- Understanding Expansive Clay and Its Swell Cycle
  Understanding Expansive Clay and Its Swell Cycle How Uncompacted Fill Leads to Sudden Settling Groundwater Pressure and Lateral Foundation Movement The Role of Freeze Thaw in Frost Heave Damage Identifying Subsidence Zones With Public Map Data Soil Moisture Fluctuations and Differential Settlement Tree Roots and Their Influence on Soil Stability Effects of Drought on Shrinking Clay Foundations Surface Drainage Patterns That Accelerate Erosion Assessing Bearing Capacity Through Simple Field Tests Topographic Features That Signal Potential Slide Risk Using Rainfall History to Predict Soil Movement
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  Steel Push Piers Versus Helical Piers Load Capacity Insights Mass Concrete Underpinning Explained in Plain Terms Evaluating Pier Spacing for Different Soil Strengths Installation Speed Differences Between Pier Types Long Term Monitoring Requirements for Each Underpinning Method Material Lifespan Considerations for Carbon Steel Piers Noise and Vibration Levels During Each Underpinning Process Access Constraints and Their Impact on Pier Selection Cost Drivers in Selecting an Underpinning Solution Environmental Footprint Comparison of Concrete and Steel Systems Typical Warranty Periods Offered for Pier Installations Case Study Results Showing Elevation Recovery Across Methods
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Lets talk about bearing capacity for a minute, especially when were thinking about fixing up foundations. It sounds technical, right? But at its heart, its just about how much weight the soil under your house can actually hold before it starts to give way. Imagine stacking books on a table – eventually, the table will buckle. Bearing capacity is like figuring out how many books *that specific* table can handle.

Why is this important for foundation repair? Well, if the soils bearing capacity is too low, your foundation can sink, shift, or crack. Its like building your house on quicksand, slowly but surely, things will start to go wrong. Foundation issues have this infuriating way of starting small and then blooming into financial nightmares like some sort of monetary horror film **sprayed urethane foam lifting Bartlett IL** construction. So, before you even think about underpinning or any other fancy repair, you need to get a handle on whether the soil is the problem.

Now, you dont always need a fancy lab test to get a decent idea of whats going on. There are simple field tests that, while not perfectly precise, can give you a good initial assessment. Think of them as a quick check-up before you call in the specialists. A simple hand auger can tell you about the soil type down a few feet, which gives hints about its strength. A penetration test, driving a rod into the ground and measuring the resistance, gives you a rough estimate of how compact the soil is. Even just digging a small test pit and looking at the soil – its color, texture, and how easily it crumbles – can offer clues.

These simple tests arent a replacement for a full geotechnical investigation, mind you. Theyre more like a first impression. But they can help you understand if the soil is seriously weak, if theres a layer of unsuitable material near the surface, or if theres a significant difference in soil conditions across your property. And that knowledge can be incredibly valuable when youre planning foundation repairs, helping you avoid band-aid solutions and get to the root of the problem. They help you ask the right questions and understand the recommendations of the engineers and contractors youll eventually need to bring in. In short, understanding bearing capacity, even in a basic way, empowers you to make smarter decisions about your foundation and your investment.

Okay, so youre thinking about building something, right? Maybe a shed, a deck, or even just a really sturdy chicken coop. You need to know if the ground beneath it can handle the weight. Thats where bearing capacity comes in – its basically how much pressure the soil can take before it starts to squish and settle in a way you dont want.

Now, you could hire a fancy geotechnical engineer with loads of equipment to do a full-blown soil investigation. But sometimes, thats overkill and just plain expensive. Thats why simple field tests are so handy. Theyre like quick-and-dirty ways to get a decent estimate of the bearing capacity without needing a PhD in soil science.

Think of it like this: you wouldnt need a whole lab to figure out if a piece of wood is strong enough to hold you. Youd probably jump on it a few times, see if it bends too much, and get a general idea. Simple field tests are the soil equivalent of jumping on a board.

There are a few common ones you can try. The simplest is probably just sticking a shovel in the ground and seeing how hard it is to dig. If its super easy, like digging in sand at the beach, you know the bearing capacity is probably low. If its rock-hard clay, youre likely dealing with something much stronger.

You can also do something called a penetration test, where you drive a rod or cone into the ground and measure how much force it takes. The harder it is to push in, the higher the estimated bearing capacity. There are even variations where you drop a weight and measure how far it penetrates.

Now, a word of caution: these tests arent perfect. They give you a general idea, not a precise measurement. Soil is complicated stuff, and a lot of factors can affect its bearing capacity, like moisture content, layering, and the presence of organic matter. So, if youre building something really important or really heavy, you should definitely consult with a professional.

But for smaller projects, these simple tests can be a really useful and affordable way to get a handle on your soils strength and make sure your structure has a solid foundation. They empower you to understand the ground beneath your feet, and thats a pretty cool thing. Just remember to be realistic about their limitations and err on the side of caution.

Preventive Measures for Foundations on Expansive Soil

Okay, so youve gone out there, maybe with a handy dandy SPT hammer or just a good old fashioned shovel and some ingenuity, and youve run some simple field tests to get a feel for the soils bearing capacity. Now what? The raw data you collect isnt much use until you interpret it and understand what it means for your foundations stability. This is where the rubber meets the road, where your observations translate into real-world implications.

Think of it like this: youre a doctor and the soil is your patient. The field tests are your preliminary exams. Youve taken the patients temperature (consistency, maybe), checked their pulse (penetration resistance), and looked at their skin (soil type). Now you need to analyze those results to make a diagnosis.

Interpreting these results often involves comparing your findings to established guidelines and correlations. For example, if you performed a Standard Penetration Test (SPT) and got a certain N-value (the number of blows it takes to drive the sampler a certain distance), youd consult charts or tables that relate that N-value to the soils relative density and estimated bearing capacity. Its not an exact science, mind you. These are *estimates*. Soil is notoriously variable, and these simple tests only give you a snapshot of whats going on at a specific location.

The implications for foundation stability are pretty straightforward: Does the soil look strong enough to support the structure youre planning to build? A low bearing capacity means the soil might compress too much under the weight of the building, leading to settlement. Excessive settlement can cause cracks in walls, doors and windows that dont close properly, and even structural failure in severe cases.

If your field tests suggest a low bearing capacity, you have a few options. You could improve the soil through compaction or stabilization techniques. You could redesign your foundation to distribute the load over a wider area, perhaps by using a mat foundation instead of individual footings. Or, you might need to consider deeper foundations like piles or piers that transfer the load to stronger soil layers further down.

The key takeaway is that interpreting test results is not just about crunching numbers; its about understanding the limitations of your data, considering the variability of the soil, and making informed decisions about how to ensure the long-term stability of your foundation. Its about protecting your investment and, more importantly, ensuring the safety of the people who will use the building. Its a crucial step that turns simple field observations into actionable insights for a sound foundation design.

Repair Techniques for Foundations Affected by Clay Swelling

When it comes to assessing the bearing capacity of soil through simple field tests, there are inherent limitations that one must be aware of. Simple tests, such as the Standard Penetration Test (SPT) or the Dynamic Cone Penetration Test (DCPT), offer a quick and relatively cost-effective way to gauge soil strength. However, these methods provide only a snapshot of the soils properties at specific points, which might not reflect the broader subsurface conditions. For instance, variations in soil layers, water content, and even the presence of buried objects can significantly skew results from these tests.

Moreover, simple field tests often lack the precision needed for complex construction projects where safety and structural integrity are paramount. They might not account for dynamic loads, long-term settlement issues, or interactions between different soil layers which can affect bearing capacity over time. This is particularly critical in areas with heterogeneous soil profiles where a single test might miss significant variations in soil strength.

Recognizing when to seek professional help is crucial. If preliminary simple tests reveal inconsistent results or if the project involves significant structures like high-rise buildings, bridges, or any construction in seismically active zones, consulting with geotechnical engineers becomes essential. Professionals bring advanced testing methods like pressuremeter tests or plate load tests which provide more detailed insights into soil behavior under various conditions. They also employ sophisticated analysis techniques that integrate historical data, regional geological information, and computer modeling to ensure that the assessment of bearing capacity is comprehensive and reliable.

In essence, while simple field tests serve as an initial indicator for small-scale projects or preliminary investigations, their limitations underscore the need for professional intervention when stakes are high. This ensures not only compliance with safety standards but also long-term stability and economic efficiency by preventing potential failures due to inadequate foundation design based on oversimplified assessments.

Okay, so weve poked around in the dirt, done our simple field tests, and maybe the ground isnt quite singing the bearing capacity song we hoped for. What now? We dont just throw our hands up and say, "Guess we cant build here!" Nope. Thats where improving bearing capacity comes into play. Its like giving the soil a pep talk and a strong cup of coffee, getting it ready to hold the weight of whatever were planning to build.

There are a bunch of common foundation repair techniques that fall under this umbrella. One fairly straightforward approach is soil compaction. Think of it like packing a suitcase really tightly. By compressing the soil particles closer together, we make the ground denser and stronger. This can involve using heavy rollers or vibratory plates to literally shake the soil into submission. Its a classic technique, especially effective for granular soils like sand and gravel.

Another option, often used when dealing with weaker soils like clay, is soil stabilization. This is where we get a little more creative and introduce additives to actually change the soils properties. We might mix in lime or cement to bind the soil particles together, making it more resistant to deformation and increasing its strength. Its like giving the soil a permanent structural makeover.

Sometimes, the problem isnt just the soil itself, but the presence of excess water. Waterlogged soil is generally weaker. So, drainage improvements can be a game-changer. Installing French drains or other drainage systems helps to remove excess water from the soil, allowing it to regain its strength and bearing capacity. Think of it as giving the soil a chance to breathe and dry out.

Finally, for more challenging situations, we might consider ground improvement techniques like stone columns or deep soil mixing. These are more complex solutions that involve reinforcing the soil with columns of compacted stone or mixing it with stabilizing agents at greater depths. Its like building a hidden skeleton within the soil to provide extra support.

Ultimately, the best technique for improving bearing capacity depends on the specific soil conditions, the type of structure being built, and, of course, the budget. The field tests we talked about earlier are crucial for informing this decision-making process. They give us the clues we need to choose the right "pep talk" for the soil, ensuring a solid and stable foundation for whatever comes next.

In the realm of geotechnical engineering, understanding the bearing capacity of soil is crucial for ensuring the stability and longevity of foundation structures. One effective approach to assess this is through simple field tests, which provide valuable insights into real-world scenarios while being practical and cost-effective. This essay delves into case studies where these field tests have been applied to evaluate bearing capacity in various foundation scenarios.

Consider a recent project in a suburban development where residential buildings were planned on a site with variable soil conditions. Here, engineers employed the Standard Penetration Test (SPT) to gain an understanding of the subsurface layers. By driving a standardized sampler into the ground and recording the number of blows required for penetration, they were able to correlate this data with established charts to estimate bearing capacities. This method proved particularly useful as it allowed for immediate feedback during site investigation, enabling adjustments in foundation design before construction commenced.

Another compelling case study involves a commercial warehouse project located near a riverbank known for its soft, alluvial soils. The challenge here was not only to determine bearing capacity but also to ensure minimal settlement under heavy loads. Engineers chose to perform the Plate Load Test (PLT), where a rigid plate is loaded incrementally while measuring settlement. This test provided direct measurement of how well the soil would support the proposed structure by mimicking load distribution from actual foundations. The results from PLT were instrumental in deciding on deep pile foundations over shallow ones, significantly affecting both cost and construction timelines.

In rural areas where infrastructure might be limited, simpler methods like the Dynamic Cone Penetrometer (DCP) test come into play. A case study from such an area involved constructing a small bridge over a creek with limited access for heavy machinery. The DCP test involved driving a cone-tipped rod into the ground and counting blows per depth increment, offering quick insights into soil resistance profiles without extensive setup or equipment. This information was vital in choosing appropriate pier foundations that would withstand both vertical loads from traffic and potential lateral forces from water flow.

Each of these examples showcases how field tests can be tailored to specific scenarios, balancing between accuracy needed for design integrity and practicality due to project constraints like budget or location accessibility. Beyond merely providing numerical values, these tests contribute qualitative understanding - how soil reacts under different conditions, which could influence decisions like using reinforced concrete or opting for more flexible foundation designs.

In conclusion, case studies applying simple field tests like SPT, PLT, and DCP in assessing bearing capacity reveal their indispensable role in geotechnical evaluations. They offer engineers tangible data from real-world applications that guide foundational decisions effectively while keeping within economic and logistical boundaries. As technology evolves, these methods continue to refine yet retain their essence - providing foundational knowledge quite literally at our feet before we build upon them.

Okay, so youre thinking about checking your foundations bearing capacity using some simple field tests. Smart move! But then the question pops up: Do you tackle this yourself (DIY), or should you call in a professional? Lets break down the cost-benefit of each approach, in plain English.

DIY foundation assessment, using simple field tests, can seem really appealing initially. The biggest draw is, of course, the cost savings. You bypass professional fees, which can definitely add up. You might find some online guides, watch a few videos, and think, "Hey, I can do this!" Plus, theres a certain satisfaction in tackling a project yourself and learning something new. You control the timeline, and you're intimately involved in the process.

However, the benefits are quickly weighed down by potential drawbacks. The accuracy of DIY assessments relies heavily on your knowledge, experience, and the quality of your tools. Simple field tests, while helpful, often provide a limited view of the overall bearing capacity. Misinterpreting the results or missing crucial signs of underlying problems could lead to inaccurate conclusions and, ultimately, more expensive repairs down the line. Think of it like diagnosing a medical condition yourself based on internet searches - you might get some things right, but youre not a doctor. Also, consider the time investment. What seems like a quick weekend project can easily balloon into a weeks-long endeavor, especially if you encounter unexpected challenges.

On the flip side, hiring a professional geotechnical engineer comes with a more significant upfront cost. Youre paying for their expertise, specialized equipment, and the peace of mind that comes with a qualified assessment. They can conduct more thorough investigations, including soil borings and laboratory testing, providing a much more accurate picture of your foundations bearing capacity. They can also identify potential problems that might be missed by DIY methods, such as hidden soil issues or drainage problems. This can prevent costly future repairs and ensure the long-term stability of your home. Furthermore, a professional assessment often comes with a report that can be valuable for insurance purposes or when selling your property.

Ultimately, the best approach depends on your individual circumstances. If you have a strong background in engineering or construction, are comfortable with technical procedures, and are confident in your ability to accurately interpret the results, a DIY assessment might be a reasonable option, especially for very minor concerns. However, if youre dealing with significant signs of foundation distress, are unsure about your abilities, or simply want the assurance of an expert opinion, investing in a professional assessment is almost always the wiser choice. Think of it as an investment in the long-term health and stability of your home. Sometimes, spending a little more upfront can save you a lot of money – and stress – down the road. The cost of misdiagnosis in this case could be far greater than the initial professional fee.

About waterproofing

Waterproofing is the process of making a things, individual or structure water-proof or water-resistant to make sure that it remains reasonably unaffected by water or stands up to the ingress of water under defined conditions. Such items might be utilized in damp atmospheres or underwater to defined depths. Waterproof and water resistant typically refer to resistance to infiltration of water in its fluid state and perhaps under pressure, whereas damp proof describes resistance to humidity or wetness. Permeation of water vapour with a material or structure is reported as a wetness vapor transmission rate (MVTR). The hulls of boats and ships were when waterproofed by applying tar or pitch. Modern things may be waterproofed by using water-repellent finishings or by sealing joints with gaskets or o-rings. Waterproofing is used of constructing frameworks (such as cellars, decks, or wet areas), watercraft, canvas, apparel (raincoats or waders), electronic devices and paper packaging (such as cartons for liquids).
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About Piling

For other uses, see Piling (disambiguation).

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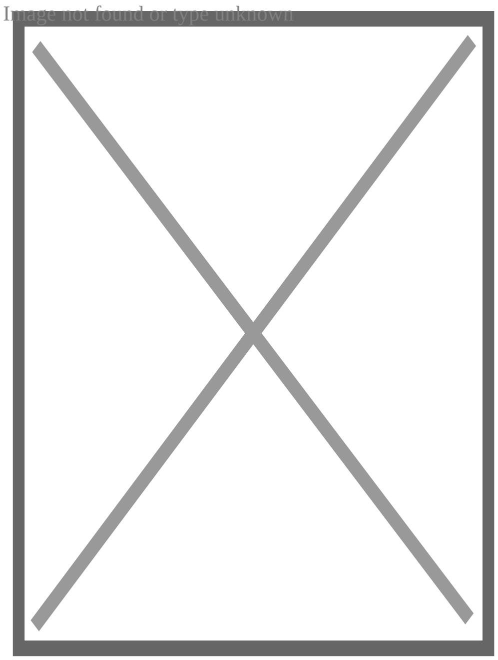
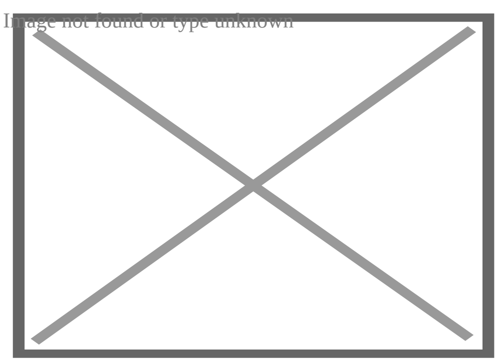
Drilling of deep piles of diameter 150 cm in bridge 423 near Ness Ziona, Israel

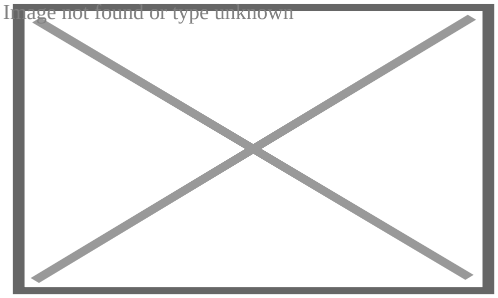


A deep foundation installation for a bridge in Napa, California, United States.



Pile driving operations in the Port of Tampa, Florida.

A **pile** or **piling** is a vertical structural element of a deep foundation, driven or drilled deep into the ground at the building site. A deep foundation is a type of foundation that transfers building loads to the earth farther down from the surface than a shallow foundation does to a subsurface layer or a range of depths.

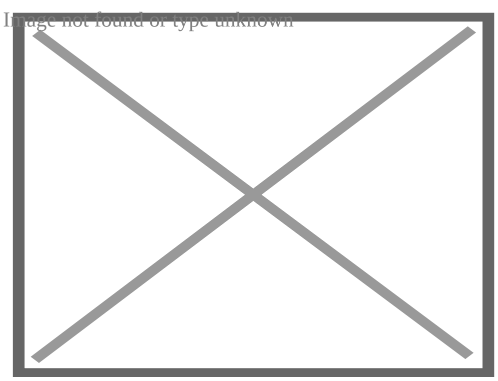


Deep foundations of The Marina Torch, a skyscraper in Dubai

There are many reasons that a geotechnical engineer would recommend a deep foundation over a shallow foundation, such as for a skyscraper. Some of the common reasons are very large design loads, a poor soil at shallow depth, or site constraints like property lines. There are different terms used to describe different types of deep foundations including the pile (which is analogous to a pole), the pier (which is analogous to a column), drilled shafts, and caissons. Piles are generally driven into the ground *in situ*; other deep foundations are typically put in place using excavation and drilling. The naming conventions may vary between engineering disciplines and firms. Deep foundations can be made out of timber, steel, reinforced concrete or prestressed concrete.

Driven foundations

[edit]



Pipe piles being driven into the ground

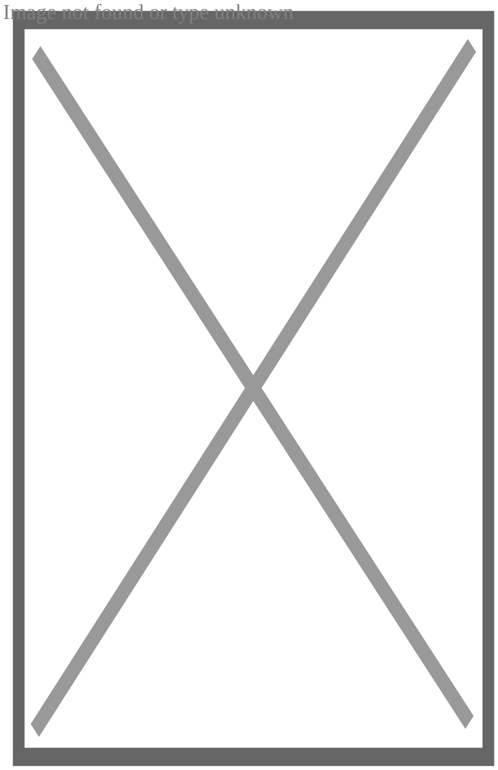


Illustration of a hand-operated pile driver in Germany after 1480

Prefabricated piles are driven into the ground using a pile driver. Driven piles are constructed of wood, reinforced concrete, or steel. Wooden piles are made from the trunks of tall trees. Concrete piles are available in square, octagonal, and round cross-sections (like Franki piles). They are reinforced with rebar and are often prestressed. Steel piles are either pipe piles or some sort of beam section (like an H-pile). Historically, wood piles used splices to join multiple segments end-to-end when the driven depth required was too long for a single pile; today, splicing is common with steel piles, though concrete piles can be spliced with mechanical and other means. Driving piles, as opposed to drilling shafts, is advantageous because the soil displaced by driving the piles compresses the surrounding soil, causing greater friction against the sides of the piles, thus increasing their load-bearing capacity. Driven piles are also considered to be "tested" for weight-bearing ability because of their method of installation.[*citation needed*]

Pile foundation systems

[edit]

Foundations relying on driven piles often have groups of piles connected by a pile cap (a large concrete block into which the heads of the piles are embedded) to distribute loads that are greater than one pile can bear. Pile caps and isolated piles are typically connected with grade beams to tie the foundation elements together; lighter structural elements bear on the grade beams, while heavier elements bear directly on the pile cap.[*citation needed*]

Monopile foundation

[edit]

A **monopile foundation** utilizes a single, generally large-diameter, foundation structural element to support all the loads (weight, wind, etc.) of a large above-surface structure.

A large number of monopile foundations[1] have been utilized in recent years for economically constructing fixed-bottom offshore wind farms in shallow-water subsea locations.[2] For example, the Horns Rev wind farm in the North Sea west of Denmark utilizes 80 large monopiles of 4 metres diameter sunk 25 meters deep into the seabed,[3] while the Lynn and Inner Dowsing Wind Farm off the coast of England went online in 2008 with over 100 turbines, each mounted on a 4.7-metre-diameter monopile foundation in ocean depths up to 18 metres.[4]

The typical construction process for a wind turbine subsea monopile foundation in sand includes driving a large hollow steel pile, of some 4 m in diameter with approximately 50mm thick walls, some 25 m deep into the seabed, through a 0.5 m layer of larger stone and gravel to minimize erosion around the pile. A transition piece (complete with pre-installed features such as boat-landing arrangement, cathodic protection, cable ducts for sub-marine cables, turbine tower flange, etc.) is attached to the driven pile, and the sand and water are removed from the centre of the pile and replaced with concrete. An additional layer of even larger stone, up to 0.5 m diameter, is applied to the surface of the seabed for longer-term erosion protection.[2]

Drilled piles

[edit]

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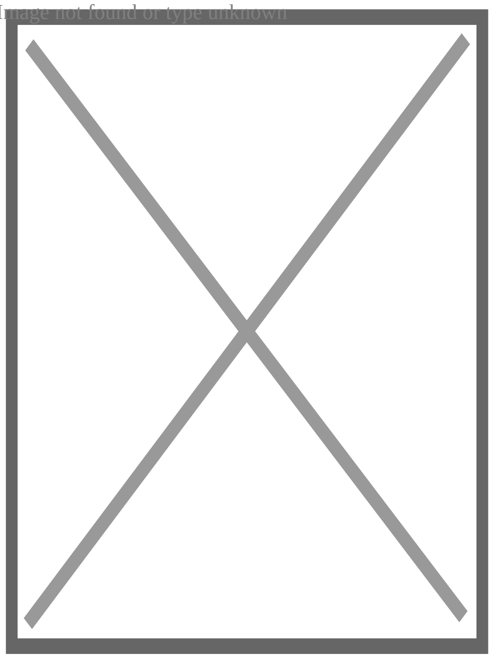


A pile machine in Amsterdam.

Also called **caissons**, **drilled shafts**, **drilled piers**, **cast-in-drilled-hole piles (CIDH piles)** or **cast-in-situ** piles, a borehole is drilled into the ground, then concrete (and often some sort of reinforcing) is placed into the borehole to form the pile. Rotary boring techniques allow larger diameter piles than any other piling method and permit pile construction through particularly dense or hard strata. Construction methods depend on the geology of the site; in particular, whether boring is to be undertaken in 'dry' ground conditions or through water-saturated strata. Casing is often used when the sides of the borehole are likely to slough off before concrete is poured.

For end-bearing piles, drilling continues until the borehole has extended a sufficient depth (socketing) into a sufficiently strong layer. Depending on site geology, this can be a rock layer, or hardpan, or other dense, strong layers. Both the diameter of the pile and the depth of the pile are highly specific to the ground conditions, loading conditions, and nature of the project. Pile depths may vary substantially across a project if the bearing layer is not level. Drilled piles can be tested using a variety of methods to verify the pile integrity during installation.

Under-reamed piles

[edit]

Under-reamed piles have mechanically formed enlarged bases that are as much as 6 m in diameter.[*citation needed*] The form is that of an inverted cone and can only be formed in stable soils or rocks. The larger base diameter allows greater bearing capacity than a straight-shaft pile.

These piles are suited for expansive soils which are often subjected to seasonal moisture variations, or for loose or soft strata. They are used in normal ground condition also where economics are favorable. [5][*full citation needed*]

Under reamed piles foundation is used for the following soils:-

1. Under reamed piles are used in black cotton soil: This type of soil expands when it comes in contact with water and contraction occurs when water is removed. So that cracks appear in the construction done on such clay. An under reamed pile is used in the base to remove this defect.

2. Under reamed piles are used in low bearing capacity Outdated soil (filled soil)

3.Under reamed piles are used in sandy soil when water table is high.

4. Under reamed piles are used, Where lifting forces appear at the base of foundation.

Augercast pile

[edit]

An augercast pile, often known as a continuous flight augering (CFA) pile, is formed by drilling into the ground with a hollow stemmed continuous flight auger to the required depth or degree of resistance. No casing is required. A cement grout mix is then pumped down the stem of the auger. While the cement grout is pumped, the auger is slowly withdrawn, conveying the soil upward along the flights. A shaft of fluid cement grout is formed to ground level. Reinforcement can be installed. Recent innovations in addition to stringent quality control allows reinforcing cages to be placed up to the full length of a pile when required.[*citation needed*]

Augercast piles cause minimal disturbance and are often used for noise-sensitive and environmentally-sensitive sites. Augercast piles are not generally suited for use in contaminated soils, because of expensive waste disposal costs. In cases such as these, a displacement pile (like Olivier piles) may provide the cost efficiency of an augercast pile and minimal environmental impact. In ground containing obstructions or cobbles and boulders, augercast piles are less suitable as refusal above the design pile tip elevation may be encountered.[*citation needed*]

Small Sectional Flight Auger piling rigs can also be used for piled raft foundations. These produce the same type of pile as a Continuous Flight Auger rig but using smaller, more lightweight equipment. This piling method is fast, cost-effective and suitable for the majority of ground types.[5][6]

Pier and grade beam foundation

[edit]

In drilled pier foundations, the piers can be connected with grade beams on which the structure sits, sometimes with heavy column loads bearing directly on the piers. In some residential construction, the piers are extended above the ground level, and wood beams bearing on the piers are used to support the structure. This type of foundation results in a crawl space underneath the building in which wiring and duct work can be laid during construction or re-modelling.[7]

Speciality piles

[edit]

Jet-piles

[edit]

In jet piling high pressure water is used to set piles.[8] High pressure water cuts through soil with a high-pressure jet flow and allows the pile to be fitted.[9] One advantage of Jet Piling: the water jet lubricates the pile and softens the ground.[10] The method is in use in Norway.[11]

Micropiles

[edit]

Micropiles are small diameter, generally less than 300mm diameter, elements that are drilled and grouted in place. They typically get their capacity from skin friction along the sides of the element, but can be end bearing in hard rock as well. Micropiles are usually heavily reinforced with steel comprising more than 40% of their cross section. They can be used as direct structural support or as ground reinforcement elements. Due to their relatively high cost and the type of equipment used to install these elements, they are often used where access restrictions and or very difficult ground conditions (cobbles and boulders, construction debris, karst, environmental sensitivity) exists or to retrofit existing structures. Occasionally, in difficult ground, they are used for new construction foundation elements. Typical applications include underpinning, bridge, transmission tower and slope stabilization projects.[6][12][13][14]

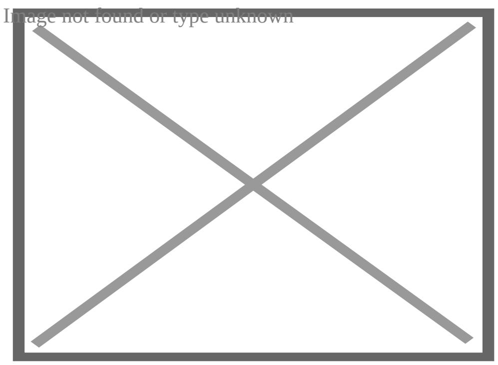
Tripod piles

[edit]

The use of a tripod rig to install piles is one of the more traditional ways of forming piles. Although unit costs are generally higher than with most other forms of piling,[*citation nee* it has several advantages which have ensured its continued use through to the present day. The tripod system is easy and inexpensive to bring to site, making it ideal for jobs with a small number of piles.[*clarification needed*]

Sheet piles

[edit]

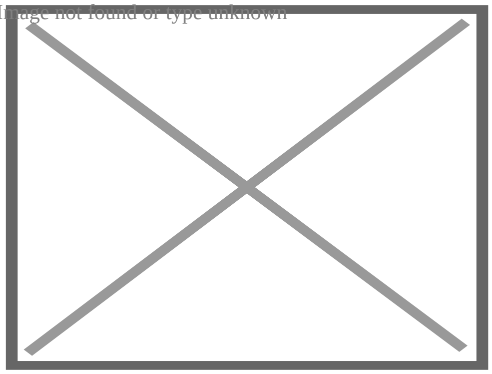


Sheet piles are used to restrain soft soil above the bedrock in this excavation

Sheet piling is a form of driven piling using thin interlocking sheets of steel to obtain a continuous barrier in the ground. The main application of sheet piles is in retaining walls and cofferdams erected to enable permanent works to proceed. Normally, vibrating hammer, t-crane and crawle drilling are used to establish sheet piles.[*citation needed*

Soldier piles

[edit]



A soldier pile wall using reclaimed railway sleepers as lagging.

Soldier piles, also known as king piles or Berlin walls, are constructed of steel H sections spaced about 2 to 3 m apart and are driven or drilled prior to excavation. As the excavation proceeds, horizontal timber sheeting (lagging) is inserted behind the H pile flanges.

The horizontal earth pressures are concentrated on the soldier piles because of their relative rigidity compared to the lagging. Soil movement and subsidence is minimized by installing the lagging immediately after excavation to avoid soil loss.[*citation needed*] Lagging can be constructed by timber, precast concrete, shotcrete and steel plates depending on spacing of the soldier piles and the type of soils.

Soldier piles are most suitable in conditions where well constructed walls will not result in subsidence such as over-consolidated clays, soils above the water table if they have some cohesion, and free draining soils which can be effectively dewatered, like sands.[*citation needed*]

Unsuitable soils include soft clays and weak running soils that allow large movements such as loose sands. It is also not possible to extend the wall beyond the bottom of the excavation, and dewatering is often required.[*citation needed*]

Screw piles

[edit]

Screw piles, also called *helical piers* and *screw foundations*, have been used as foundations since the mid 19th century in screw-pile lighthouses.[*citation needed*] Screw piles are galvanized iron pipe with helical fins that are turned into the ground by machines to the required depth. The screw distributes the load to the soil and is sized accordingly.

Suction piles

[edit]

Suction piles are used underwater to secure floating platforms. Tubular piles are driven into the seabed (or more commonly dropped a few metres into a soft seabed) and then a pump sucks water out at the top of the tubular, pulling the pile further down.

The proportions of the pile (diameter to height) are dependent upon the soil type. Sand is difficult to penetrate but provides good holding capacity, so the height may be as short as half the diameter. Clays and muds are easy to penetrate but provide poor holding capacity, so the height may be as much as eight times the diameter. The open nature of gravel means that water would flow through the ground during installation, causing 'piping' flow (where water boils up through weaker paths through the soil). Therefore, suction piles cannot be used in gravel seabeds.[*citation needed*]

Adfreeze piles

[edit]

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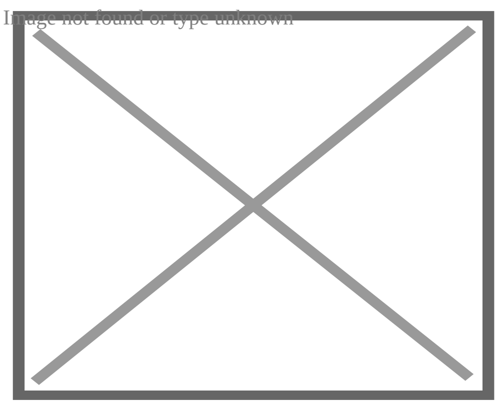


Adfreeze piles supporting a building in Utqia?vik, Alaska

In high latitudes where the ground is continuously frozen, adfreeze piles are used as the primary structural foundation method.

Adfreeze piles derive their strength from the bond of the frozen ground around them to the surface of the pile.[*citation needed*]

Adfreeze pile foundations are particularly sensitive in conditions which cause the permafrost to melt. If a building is constructed improperly then it can melt the ground below, resulting in a failure of the foundation system.[*citation needed*]

Vibrated stone columns

[edit]

Vibrated stone columns are a ground improvement technique where columns of coarse aggregate are placed in soils with poor drainage or bearing capacity to improve the soils.[*citation needed*]

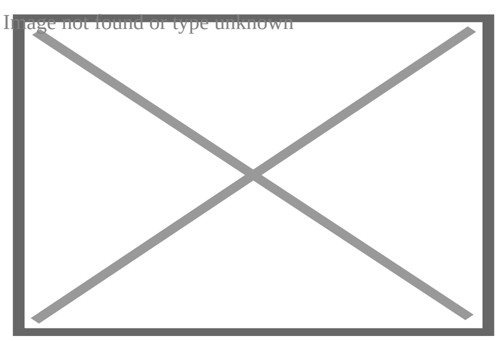
Hospital piles

[edit]

Specific to marine structures, hospital piles (also known as gallow piles) are built to provide temporary support to marine structure components during refurbishment works. For example, when removing a river pontoon, the brow will be attached to hospital pile to support it. They are normal piles, usually with a chain or hook attachment.[*citation needed*]

Piled walls

[edit]



Sheet piling, by a bridge, was used to block a canal in New Orleans after Hurricane Katrina damaged it.

Piled walls can be drivene or bored. They provide special advantages where available working space dictates and open cut excavation not feasible. Both methods offer technically effective and offer a cost efficient temporary or permanent means of retaining the sides of bulk excavations even in water bearing strata. When used in permanent works, these walls can be designed to resist vertical loads in addition lateral load from retaining soil. Construction of both methods is the same as for foundation bearing piles. Contiguous walls are constructed with small gaps between adjacent piles. The spacing of the piles can be varied to provide suitable bending stiffness.

Secant piled walls

[edit]

Secant pile walls are constructed such that space is left between alternate 'female' piles for the subsequent construction of 'male' piles.[*clarification needed*] Construction of 'male' piles involves boring through the concrete in the 'female' piles hole in order to key 'male' piles between. The male pile is the one where steel reinforcement cages are installed, though in some cases the female piles are also reinforced.[*citation needed*]

Secant piled walls can either be true hard/hard, hard/intermediate (firm), or hard/soft, depending on design requirements. Hard refers to structural concrete and firm or soft is usually a weaker grout mix containing bentonite.[*citation needed*] All types of wall can be constructed as free standing cantilevers, or may be propped if space and sub-structure design permit. Where party wall agreements allow, ground anchors can be used as tie backs.

Slurry walls

[edit]

A slurry wall is a barrier built under ground using a mix of bentonite and water to prevent the flow of groundwater. A trench that would collapse due to the hydraulic pressure in the surrounding soil does not collapse as the slurry balances the hydraulic pressure.

Deep mixing/mass stabilization techniques

[edit]

These are essentially variations of *in situ* reinforcements in the form of piles (as mentioned above), blocks or larger volumes.

Cement, lime/quick lime, flyash, sludge and/or other binders (sometimes called stabilizer) are mixed into the soil to increase bearing capacity. The result is not as solid as concrete, but should be seen as an improvement of the bearing capacity of the original soil.

The technique is most often applied on clays or organic soils like peat. The mixing can be carried out by pumping the binder into the soil whilst mixing it with a device normally mounted on an excavator or by excavating the masses, mixing them separately with the binders and refilling them in the desired area. The technique can also be used on lightly contaminated masses as a means of binding contaminants, as opposed to excavating them and transporting to landfill or processing.

Materials

[edit]

Timber

[edit]
Main article: Timber pilings

As the name implies, timber piles are made of wood.

Historically, timber has been a plentiful, locally available resource in many areas. Today, timber piles are still more affordable than concrete or steel. Compared to other types of piles (steel or concrete), and depending on the source/type of timber, timber piles may not be suitable for heavier loads.

A main consideration regarding timber piles is that they should be protected from rotting above groundwater level. Timber will last for a long time below the groundwater level. For timber to rot, two elements are needed: water and oxygen. Below the groundwater level, dissolved oxygen is lacking even though there is ample water. Hence, timber tends to last for a long time below the groundwater level. An example is Venice, which has had timber pilings since its beginning; even most of the oldest piles are still in use. In 1648, the Royal Palace of Amsterdam was constructed on 13,659 timber piles that still survive today since they were below groundwater level. Timber that is to be used above the water table can be protected from decay and insects by numerous forms of wood preservation using pressure treatment (alkaline copper quaternary (ACQ), chromated copper arsenate (CCA), creosote, etc.).

Splicing timber piles is still quite common and is the easiest of all the piling materials to splice. The normal method for splicing is by driving the leader pile first, driving a steel tube (normally 60–100 cm long, with an internal diameter no smaller than the minimum toe diameter) half its length onto the end of the leader pile. The follower pile is then simply slotted into the other end of the tube and driving continues. The steel tube is simply there to ensure that the two pieces follow each other during driving. If uplift capacity is required, the splice can incorporate bolts, coach screws, spikes or the like to give it the necessary capacity.

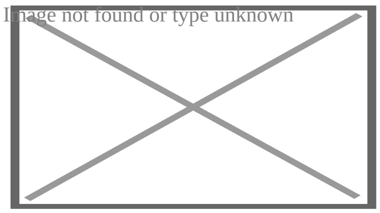
Iron

[edit]

Cast iron may be used for piling. These may be ductile.[*citation needed*]

Steel

[edit]



Cutaway illustration. Deep inclined (battered) pipe piles support a precast segmented skyway where upper soil layers are weak muds.

Pipe piles are a type of steel driven pile foundation and are a good candidate for inclined (battered) piles.

Pipe piles can be driven either open end or closed end. When driven open end, soil is allowed to enter the bottom of the pipe or tube. If an empty pipe is required, a jet of water or an auger can be used to remove the soil inside following driving. Closed end pipe piles are constructed by covering the bottom of the pile with a steel plate or cast steel shoe.

In some cases, pipe piles are filled with concrete to provide additional moment capacity or corrosion resistance. In the United Kingdom, this is generally not done in order to reduce the cost.[*citation needed*] In these cases corrosion protection is provided by allowing for a sacrificial thickness of steel or by adopting a higher grade of steel. If a concrete filled pipe pile is corroded, most of the load carrying capacity of the pile will remain intact due to the concrete, while it will be lost in an empty pipe pile. The structural capacity of pipe piles is primarily calculated based on steel strength and concrete strength (if filled). An allowance is made for corrosion depending on the site conditions and local building codes. Steel pipe piles can either be new steel manufactured specifically for the piling industry or reclaimed steel tubular casing previously used for other purposes such as oil and gas exploration.

H-Piles are structural beams that are driven in the ground for deep foundation application. They can be easily cut off or joined by welding or mechanical drive-fit splicers. If the pile is driven into a soil with low pH value, then there is a risk of corrosion, coal-tar epoxy or cathodic protection can be applied to slow or eliminate the corrosion process. It is common to allow for an amount of corrosion in design by simply over dimensioning the cross-sectional area of the steel pile. In this way, the corrosion process can be prolonged up to 50 years.[*citation needed*]

Prestressed concrete piles

[edit]

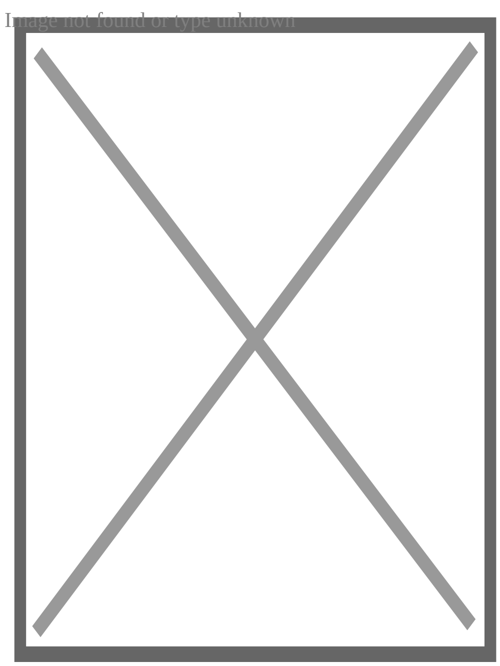
Concrete piles are typically made with steel reinforcing and prestressing tendons to obtain the tensile strength required, to survive handling and driving, and to provide sufficient bending resistance.

Long piles can be difficult to handle and transport. Pile joints can be used to join two or more short piles to form one long pile. Pile joints can be used with both precast and prestressed concrete piles.

Composite piles

[edit]

A "composite pile" is a pile made of steel and concrete members that are fastened together, end to end, to form a single pile. It is a combination of different materials or different shaped materials such as pipe and H-beams or steel and concrete.



'Pile jackets' encasing old concrete piles in a saltwater environment to prevent corrosion and consequential weakening of the piles when cracks allow saltwater to contact the internal steel reinforcement rods

Construction machinery for driving piles into the ground

[edit]

Construction machinery used to drive piles into the ground:[15]

- Pile driver is a device for placing piles in their designed position.
- Diesel pile hammer is a device for hammering piles into the ground.
- Hydraulic hammer is removable working equipment of hydraulic excavators, hydroficated machines (stationary rock breakers, loaders, manipulators, pile driving hammers) used for processing strong materials (rock, soil, metal) or pile driving elements by impact of falling parts dispersed by high-pressure fluid.
- Vibratory pile driver is a machine for driving piles into sandy and clay soils.
- Press-in pile driver is a machine for sinking piles into the ground by means of static force transmission.[16]
- Universal drilling machine.

Construction machinery for replacement piles

[edit]

Construction machinery used to construct replacement piles:[15]

- Sectional Flight Auger or Continuous Flight Auger
- Reverse circulation drilling
- Ring bit concentric drilling

See also

[edit]
- Eurocode EN 1997
- International Society for Micropiles
- Post in ground construction also called earthfast or posthole construction; a historic method of building wooden structures.
- Stilt house, also known as a lake house; an ancient, historic house type built on pilings.
- Shallow foundations
- Pile bridge
- Larssen sheet piling

Notes

[edit]

1. **^** Offshore Wind Turbine Foundations, 2009-09-09, accessed 2010-04-12.
2. ^ ***a*** ***b*** Constructing a turbine foundation Archived 21 May 2011 at the Wayback Machine Horns Rev project, Elsam monopile foundation construction process, accessed 2010-04-12]

3. **^** Horns Revolution Archived 14 July 2011 at the Wayback Machine, Modern Power Systems, 2002-10-05, accessed 2010-04-14.
4. **^** *"Lynn and Inner Dowsing description". Archived from the original on 26 July 2011. Retrieved 23 July 2010.*
5. ^ ***a b*** Handbook on Under-reamed and bored compaction pile foundation, Central building research institute Roorkee, Prepared by Devendra Sharma, M. P. Jain, Chandra Prakash
6. ^ ***a b*** *Siel, Barry D.; Anderson, Scott A. "Implementation of Micropiles by the Federal Highway Administration" (PDF). Federal Highway Administration (US).* cite journal: Cite journal requires |journal= (help)
7. **^** *Marshall, Brain (April 2000). "How House Construction Works". How Stuff Works. HowStuffWorks, Inc. Retrieved 4 April 2013.*
8. **^** *"jet-pile". Merriam-Webster. Retrieved 2 August 2020.*
9. **^** *Guan, Chengli; Yang, Yuyou (21 February 2019). "Field Study on the Waterstop of the Rodin Jet Pile". Applied Sciences. doi:10.3390/app9081709. Retrieved 2 August 2020.*
10. **^** *"Press-in with Water Jetting". Giken.com. Giken Ltd. Retrieved 2 August 2020.*
11. **^** *"City Lade, Trondheim". Jetgrunn.no. Jetgrunn AS. Retrieved 2 August 2020.*
12. **^** *Omer, Joshua R. (2010). "A Numerical Model for Load Transfer and Settlement of Bored Cast In-Situ Piles". Proceedings of the 35th Annual Conference on Deep Foundations. Archived from the original on 14 April 2021. Retrieved 20 July 2011.*
13. **^** *"International Society for Micropiles". Retrieved 2 February 2007.*
14. **^** *"GeoTechTools". Geo-Institute. Retrieved 15 April 2022.*
15. ^ ***a b*** *McNeil, Ian (1990). An Encyclopaedia of the history of technolology. Routledge. ISBN 9780415147927. Retrieved 20 July 2022 – via Internet Archive.*
16. **^** *"General description of the press-in pile driving unit". Concrete Pumping Melbourne. 13 October 2021. Archived from the original on 25 December 2022. Retrieved 20 July 2022.*

References

[edit]

- Italiantrivelle Foundation Industry Archived 25 June 2014 at the Wayback Machine The Deep Foundation web portal Italiantrivelle is the number one source of information regarding the Foundation Industry. (Link needs to be removed or updated, links to inappropriate content)
- *Fleming, W. G. K. et al., 1985, Piling Engineering, Surrey University Press; Hunt, R. E., Geotechnical Engineering Analysis and Evaluation, 1986, McGraw-Hill.*
- Coduto, Donald P. *Foundation Design: Principles and Practices* 2nd ed., Prentice-Hall Inc., 2001.
- NAVFAC DM 7.02 Foundations and Earth Structures U.S. Naval Facilities Engineering Command, 1986.
- Rajapakse, Ruwan., *Pile Design and Construction Guide*, 2003

- Tomlinson, P.J., *Pile Design and Construction Practice*, 1984
- Stabilization of Organic Soils Archived 22 February 2012 at the Wayback Machine
- Sheet piling handbook, 2010

External links

[edit]

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- Deep Foundations Institute

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Geotechnical engineering

Offshore geotechnical engineering

Investigation and instrumentation

- Field (*in situ*)
  - Core drill
  - Cone penetration test
  - Geo-electrical sounding
  - Permeability test
  - Load test
    - Static
    - Dynamic
    - Statnamic
  - Pore pressure measurement
    - Piezometer
    - Well
  - Ram sounding
  - Rock control drilling
  - Rotary-pressure sounding
  - Rotary weight sounding
  - Sample series
  - Screw plate test
  - Deformation monitoring
    - Inclinometer
    - Settlement recordings
  - Shear vane test
  - Simple sounding
  - Standard penetration test
  - Total sounding
  - Trial pit
  - Visible bedrock
  - Nuclear densometer test
  - Exploration geophysics
  - Crosshole sonic logging
  - Pile integrity test
  - Wave equation analysis
- Laboratory testing
  - Soil classification
  - Atterberg limits
  - California bearing ratio
  - Direct shear test
  - Hydrometer
  - Proctor compaction test
  - R-value
  - Sieve analysis
  - Triaxial shear test
  - Oedometer test
  - Hydraulic conductivity tests
  - Water content tests

Soil

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

Structures (Interaction)

- Natural features
  - Topography
  - Vegetation
  - Terrain
  - Topsoil
  - Water table
  - Bedrock
  - Subgrade
  - Subsoil
  - Shoring structures
    - Retaining walls
    - Gabion
    - Ground freezing
    - Mechanically stabilized earth
    - Pressure grouting
    - Slurry wall
    - Soil nailing
    - Tieback
- Earthworks
  - Land development
  - Landfill
  - Excavation
  - Trench
  - Embankment
  - Cut
  - Causeway
  - Terracing
  - Cut-and-cover
  - Cut and fill
  - Fill dirt
  - Grading
  - Land reclamation
  - Track bed
  - Erosion control
  - Earth structure
  - Expanded clay aggregate
  - Crushed stone
  - Geosynthetics
    - Geotextile
    - Geomembrane
    - Geosynthetic clay liner
    - Cellular confinement
- Foundations
  - Infiltration
  - Shallow
  - Deep

Mechanics

- Forces
  - Effective stress
  - Pore water pressure
  - Lateral earth pressure
  - Overburden pressure
  - Preconsolidation pressure
- Phenomena/ problems
  - Permafrost
  - Frost heaving
  - Consolidation
  - Compaction
  - Earthquake
    - Response spectrum
    - Seismic hazard
    - Shear wave
  - Landslide analysis
    - Stability analysis
    - Mitigation
    - Classification
    - Sliding criterion
    - Slab stabilisation
  - Bearing capacity * Stress distribution in soil

Numerical analysis software

- SEEP2D
- STABL
- SVFlux
- SVSlope
- UTEXAS
- Plaxis

Related fields

- Geology
- Geochemistry
- Petrology
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- Geomorphology
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About Soil mechanics

Dirt mechanics is a branch of dirt physics and applied technicians that explains the actions of soils. It differs from fluid auto mechanics and solid auto mechanics in the feeling that soils include a heterogeneous mix of fluids (typically air and water) and particles (usually clay, silt, sand, and crushed rock) yet dirt may likewise contain natural solids and various other matter. Along with rock technicians, soil mechanics gives the theoretical basis for analysis in geotechnical engineering, a subdiscipline of civil design, and design geology, a subdiscipline of geology. Dirt technicians is utilized to assess the contortions of and flow of liquids within all-natural and man-made frameworks that are sustained on or made from soil, or structures that are buried in soils. Instance applications are building and bridge structures, retaining walls, dams, and hidden pipe systems. Principles of soil auto mechanics are also used in related self-controls such as geophysical engineering, seaside design, agricultural engineering, and hydrology. This post describes the genesis and structure of soil, the difference between pore water stress and inter-granular reliable anxiety, capillary action of fluids in the soil pore areas, soil category, seepage and leaks in the structure, time dependent modification of quantity because of squeezing water out of small pore areas, also referred to as loan consolidation, shear stamina and rigidity of dirts. The shear strength of soils is mostly stemmed from friction between the particles and interlocking, which are really conscious the efficient anxiety. The article ends with some instances of applications of the principles of soil auto mechanics such as incline security, lateral earth stress on keeping walls, and bearing ability of structures.
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