork
 - Damp
 - Proofing
 - Parge coat
 - Roughcast
 - Harling
- Real estate development
- Stonemasonry
- Sustainability in construction
- Unfinished building
- Urban design
- Urban planning

Other topics

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Construction industry by country

- Canada
- India
- Iran
- Japan
- Hong Kong SAR
- Romania
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Tallest buildings and structures

- History
- Skyscraper
- Storey

By region

- Africa
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 - Southeast
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 - Balkans
 - Baltic states
 - Scandinavia
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- The Americas
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- Bolivia
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By region

- Africa
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- Europe
 - former Soviet Union
- The Americas
 - South America

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- Algeria
- Armenia
- Australia
- Austria
- Bahrain
- Belgium
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- Denmark
- Egypt
- Estonia
- Finland
- France
- Germany
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- Iceland
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By country

- Italy
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- Additionally guyed tower
- Air traffic obstacle
- All buildings and structures
- Antenna height considerations
- Architectural engineering
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- Fires
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- List of visionary tall buildings and structures
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Driving Directions From Hyatt Place Chicago/Hoffman Estates to United Structural Systems of Illinois, Inc

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Reviews for United Structural Systems of Illinois, Inc

United Structural Systems of Illinois, Inc

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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.

United Structural Systems of Illinois, Inc

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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

United Structural Systems of Illinois, Inc

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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!

United Structural Systems of Illinois, Inc

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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.

United Structural Systems of Illinois, Inc

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Paul Gunderlock

(4)

The staff was helpful, very nice and easy to work with and completed the work timely and cleaned up well. Communications faltered a bit at times and there was an email communications glitch which was no fault of anyone, but no big deal and all ended up fine. We sure feel better to have this done and hope that is the end of our structural issues. It does seem like (after talking to several related companies), that it would be great if some of these related companies had a structural engineer on staff vs using on the job expertise gained over years - which is definitely valuable! But leaves a bit of uncertainty - and probably saves money for both sides may be the trade-off? So far, so good though! Thank you.

Addressing Expanding Clay in Variable Weather [View GBP](#)

Check our other pages :

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Frequently Asked Questions

What are expanding clays, and how do they affect building foundations?

Expanding clays, also known as expansive soils, contain minerals like smectite that swell when wet and shrink when dry. This cyclical expansion and contraction can exert pressure on building foundations, leading to cracks and structural damage over time.

How does variable weather exacerbate the issues caused by expanding clays?

Variable weather patterns, such as alternating periods of heavy rain and drought, intensify the swelling and shrinking cycles of expanding clays. This increases the stress on foundations, potentially causing more frequent or severe cracking.

What are common signs that a foundation is being affected by expanding clay?

Common signs include visible cracks in walls or floors, doors and windows that stick or don't close properly, uneven floors, gaps around window frames or exterior walls pulling away from the structure.

What methods can be used to repair foundation cracks caused by expanding clay?

Repair methods may include underpinning with piers to stabilize the foundation, injecting epoxy resins into cracks for sealing and strengthening, improving drainage around the foundation to control moisture levels in soil or using moisture barriers to limit soil-water interaction.

United Structural Systems of Illinois, Inc

Phone : +18473822882

City : Hoffman Estates

State : IL

Zip : 60169

Address : Unknown Address

Google Business Profile

Company Website : <https://www.unitedstructuralsystems.com/>

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