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Detailed explanation of traditional repair methods such as epoxy injection, polyurethane foam injection, and concrete patching.

Overview of common repair equipment used in residential foundation repair

Maintaining residential foundation repair equipment is crucial for ensuring the longevity and efficiency of these tools. Helical piers provide strong support for homes needing foundation repair expert service [professional foundation repair service](#) home improvement. In this essay, we'll explore the maintenance routines for some of the most common repair equipment used in residential foundation repair.

One of the primary pieces of equipment used in foundation repair is the hydraulic jack. These jacks are used to lift and stabilize the foundation, and regular maintenance is essential to ensure they function correctly. Maintenance routines for hydraulic jacks include checking the hydraulic fluid levels, inspecting the seals and hoses for leaks, and lubricating moving parts to prevent wear and tear. Additionally, it's important to store hydraulic jacks in a dry, clean environment to prevent rust and corrosion.

Another common piece of equipment used in foundation repair is the soil injection pump. These pumps are used to inject materials like polyurethane foam or epoxy into the soil beneath the foundation to stabilize it. Maintenance routines for soil injection pumps include checking the pump's seals and hoses for leaks, ensuring the injection nozzle is clean and free of debris, and regularly changing the injection material to prevent clogging. It's also important to store soil injection pumps in a cool, dry environment to prevent damage to the pump's components.

Piers and helical piers are also commonly used in foundation repair. These piers are driven into the ground beneath the foundation to provide additional support. Maintenance routines for piers include inspecting the piers for signs of damage or corrosion, ensuring the piers are properly anchored to the foundation, and checking the pier's alignment to ensure it's providing the necessary support. It's also important to regularly inspect the soil around the piers to ensure it's stable and not eroding.

In addition to these specific maintenance routines, it's important to follow general maintenance practices for all foundation repair equipment. This includes regularly cleaning the equipment to remove dirt and debris, storing equipment in a dry, clean environment, and following the manufacturer's recommended maintenance schedules.

In conclusion, maintaining residential foundation repair equipment is essential for ensuring the longevity and efficiency of these tools. By following specific maintenance routines for equipment like hydraulic jacks, soil injection pumps, and piers, as well as general maintenance practices, repair professionals can ensure their equipment is always in top condition and ready to tackle any foundation repair project.

Recommended maintenance schedules for different types of repair equipment

Certainly! Keeping repair equipment in top-notch condition is crucial for ensuring efficiency, safety, and longevity. Recommended maintenance schedules for different types of repair equipment play a pivotal role in achieving these goals. Let's delve into the importance of these schedules and how they vary across equipment types.

First and foremost, maintenance schedules are tailored to the specific needs and usage patterns of each type of repair equipment. For instance, heavy-duty machinery like excavators and cranes, which are subjected to rigorous use in construction sites, demand more frequent inspections and servicing compared to lighter tools such as drills or saws used in less demanding environments.

Regular maintenance not only prevents unexpected breakdowns but also extends the lifespan of the equipment. By adhering to recommended schedules, operators can identify potential issues before they escalate into costly repairs or even safety hazards. This proactive approach ultimately saves both time and money in the long run.

Moreover, maintenance schedules are not one-size-fits-all; they vary depending on factors such as the manufacturer's guidelines, operating conditions, and the equipment's age and usage history. For example, equipment operating in harsh environments like extreme temperatures or dusty conditions may require more frequent maintenance to combat accelerated wear and tear.

In addition to manufacturer recommendations, industry standards and regulations also play a significant role in shaping maintenance schedules. Compliance with these standards not only ensures the safety of operators but also helps companies avoid legal liabilities and fines associated with non-compliance.

Furthermore, advancements in technology have revolutionized maintenance practices. Predictive maintenance, enabled by sensors and data analytics, allows operators to schedule maintenance based on real-time equipment performance data rather than fixed intervals. This approach optimizes maintenance efforts, reducing downtime and maximizing equipment uptime.

In conclusion, recommended maintenance schedules are indispensable for preserving the reliability and performance of repair equipment. By adhering to these schedules and considering factors such as equipment type, operating conditions, and technological advancements, operators can ensure the smooth operation of their equipment while minimizing risks and maximizing efficiency.

Step-by-step guide to performing routine maintenance checks on repair equipment

Maintaining repair equipment is crucial for ensuring its longevity, efficiency, and safety. A step-by-step guide to performing routine maintenance checks can help technicians keep their tools in optimal condition. Here's a comprehensive approach to maintaining repair equipment:

1. **Preparation**: Begin by gathering all necessary tools and documentation. Ensure you have the equipment's manual handy for specific guidelines and safety instructions.
2. **Safety First**: Before starting any maintenance, ensure the equipment is turned off and unplugged. Use lockout/tagout procedures to prevent accidental startup.
3. **Visual Inspection**: Conduct a thorough visual inspection of the equipment. Look for any signs of wear and tear, loose parts, or obvious damage. Check for fluid leaks, frayed wires, or any other irregularities.
4. **Cleaning**: Clean the equipment thoroughly. Remove dirt, dust, and debris that can accumulate and cause malfunctions. Use appropriate cleaning agents and tools to avoid damaging sensitive components.
5. **Lubrication**: Apply lubricants to moving parts as per the manufacturer's recommendations. This reduces friction and wear, ensuring smooth operation. Be cautious not to over-lubricate, as this can attract more dirt and cause issues.
6. **Tightening Fasteners**: Check all bolts, screws, and fasteners. Tighten any that are loose to prevent parts from coming apart during use.
7. **Fluid Levels**: Check and top up any fluid levels, such as oil, coolant, or hydraulic fluid. Ensure you use the correct type of fluid specified by the manufacturer.
8. **Electrical Checks**: Inspect all electrical connections and wires. Look for signs of corrosion, fraying, or loose connections. Ensure that all safety switches and guards are functioning correctly.
9. **Functional Testing**: After performing maintenance checks, test the equipment to ensure it operates correctly. This may involve running the machine through a series of cycles or performing specific tasks it is designed for.
10. **Documentation**: Keep a record of all maintenance activities. Note the date, type of maintenance performed, and any issues found. This helps in tracking the equipment's condition over time and planning future maintenance schedules.
11. **Final Inspection**: Conduct a final inspection to ensure no steps were missed and everything is secure and functioning as it should.

By following this step-by-step guide, technicians can ensure that repair equipment remains in top condition, reducing downtime and enhancing safety in the workplace. Regular

maintenance not only extends the life of the equipment but also contributes to a more efficient and reliable operation.

Identifying signs of wear and tear on repair equipment and when to seek professional help

Certainly! Recognizing signs of wear and tear on repair equipment is crucial for maintaining efficiency, safety, and longevity of the tools. Here are some common indicators that your repair equipment might need attention or professional help:

Firstly, look out for unusual noises during operation. Equipment that starts to make grinding, squeaking, or rattling sounds can be a sign of internal wear. This could be due to loose components, worn-out bearings, or misaligned parts. Ignoring these sounds can lead to more severe damage and costly repairs down the line.

Next, observe any changes in performance. If your equipment isn't cutting, drilling, or fastening as effectively as it used to, it might be time for a check-up. Reduced power, slower operation, or difficulty in completing tasks are red flags. This could be due to a variety of reasons such as clogged parts, worn-out motors, or outdated software in the case of computerized equipment.

Visual inspections are also key. Look for physical signs of wear such as cracks, chips, or rust on the equipment's exterior. These can compromise the structural integrity and safety of the tool. Additionally, worn or frayed cables and hoses can pose serious risks, especially if they're electrical or hydraulic components.

Fluid leaks are another critical sign. Whether it's oil, coolant, or hydraulic fluid, any leakage indicates a problem that needs immediate attention. Not only can these fluids damage other parts of the equipment, but they also pose safety hazards and environmental concerns.

Lastly, pay attention to the equipment's maintenance schedule. Regular servicing can catch minor issues before they become major problems. If it's been a while since the last professional check-up, it might be time to schedule one.

Knowing when to seek professional help is equally important. If you notice any of the above signs, it's wise to consult a professional. They have the expertise to diagnose problems accurately and perform necessary repairs or replacements. Attempting to fix complex issues without the proper knowledge can lead to further damage and even accidents.

In conclusion, keeping an eye on these signs of wear and tear and acting promptly can save you time, money, and ensure the safety of those using the equipment. Regular maintenance and timely professional help are key to keeping your repair equipment in top shape.

Tips for prolonging the lifespan of repair equipment through proper maintenance

Certainly! Ensuring the longevity of repair equipment is crucial for both efficiency and cost-effectiveness in any maintenance routine. Here are some practical tips for prolonging the lifespan of repair equipment through proper maintenance:

Firstly, regular inspections are key. Equipment should be routinely checked for wear and tear, loose components, or any signs of impending failure. Early detection of issues can prevent more significant problems down the line. It's beneficial to establish a schedule for these inspections, perhaps monthly or quarterly, depending on the usage intensity of the equipment.

Secondly, cleanliness is vital. Dust, grime, and other contaminants can wreak havoc on mechanical parts. Regular cleaning not only keeps the equipment looking good but also ensures that it functions smoothly. Pay special attention to moving parts and areas where debris might accumulate.

Thirdly, lubrication is a must. Many pieces of repair equipment have moving parts that require lubrication to function correctly. Adhering to the manufacturer's recommendations for lubrication types and schedules is essential. This simple step can significantly reduce friction and wear, thereby extending the equipment's lifespan.

Fourthly, proper storage is often overlooked but is incredibly important. When equipment is not in use, it should be stored in a dry, clean environment. This prevents rust and corrosion, which can severely damage metal components. Additionally, using covers can protect equipment from dust and other environmental factors.

Fifthly, training and education for those who operate and maintain the equipment are crucial. Understanding how to use equipment correctly and recognizing signs of trouble can prevent misuse and accidental damage. Regular training sessions can ensure that everyone is up to date with best practices.

Lastly, keeping detailed records of maintenance and repairs is invaluable. This documentation can help identify patterns or recurring issues, allowing for more targeted maintenance efforts. It also provides a historical record that can be useful for warranty claims or when considering upgrades or replacements.

In conclusion, prolonging the lifespan of repair equipment through proper maintenance is not just about following a checklist. It's about adopting a mindset of care and attention towards the tools that play a crucial role in our daily operations. By implementing these tips, we can ensure that our equipment remains in top condition, ready to tackle any repair challenge that comes our way.

Importance of keeping detailed maintenance records for repair equipment

Keeping detailed maintenance records for repair equipment is a crucial practice that can significantly enhance the efficiency and reliability of maintenance routines. Here's why it's important:

Firstly, detailed records provide a historical overview of the equipment's performance and maintenance activities. This history can help predict when equipment might fail or require servicing, allowing for proactive rather than reactive maintenance. By analyzing past data, maintenance teams can identify patterns and trends that might indicate impending issues, thus preventing unexpected breakdowns.

Secondly, maintaining accurate records ensures compliance with manufacturer warranties and industry regulations. Many warranties require proof of regular maintenance to remain valid. Furthermore, certain industries have regulatory requirements that mandate the keeping of detailed maintenance logs. These records can serve as evidence of due diligence in the event of an audit or inspection.

Thirdly, detailed records facilitate better communication and coordination among team members. When multiple individuals are involved in the maintenance of equipment, having a centralized record of all activities ensures that everyone is on the same page. This reduces the likelihood of miscommunication and ensures that all necessary tasks are completed in a timely manner.

Additionally, these records can be invaluable during the training of new staff. They provide a practical reference point for understanding the equipment's maintenance history and the types of issues that have arisen in the past. This can accelerate the learning curve for new employees and ensure that they are well-prepared to handle the equipment effectively.

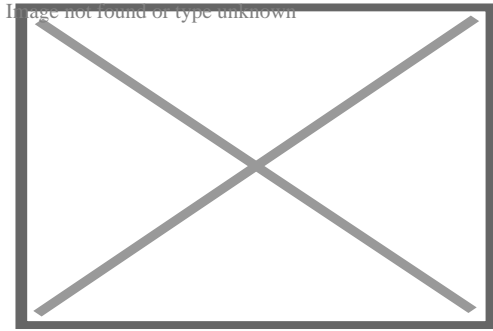
Lastly, detailed maintenance records can contribute to cost savings in the long run. By tracking the frequency and types of repairs needed, organizations can make informed decisions about whether to continue using certain equipment or invest in newer, more reliable models. This data-driven approach can lead to more strategic budgeting and resource allocation.

In summary, the importance of keeping detailed maintenance records for repair equipment cannot be overstated. It enhances predictive maintenance, ensures compliance, improves team communication, aids in training, and can lead to significant cost savings. Adopting this practice is a smart investment in the longevity and efficiency of your repair equipment.

About building code

The examples and perspective in this article **may not represent a worldwide view of the subject**. You may improve this article, discuss the issue on the talk page, or create a new article, as appropriate. *(November 2021) (Learn how and when to remove this message)*

Not to be confused with Zoning laws.



Code Violation: This fire-rated concrete block wall is penetrated by cable trays and electrical cables. The hole should be firestopped to restore the fire-resistance rating of the wall. Instead, it is filled with flammable polyurethane foam.

A **building code** (also **building control** or **building regulations**) is a set of rules that specify the standards for construction objects such as buildings and non-building structures. Buildings must conform to the code to obtain planning permission, usually from a local council. The main purpose of building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures.^[1] for example, the building codes in many countries require engineers to consider the effects of soil liquefaction in the design of new buildings.^[1] The building code becomes law of a particular jurisdiction when formally enacted by the appropriate governmental or private authority.^[2]

Building codes are generally intended to be applied by architects, engineers, interior designers, constructors and regulators but are also used for various purposes by safety inspectors, environmental scientists, real estate developers, subcontractors, manufacturers of building products and materials, insurance companies, facility managers, tenants, and others. Codes regulate the design and construction of structures where adopted into law.

Examples of building codes began in ancient times.^[3] In the USA the main codes are the International Building Code or International Residential Code [IBC/IRC], electrical codes and plumbing, mechanical codes. Fifty states and the District of Columbia have adopted the I-Codes at the state or jurisdictional level.^[4] In Canada, national model codes are published by the National Research Council of Canada.^[5] In the United Kingdom, compliance with Building Regulations is monitored by building control bodies, either Approved Inspectors or Local Authority Building Control departments. Building Control regularisation charges apply in case work is undertaken which should have had been inspected at the time of the work if this was not done.^[6]

Types

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The practice of developing, approving, and enforcing building codes varies considerably among nations. In some countries building codes are developed by the government agencies or quasi-

governmental standards organizations and then enforced across the country by the central government. Such codes are known as the **national building codes** (in a sense they enjoy a mandatory nationwide application).

In other countries, where the power of regulating construction and fire safety is vested in local authorities, a system of model building codes is used. Model building codes have no legal status unless adopted or adapted by an authority having jurisdiction. The developers of model codes urge public authorities to reference model codes in their laws, ordinances, regulations, and administrative orders. When referenced in any of these legal instruments, a particular model code becomes law. This practice is known as 'adoption by reference'. When an adopting authority decides to delete, add, or revise any portions of the model code adopted, it is usually required by the model code developer to follow a formal adoption procedure in which those modifications can be documented for legal purposes.

There are instances when some local jurisdictions choose to develop their own building codes. At some point in time all major cities in the United States had their own building codes. However, due to ever increasing complexity and cost of developing building regulations, virtually all municipalities in the country have chosen to adopt model codes instead. For example, in 2008 New York City abandoned its proprietary *1968 New York City Building Code* in favor of a customized version of the International Building Code.^[7] The City of Chicago remains the only municipality in America that continues to use a building code the city developed on its own as part of the *Municipal Code of Chicago*.

In Europe, the Eurocode: Basis of structural design, is a pan-European building code that has superseded the older national building codes. Each country now has National Annexes to localize the contents of the Eurocodes.

Similarly, in India, each municipality and urban development authority has its own building code, which is mandatory for all construction within their jurisdiction. All these local building codes are variants of a National Building Code,^[8] which serves as model code providing guidelines for regulating building construction activity.

Scope

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The purpose of building codes is to provide minimum standards for safety, health, and general welfare including structural integrity, mechanical integrity (including sanitation, water supply, light, and ventilation), means of egress, fire prevention and control, and energy conservation.^[9]
^[10] Building codes generally include:

- Standards for structure, placement, size, usage, wall assemblies, fenestration size/locations, egress rules, size/location of rooms, foundations, floor assemblies, roof structures/assemblies, energy efficiency, stairs and halls, mechanical, electrical, plumbing, site drainage & storage, appliance, lighting, fixtures standards, occupancy rules, and swimming pool regulations
- Rules regarding parking and traffic impact
- Fire code rules to minimize the risk of a fire and to ensure safe evacuation in the event of such an emergency^[citation needed]
- Requirements for earthquake (seismic code), hurricane, flood, and tsunami resistance, especially in disaster prone areas or for very large buildings where a failure would be catastrophic^[citation needed]
- Requirements for specific building uses (for example, storage of flammable substances, or housing a large number of people)
- Energy provisions and consumption
- Grandfather clauses: Unless the building is being renovated, the building code usually does not apply to existing buildings.
- Specifications on components
- Allowable installation methodologies
- Minimum and maximum room ceiling heights, exit sizes and location
- Qualification of individuals or corporations doing the work
- For high structures, anti-collision markers for the benefit of aircraft

Building codes are generally separate from zoning ordinances, but exterior restrictions (such as setbacks) may fall into either category.

Designers use building code standards out of substantial reference books during design. Building departments review plans submitted to them before construction, issue permits [or not] and inspectors verify compliance to these standards at the site during construction.

There are often additional codes or sections of the same building code that have more specific requirements that apply to dwellings or places of business and special construction objects such as canopies, signs, pedestrian walkways, parking lots, and radio and television antennas.

Criticism

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Building codes have been criticized for contributing to housing crisis and increasing the cost of new housing to some extent, including through conflicting code between different administrators.^[11] Proposed improvements include regular review and cost-benefit analysis of building codes,^[12] promotion of low-cost construction materials and building codes suitable to mass production,^[11] reducing bureaucracy, and promoting transparency.^[13]

History

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Antiquity

[edit]

Building codes have a long history. The earliest known written building code is included in the Code of Hammurabi,^[3] which dates from circa 1772 BC.

The book of Deuteronomy in the Hebrew Bible stipulated that parapets must be constructed on all houses to prevent people from falling off.^[14]

In the Chinese book of rites it mentions that ancestral temples and houses should be a certain standard length in ancient China they measured land in the chu or well field system so it was important to be precise though most of the actual lengths are lost or obscure.^{[15][16]}

In ancient Japan a certain official destroyed a courtiers house because the size was above his rank.^[17]

Modern era

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France

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In Paris, under the reconstruction of much of the city under the Second Empire (1852–70), great blocks of apartments were erected^[18] and the height of buildings was limited by law to five or six stories at most.

United Kingdom

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After the Great Fire of London in 1666, which had been able to spread so rapidly through the densely built timber housing of the city, the Rebuilding of London Act 1666 was passed in the same year as the first significant building regulation.^[19] Drawn up by Sir Matthew Hale, the act regulated the rebuilding of the city, required housing to have some fire resistance capacity and authorised the City of London Corporation to reopen and widen roads.^[20] The Laws of the Indies were passed in the 1680s by the Spanish Crown to regulate the urban planning for colonies throughout Spain's worldwide imperial possessions.

The first systematic national building standard was established with the Metropolitan Buildings Act 1844. Among the provisions, builders were required to give the district surveyor two days' notice before building, regulations regarding the thickness of walls, height of rooms, the materials used in repairs, the dividing of existing buildings and the placing and design of chimneys, fireplaces and drains were to be enforced and streets had to be built to minimum requirements.^[21]

The Metropolitan Buildings Office was formed to regulate the construction and use of buildings throughout London. Surveyors were empowered to enforce building regulations, which sought to improve the standard of houses and business premises, and to regulate activities that might threaten public health. In 1855 the assets, powers and responsibilities of the office passed to the Metropolitan Board of Works.

United States

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The City of Baltimore passed its first building code in 1891.^[22] The Great Baltimore Fire occurred in February 1904. Subsequent changes were made that matched other cities.^[23] In 1904, a Handbook of the Baltimore City Building Laws was published. It served as the building code for four years. Very soon, a formal building code was drafted and eventually adopted in 1908.

The structural failure of the tank that caused the Great Molasses Flood of 1919 prompted the Boston Building Department to require engineering and architectural calculations be filed and signed. U.S. cities and states soon began requiring sign-off by registered professional engineers for the plans of major buildings.^[24]

More recently, the 2015 Berkeley balcony collapse has prompted updates to California's balcony building codes, set for 2025, which include stricter material requirements, enhanced load-bearing standards, and mandatory inspections which known as SB326 and SB721.^[25] These laws mandate regular inspections every six years for multifamily buildings. Property owners and HOAs are required to address any structural or waterproofing issues identified during inspections to ensure compliance and safety. Failure to comply can result in fines, increased liability, and legal consequences. The updates aim to prevent tragedies like the Berkeley collapse, which was caused by dry rot and structural failure, by ensuring the long-term safety and durability of elevated structures.^[26]

Energy codes

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The current energy codes^[*clarification needed*] of the United States are adopted at the state and municipal levels and are based on the International Energy Conservation Code (IECC). Previously, they were based on the Model Energy Code (MEC). As of March 2017, the following residential codes have been partially or fully adopted by states:^[27]

- 2015 IECC or equivalent (California, Illinois, Maryland, Massachusetts, Michigan, Pennsylvania, New Jersey, New York, Vermont, Washington)
- 2012 IECC or equivalent (Alabama, Connecticut, Delaware, District of Columbia, Florida, Iowa, Minnesota, Nevada, Rhode Island, Texas)
- 2009 IECC or equivalent (Arkansas, Georgia, Idaho, Indiana, Kentucky, Louisiana, Montana, Nebraska, New Hampshire, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Virginia, West Virginia, Wisconsin)
- 2006 IECC or equivalent (Utah)
- 2006 IECC or no statewide code (Alaska, Arizona, Colorado, Kansas, Maine, Mississippi, Missouri, North Dakota, South Dakota, Wyoming)

Australia

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Australia uses the National Construction Code.

See also

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- Building officials
- Construction law
- Earthquake-resistant structures
- Energy Efficiency and Conservation Block Grants
- Outline of construction
- Seismic code
- Uniform Mechanical Code
- Variance (land use) – permission to vary zoning and sometimes building to code

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External links

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Wikimedia Commons has media related to ***Building and Fire Code Violations***.

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- IAPMO Codes Website

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- American Institute of Constructors (AIC)
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 - Asbestos Testing and Consultancy Association (ATAC)
 - Associated General Contractors of America (AGC)
 - Association of Plumbing and Heating Contractors (APHC)
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- 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

 [Outline](#)  [Category](#) broken image icon or type unknown

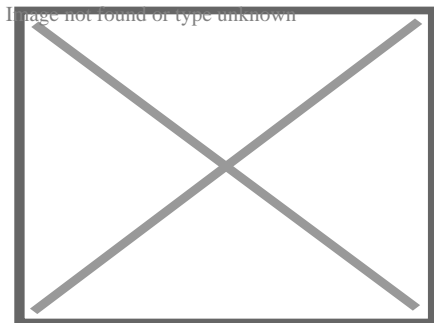
About soil compaction

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

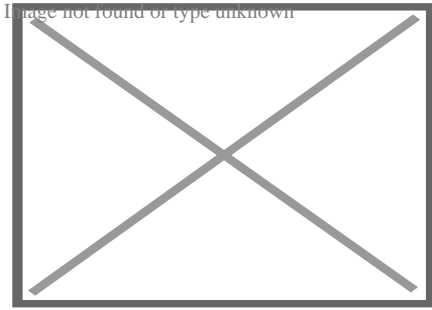
In geotechnical engineering, **soil compaction** is the process in which stress applied to a soil causes densification as air is displaced from the pores between the soil grains. When stress is applied that causes densification due to water (or other liquid) being displaced from between the soil grains,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

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

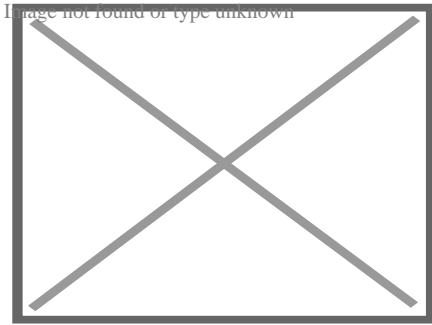
Before soils can be compacted in the field, some laboratory tests are required to determine their engineering properties. Among various properties, the maximum dry density and the optimum moisture content are vital and specify the required density to be compacted in the field.^[2]



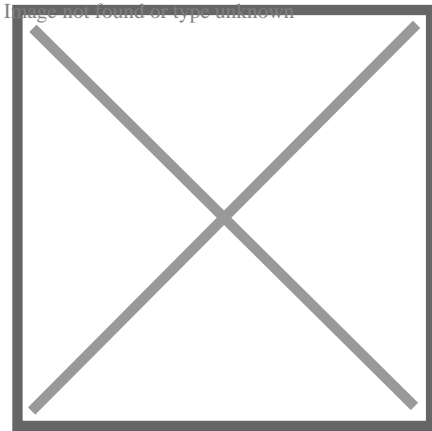
A 10 tonne excavator is here equipped with a narrow sheepsfoot roller to compact the fill over newly placed sewer pipe, forming a stable support for a new road surface.



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



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



Vibratory rammer in action

In construction

[edit]

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

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

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

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

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

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

Compaction methods

[edit]

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

The available techniques can be classified as:

1. Static – a large stress is slowly applied to the soil and then released.
2. Impact – the stress is applied by dropping a large mass onto the surface of the soil.

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

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

Test methods in laboratory

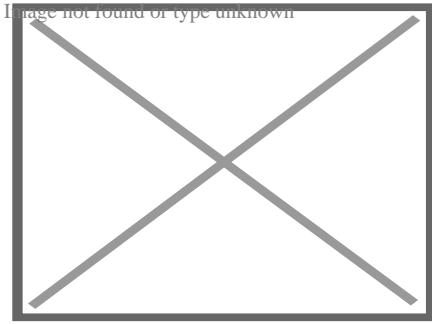
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Soil compactors are used to perform test methods which cover laboratory compaction methods used to determine the relationship between molding water content and dry unit weight of soils. Soil placed as engineering fill is compacted to a dense state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

See also

[edit]

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



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

References

[edit]

1. ^ Soil compaction due to lack of water in soil
2. ^ *Jia, Xiaoyang; Hu, Wei; Polaczyk, Pawel; Gong, Hongren; Huang, Baoshan (2019). "Comparative Evaluation of Compacting Process for Base Materials using Lab Compaction Methods". *Transportation Research Record: Journal of the Transportation Research Board*. **2673** (4): 558–567. doi:10.1177/0361198119837953. ISSN 0361-1981.*
3. ^ *McCarthy, David F. (2007). *Essentials of Soil Mechanics and Foundations*. Upper Saddle River, NJ: Pearson Prentice Hall. p. 595. ISBN 978-0-13-114560-3.*
4. ^ *McCarthy, David F. (2007). *Essentials of Soil Mechanics and Foundations*. Upper Saddle River, NJ: Pearson Prentice Hall. pp. 601–602. ISBN 978-0-13-114560-3.*
5. ^ **a b** *McCarthy, David F. (2007). *Essentials of Soil Mechanics and Foundations*. Upper Saddle River, NJ: Pearson Prentice Hall. p. 602. ISBN 978-0-13-114560-3.*
6. ^ *Das, Braja M. (2002). *Principles of Geotechnical Engineering*. Pacific Grove, CA: Brooks/Cole. p. 105. ISBN 0-534-38742-X.*
7. ^ "Automatic Soil Compactor". *cooper.co.uk*. Cooper Research Technology. Archived from the original on 27 August 2014. Retrieved 8 September 2014.





















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Geotechnical engineering

Offshore geotechnical engineering

Investigation and instrumentation

Field (*in situ*)

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

Soil

Types

- Clay
- Silt
- Sand
- Gravel
- Peat
- Loam
- Loess

Properties

- Hydraulic conductivity
- Water content
- Void ratio
- Bulk density
- Thixotropy
- Reynolds' dilatancy
- Angle of repose
- Friction angle
- Cohesion
- Porosity
- Permeability
- Specific storage
- Shear strength
- Sensitivity

**Structures
(Interaction)**

Natural features

- Topography
- Vegetation
- Terrain
- Topsoil
- Water table
- Bedrock
- Subgrade
- Subsoil

Earthworks

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

Foundations

- Shallow
- Deep

Mechanics

Forces

- Effective stress
- Pore water pressure
- Lateral earth pressure
- Overburden pressure
- Preconsolidation pressure

Phenomena/ problems

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

Numerical analysis software

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

Related fields

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

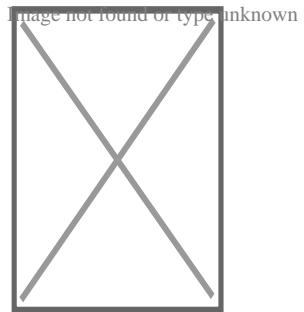
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Soil science

- History
- Index

Main fields

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



Soil topics

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

- **v**
- **t**
- **e**

Soil classification

**World
Reference
Base
for Soil
Resources
(1998–)**

- Acrisols
- Alisols
- Andosols
- Anthrosols
- Arenosols
- Calcisols
- Cambisols
- Chernozem
- Cryosols
- Durisols
- Ferralsols
- Fluvisols
- Gleysols
- Gypsisols
- Histosol
- Kastanozems
- Leptosols
- Lixisols
- Luvisols
- Nitisols
- Phaeozems
- Planosols
- Plinthosols
- Podzols
- Regosols
- Retisols
- Solonchaks
- Solonetz
- Stagnosol
- Technosols
- Umbrisols
- Vertisols

**USDA soil
taxonomy**

- Alfisols
- Andisols
- Aridisols
- Entisols
- Gelisols
- Histosols
- Inceptisols

Applications

- Soil conservation
- Soil management
- Soil guideline value
- Soil survey
- Soil test
- Soil governance
- Soil value
- Soil salinity control
- Erosion control
- Agroecology
- Liming (soil)

Related fields

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

Societies, Initiatives


- Australian Society of Soil Science Incorporated
- Canadian Society of Soil Science
- Central Soil Salinity Research Institute (India)
- German Soil Science Society
- Indian Institute of Soil Science
- International Union of Soil Sciences
- International Year of Soil
- National Society of Consulting Soil Scientists (US)
- OPAL Soil Centre (UK)
- Soil Science Society of Poland
- Soil and Water Conservation Society (US)
- Soil Science Society of America
- World Congress of Soil Science

Scientific journals

- *Acta Agriculturae Scandinavica B*
- *Journal of Soil and Water Conservation*
- *Plant and Soil*
- *Pochvovedenie*
- *Soil Research*
- *Soil Science Society of America Journal*

See also

- Land use
- Land conversion
- Land management
- Vegetation
- Infiltration (hydrology)
- Groundwater
- Crust (geology)
- Impervious surface/Surface runoff
- Petrichor

-  [Wikipedia:WikiProject Soil](#)
-  [Category soil](#)
- [Category soil science](#)
-  [List of soil scientists](#)

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About Cook County

Photo

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Things To Do in Cook County

Photo

Image not found or type unknown

Sand Ridge Nature Center

4.8 (96)

Photo

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River Trail Nature Center

4.6 (235)

Photo

Palmisano (Henry) Park

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Driving Directions in Cook County

Driving Directions From Palmisano (Henry) Park to

Driving Directions From Lake Katherine Nature Center and Botanic Gardens to

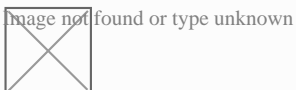
Driving Directions From Navy Pier to

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<https://www.google.com/maps/dir/Palmisano+%28Henry%29+Park/United+Structural+Systems+of+Illinois%2C+87.6490151,14z/data=!3m1!4b1!4m14!4m13!1m5!1m1!1sunknown!2m2!1d-87.6490151!2d41.8429903!1m5!1m1!1sChIJ-wSxDtinD4gRiv4kY3RRh9U!2m2!1d-88.1396465!2d42.0637725!3e1>

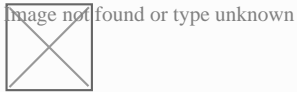
Reviews for



Jeffery James

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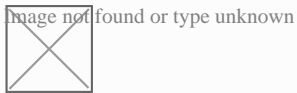
Very happy with my experience. They were prompt and followed through, and very helpful in fixing the crack in my foundation.



Sarah McNeily

(5)

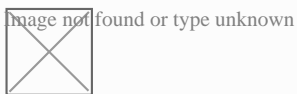
USS was excellent. They are honest, straightforward, trustworthy, and conscientious. They thoughtfully removed the flowers and flower bulbs to dig where they needed in the yard, replanted said flowers and spread the extra dirt to fill in an area of the yard. We've had other services from different companies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



Jim de Leon

(5)

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

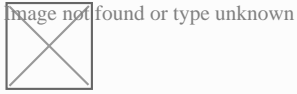


Chris Abplanalp

(5)

USS did an amazing job on my underpinning on my house, they were also very courteous to the proximity of my property line next to my neighbor. They kept things in order with all the dirt/mud they had to excavate. They were

done exactly in the timeframe they indicated, and the contract was very details oriented with drawings of what would be done. Only thing that would have been nice, is they left my concrete a little muddy with boot prints but again, all-in-all a great job



Dave Kari

(5)

What a fantastic experience! Owner Rick Thomas is a trustworthy professional. Nick and the crew are hard working, knowledgeable and experienced. I interviewed every company in the area, big and small. A homeowner never wants to hear that they have foundation issues. Out of every company, I trusted USS the most, and it paid off in the end. Highly recommend.

Maintenance Routines for Repair Equipment [View GBP](#)

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State : IL

Zip : 60169

Address : 2124 Stonington Ave

Google Business Profile

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

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