



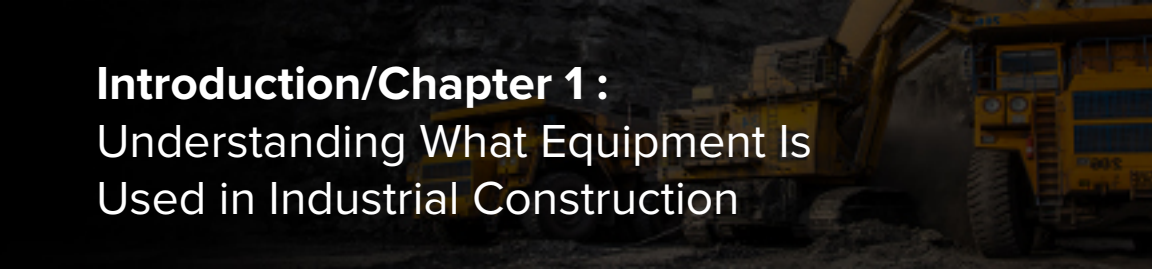
**INDUSTRIAL CONSTRUCTION:**  
A Comprehensive Guide to the Heavy  
Equipment and Tools of the Trade



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# Introduction/Chapter 1 : Understanding What Equipment Is Used in Industrial Construction

The types of construction equipment and their uses often depends on an industrial construction project's size and purpose. However, industrial construction methods for highway construction, routine road maintenance, forestry, bridge construction and erecting structures employ many of the same tools and pieces of heavy equipment and machinery. Laborers across many different industries use these heavy machines to complete their desired task — to build.

Structural building sites, roadway creation and other civil engineering projects, such as sewer and pipeline projects, utilize earth-moving and excavation equipment. Excavating both earth and rock with heavy equipment and explosive blasting is important for the removal of natural obstacles from building sites.

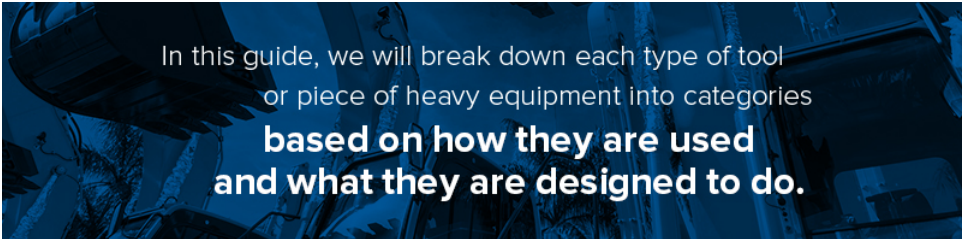
Explosives and heavy machines overcome the rough terrain of any building site and allow for the creation of our modern highways, rail lines and tunnels. Almost all construction sites employ some excavation tools: backhoes, bulldozers, loaders and graders. Using these tools, construction teams can shape the land in ways that will provide the safest and most structurally sound area possible.

Transportation methods are also a vital part of construction. Building materials, tools and waste need to be transported in and out of most work sites regularly. In many cases, dump trucks haul earth, rock and construction materials to or from building sites — depending on the needs of a project. Machines, like cranes, hoist beams, heavy pieces of equipment, materials and tools to hard-to-reach places where contractors are working.

In this guide, we will break down each type of tool or piece of heavy equipment into categories based on their use and design — and how Quincy compressors can provide power to industrial construction machines on job sites.

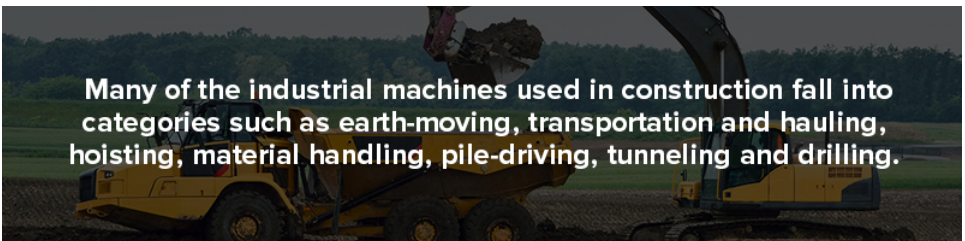
Construction equipment encompasses everything from hand tools and pneumatic air

compressor systems to other pieces of industrial machinery like loaders and scrapers. Many of the industrial machines used in construction fall into these categories: earth-moving, transportation and hauling, hoisting, material handling, pile-driving, tunneling and drilling.



In addition to looking at larger pieces of heavy equipment, we will look at other common tools used in construction. Other equipment includes general-purpose tools used in most construction projects.

These include pneumatic hand tools, hydraulic hammers and compressed air systems used to power a variety of general-purpose tools for nailing, grinding and drilling.



Other systems, such as conveyors, move heavy materials across a job site or help to remove waste efficiently. In other projects, especially those using concrete, pumping systems and hoses supply or remove water and other materials.

The goal of this guide is to provide you with an understanding of what types of heavy equipment are used in industrial construction. Each chapter outlines the types of systems and machines employed, how they are used, and what they offer in terms of performance

and versatility during the construction process. Each chapter will outline the different types of industrial construction equipment and their unique uses in the industry.

## Chapter 1: Earth-Moving Heavy Equipment — The Importance of Excavation

For the earliest builders of human civilization, attempting to overcome earthen obstacles has been a challenge met with everything from human ingenuity and primitive hand tools to the powerful pieces of industrial machinery we see today.

Earth, rock and clay provide unique problems for construction workers. In some cases, mountains may need to be blasted through for railroad and roadway tunnel development. Extracting precious minerals and other valuables provided by Mother Nature may require mining, drilling and excavating for miles underground.



Almost any building project will need earth-moving equipment. Even architectural or landscape development requires detailed planning regarding topography, grades and slopes.

Gravity acting on the earth and natural elements such as rain can pose risks to not only workers but also to completed structures in the form of landslides and sinkholes. When conducting analysis for earth-moving measures, you should understand the intricate geologic makeup of an area to identify any potential problems for the present and in the future.

Unless rock or large areas are a major obstacle, most projects do not require heavy blasting. For this chapter, we will look at the various types of heavy equipment used in the movement and excavation of earth. These pieces of machinery are used primarily for shifting large areas of soil and landscapes. These projects can take the form of digging foundation areas and general landscaping. Heavy equipment includes excavators, or backhoes, bulldozers, loaders and other machines used for grading and scraping.



Heavy equipment includes excavators, or backhoes, bulldozers, loaders and other machines used for grading and scraping.

Each piece of equipment provides unique advantages to earth-moving, and in some cases may be needed for harder-to-reach places.

## 1. Excavators: Laying Foundations and Doing Heavy Lifting

The excavator represents one of the most common, and important, pieces of heavy equipment seen in construction. Excavation widely depends on these machines, also referred to as diggers, as they utilize a boom-stick and a bucket with a cab on a rotating platform. These machines provide easier access to harder-to-reach places and a full range of motion, with the ability to rotate the bucket on any side of the machine.

The house sits upon an undercarriage with tracks and wheels that allow for easy transportation as well. Also, diggers are highly effective at removing large amounts of earth and other obstacles quickly and efficiently. Some of their most common uses in the field include:

- Digging of foundations, trenches and holes
- Demolition
- Forestry work

- Material handling
- Grading
- Landscape work
- Heavy lifting

Backhoes represent a different type of excavator that use a similar set-up, with the bucket and dipper-stick attached to the rear of a front loader, or tractor. The power of the excavating tools comes from hydraulics, the driving force behind the machines.

## 2. Bulldozers: Moving the Earth at Construction Sites

As with excavators, bulldozers are common at numerous types of job sites. These pieces of heavy equipment utilize tracks and a large metal blade primarily for pushing earth at a construction site. They're considered crawlers because of their use of tracks, which provides more ground stability through weight displacement across the entire machine.

Typically at the rear, another device called a ripper is attached and used to loosen up soil, dirt and rock. The front blade can then be used to move sand, dirt and rock as well as other materials. Bulldozers are powerful and versatile machines that can navigate over rough terrain and move large amounts of material quickly and efficiently.

The use of wide tracks provides the machine with good traction for rough working environments such as sandy or muddy areas. In addition, they offer incredible power for moving some of the heaviest materials at construction sites.

However, certain areas may not be as accessible for bulldozers as other types of earth-moving machines because of their bulkier size. Different models of bulldozers are available and can offer some flexibility depending on the terrain and working environment.

## 3. Loaders: Transporting Materials Around the Job Site

Loading heavy materials such as asphalt, rock, debris, snow or construction waste in large quantities will require the use of another type of heavy equipment. You will see many sizes of loaders, but the main goal at any job site is to load material on or into some other piece

of equipment to transport it to another location.

Even large amounts of gravel, wood, logs or sand can pose a challenge for construction projects. Large quantities of any heavy material require safe handling. Having a good loader with the right specifications can prove invaluable for any project.

One of the most common types of loaders is the skid-loader, or skid-steer loader. Powered by an engine, its rigid frame sits on durable wheels, or tracks, that operate differently from other vehicles through the use of skid-steering. Skid-steer loaders have lift arms attached that are capable of being fitted with a variety of job-specific tools.

The way it operates makes the loader unique:

- The wheels on each side of the vehicle are locked and synchronized with one another.
- This placement makes it possible for an operator to drive one side independently of the other, which offers extra maneuverability.

Crawler loaders, which have tracks, are very maneuverable at job sites, capable of traveling under their own power. However, due to the increased power of hydraulic excavators, crews may not utilize crawler loaders as often, and their use has been in decline for several decades.

## 4. Trenchers: Digging Ditches at Construction Sites

Trenchers are designed to create ditches, or trenches. Crews also refer to them as ditchers because of this function. These machines look like other excavating equipment but are optimized for the digging of trenches, typically for piping projects.

You may spot two main types of trenchers at a construction site. The ladder trencher and the wheel trencher both offer incredible versatility for digging trenches and operate at much higher rates of speed than any other type of excavating equipment for the task. Depending on the operation, trenchers may be utilized to expedite the installation or maintenance of projects such as wastewater or drainage piping.



## 5. Graders: Creating Level Surfaces for Construction

As with bulldozers, graders represent another vital piece of engineering equipment used to move large amounts of earth. The overall goal of graders is to finish the grade and ensure properly smoothed and flat surfaces for development. In architectural design, graders may be employed to create wider, flat areas to form the foundation for buildings and structures.

In civil engineering projects such as road work and maintenance, graders help level the surface for asphalt roadways. Graders often employ six wheels and a powerful engine to power the vehicle. Like bulldozers, graders are equipped with blades. These engineering vehicles act similarly to scrapers as well and are all used in unison on projects that require precision when finishing the grade.

## 6. Scrapers: Scooping and Hauling on the Job Site

As with bulldozers and graders, scrapers offer unique advantages in civil engineering. Scrapers are machines equipped with a hopper that can be raised and lowered, depending on the job, with hydraulics. The hopper, or bowl, cuts into the soil with its sharp edge. Once the hopper gets full from scraping, the vehicle can transport the material to the desired site.

Scrapers can transport large amounts of material easily and dump loads without the use of any additional machinery. Scrapers offer unique advantages and can cut down on the need for a loader. Once the scraper drops the load, it can return to the work site and fill its hopper again.

## 7. Compactors: Increasing Earth Density for a Firmer Foundation

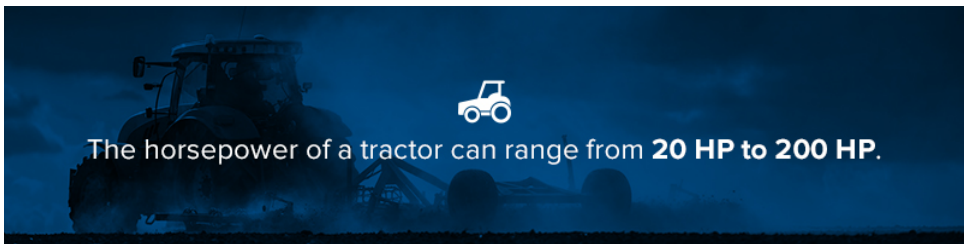
Loose soil can pose numerous problems for building projects, so often job sites must increase the overall density of the earth through compacting. Compactors are specialized machines that can be used for soil compaction, or in some cases in landfills to save space. You may see different types of compactors at a job site:

- Vibratory compactor machines use tamping foot roller systems.
- Other machines may be equipped with a plate system used for ramming.

- One of the most common types is the roller-based compactor. Smooth roller compactors designed for compaction of gravel and other materials need a smooth surface. Another type of wheel roller is the sheep foot wheel, used for deeper areas of soil compaction.

## 8. Tractors: Towing Equipment From Place to Place


The tractor is one of the most versatile and common pieces of heavy machinery used in the industry. Tractors move or tow heavy equipment around the job site. With much more horsepower — your average homeowner’s contractor ranges from 20 horsepower to 60 horsepower, while diesel tractors meant for heavy construction are at least in the 200 to 600 horsepower range — industrial tractors can provide the power for nearly any earth moving task.



Whether they have wheels or tracks, tractors provide an important service around the job site. What they lack in tools, they make up for in raw power, providing multiple uses in earth-moving projects. Crawler tractors enjoy advantages on rough terrain with increased stability. However, wheeled tractors are faster and offer a better speed for long-distance hauling of equipment across larger construction sites.

To begin excavation, pieces of heavy equipment not designed for roadways need to be moved to the construction area. Hauling essential building supplies into a site on time can make the difference between failure and success for any project.

After the extensive process of moving equipment and supplies, the project itself must be completed. Then, once finished, transportation equipment is just as valuable for hauling debris during the cleanup phase of the construction project.



## Chapter 2: Transportation Equipment - Hauling Supplies and Materials

For all of these tasks on a job site, crews may utilize several different types of hauling and material handling equipment — depending on the needed application. Almost every building project needs a type of hauler for material handling or equipment transport.

Some of these haulers may be allowed and capable of operating on public roadways for access to and from the work site. Special drivers' licenses, local highway restrictions and federal or state motor carrier safety rules need to be checked.

Large trucks equipped with rubber tires can be considered roadway vehicles. However, some tracked vehicles may also be permissible on local roads. All haulers, including tipper trucks, large concrete mixers, trailers and dump trucks, are self-propelled and offer extreme advantages in material or equipment handling.

Here are some of the most common types of heavy equipment used for hauling.

### 1. Tipper Trucks: Dumping Large Quantities of Load Material

Tipper trucks operate with a large platform raised at an angle from the front to assist in dumping a large load of material. Gravity acts as the prevailing force that helps in the tipper's design.

They pop up most frequently in environments such as mining or quarry operations where large loads of rock and minerals need to be unloaded quickly. Because the tipper is a truck, it offers excellent maneuverability, versatility and longevity, and can help significantly reduce operating costs for a construction crew.

### 2. Concrete Trucks: Carrying and Sometimes Mixing the Concrete

If the project calls for concrete, crews use concrete trucks designed specifically to transport the material to the work site. There are different types of concrete trucks that can be used depending on the nature of the application. For plant-mixed concrete, general transit trucks conduct transportation. In some cases, dump trucks haul concrete to the site and mix it on site. It all depends on how much and what use the concrete will serve in the overall building application.

Agitating and non-agitating trucks haul concrete, while mixers can be used for both. Concrete mixers have an agitator that will mix and then, when ready, pour the concrete into the proper location. Being hauled by a truck allows for speed, efficiency and maneuverability at a work site where fast pouring may be useful or essential.

### 3. Trailer Trucks: Hauling Equipment and Supplies Long Distances

The most common type of truck is the trailer truck. Trailer trucks haul almost any piece of equipment or building supplies over incredible distances. Trailer trucks transport things on highways and job sites. Loading a trailer presents a fast and effective means of getting your materials from point-to-point without much worry. Although these trucks face strict enforcement of weight regulations, and trailers are common, invaluable machines for hauling construction materials and supplies.

**In almost every building project,  
some sort of hauler will be needed for  
material handling or equipment transport.**



### 4. Tankers: Transporting Materials on Highways and Through Job Sites

Tanker trucks are not as common as some of the others on this list, but they are still an essential part of building and fueling applications on a job site. Tankers transport liquids, gases and waste materials on highways and public roadways. In some cases, they may be

equipped with a vacuum to help remove waste materials from areas such as septic tanks. Often crews use tankers in situations where wastewater needs to be pumped out from a work site.

Crews often run into logistical issues refueling excavators and other machinery on-site. They can deploy tankers to bring fuel to this vital equipment. They offer versatility because they can handle materials in liquid or gas states.




## 5. Dump Trucks: Quickly Hauling and Dumping Their Loads

As with tipper trucks, dump trucks haul materials and dump their loads quickly. Gravity plays a role in their operation, but motors raise the automatic unloading device. The dump truck has an increased capacity for material and per axle, can carry 20,000 lbs. Typically dump trucks take part in earth-moving operations and haul soil. Crews most often use side or rear dump trucks:

- Side dump trucks tip their platform to the side of the truck with one side raised while gravity does the rest of the work.
- Rear dump trucks operate like a tipper truck. Hydraulic lifts are needed to push up the immense load and platform.



In some cases, bottom dump trucks get deployed as well. They appear similar to trailer trucks, and the body of the platform does not move as with rear or side dump trucks. Instead, dumping takes place through the bottom of the truck platform. This feature makes them ideal for transporting materials such as sand, gravel or dry soil.



# Chapter 3:

## Hoisting and Material Handling Equipment - The Use of Cranes and Material Handling Tools

Hoisting and moving heavy materials from one point to another around a job site requires the use of specialized machinery. In some cases, a crew may need to suspend the materials when building large-scale projects such as industrial buildings, dams or skyscrapers. The invention of cranes made material handling on a large scale easier for work crews.

Hard-to-reach locations where trucks and other construction vehicles cannot traverse may need steel, heavy equipment and supplies. Engineers developed these pieces of heavy equipment to provide stability, distribute weight and offer safety when handling heavy loads at shorter distances. Crews often affix these simple machines to a platform, either mobile or static, to offer a mechanical advantage over other types of man-powered, pulley-based or motor-driven hoisting methods. Cranes represent essential components to construction, and crews primarily use them for the heaviest of lifting tasks.

By employing hoisting and other material handling machines at your work site, you can avoid the costly loading, hauling and unloading of materials from multiple pieces of heavy equipment. Hoisting equipment can also include jacks, winches and chain hoists.

### What Are Hoists and When Do Crews Use Them?

Hoists lift and lower by use of a chain, cable, wire or rope. In this sense, cranes are also a type of hoist because they employ wires, cables or ropes for moving objects from one place to another. For small applications, hoists in conjunction with pulleys can be operated by hand.

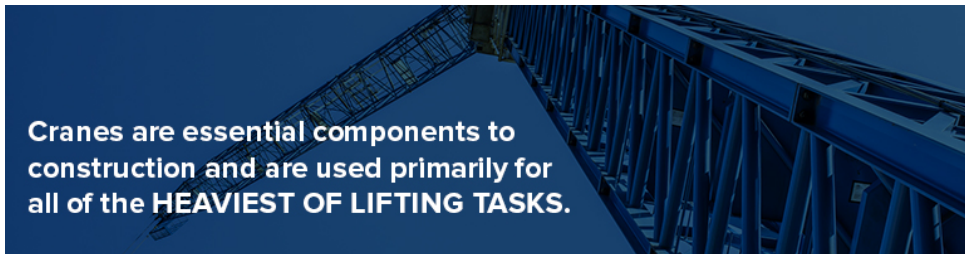
When elbow grease and muscle isn't enough because of the weight of the object being hoisted, electric, pneumatic or hydraulic-driven hoists may be used. Electric hoists are easy to operate and offer more flexibility, while chain hoists are used for simple lift and lower operations.

Materials aren't the only vital pieces of a construction project that may need hoisting. Workers may need to be hoisted through the use of temporary elevator systems, or lifts, during the construction of larger-scale building projects.

It is important to safely secure workers, making them capable of getting to hard-to-reach or elevated areas on a project. Workers can use boom lifts, or boom hoists, to access hard-to-reach places. They are common in construction but also in maintenance operations such as working on utility poles.

## How Forklifts and Conveyors Fit In

On the smaller scale, forklifts and conveyor systems also provide similar functions in terms of handling materials. Conveyor systems operate as a means to transport large quantities of a material such as waste, supplies or equipment over a relatively short distance. Forklifts move small loads over short distances and provide flexibility and maneuverability that conveyors do not.



Here's a look at some of the most common hoisting and material handling devices, including different types of cranes and conveyor systems you may see on a job site.

### 1. Mobile Cranes: Easy to Relocate on Short-Term Projects

Mobile cranes provide easy relocation at different areas of a job site. Wheels or tracks house most mobile cranes, and they offer adequate weight distribution and maneuverability over rough terrain. However, the design of mobile cranes also presents some safety issues:



- They are not capable of lifting loads as heavy as some other types of cranes
- They can be prone to overloading because of a lack of safety features

Mobile cranes, however, are the best choice for short-term projects and maximum mobility throughout a varying job site. Their mobility gives them an advantage and can save on the costs of setting up and relocating a more static crane.

## 2. Derrick Cranes: Lifting up to 200 Tons

These unique cranes feature a mast, a boom and a wheel-driven rotation. When constructing very large, high structures such as multiple-level apartment complexes, hospitals or other industrial buildings, derrick cranes may be employed. As common with most industrial construction equipment, to operate a derrick crane, you need to be certified based on OSHA's rules.

These cranes do offer the ability to lift up to 200 tons and have full 360-degree rotation features. They operate under diesel power and electric power. For longer-term projects, derrick cranes are more common than mobile cranes, which are employed on a short-term basis.

## 3. Tower Cranes: A Bigger Version of the Derrick Crane

Tower cranes are similar to derrick cranes, but they're mounted on a large steel tower for maximum height and stability. Crews employ them for the construction of skyscrapers and large high-rise buildings. Unlike mobile cranes, tower cranes get deployed for large, long-term projects and are considered some of the safest cranes in use.

**Derrick cranes offer the ability to lift up to  
200 tons and have full 360 degree rotation features.**



Like the derrick crane, they offer incredible capacity for heavy loads and rotation from a single bull-wheel base. A tower crane's load capability depends on the height, reach, lifting power and counterweights — and the placement of the load in relation to the jib.

## 4. Conveyors: Moving Materials From One Place to Another

While they may get overlooked because of their simplicity, conveyors fulfill essential functions for heavy equipment utilized at building sites. They offer incredible versatility in transporting large quantities or heavy materials from one area to another.

They can convey material in a variety of directions, either vertically, horizontally or on an incline, using a consecutive chain belt to push materials through quickly. In most mining operations, and for the movement of concrete, crews employ conveyors. Advantages to their use include:

- Saving time
- Increasing overall output
- Running continuously

Belt conveyors operate using a rubber belt that runs over a series of drums or pulleys. These types of conveyors handle all kinds of materials, both wet and dry, and can convey thousands of tons of material per hour over long distances. They are also lightweight and have speed control functions to increase or decrease output.


For more grain-sized materials, crews may use screw conveyor systems instead. Screw conveyors cost less, but do not handle the large quantities belt conveyors do cost less. They operate by a motor that drives a screw or helix over a bearing from one end. Material enters one side and pushes through the conveyor before being carried to the other end by the rotation of the screw.

You may also see a bucket conveyor, another common type. Through a series of buckets moving vertically or on an incline, material rises from a lower level to a higher level. Also

referred to as bucket elevators, these machines are very common in the coal industry to transport coal from one point to another.

## 5. Forklifts: Moving Heavy Materials Back and Forth

Forklifts might not come to mind when you think of a piece of heavy equipment for construction work, but these little workhorses offer versatility and maneuverability in lifting and moving heavy materials or supplies from one place to another. Depending on the application, forklifts have different load capacities, mostly between one and five tons. However, some may be designed for larger load capacities.



## Chapter 4: Methods of Concrete Construction and Building Equipment

As mentioned earlier, the transportation, hauling and mixing of concrete at any given building site can depend greatly on the specific requirements of the project. Concrete, cement and other aggregate materials play a vital role in both architectural and civil projects. Construction crews frequently use concrete, the main component of paving.

However, the nature of concrete makes transport and use a very complicated process that involves various pieces of heavy equipment. Haulers transport and deliver the concrete to the building site before additional equipment can be used to mix, spread and finish the concrete at the proper height and grade. Concrete asphalt, along with other materials, also may require the use of heavy machines such as rollers and crushers for paving on roadways.

Portland cement, a commercial grade cement, needs to be mixed before spreading for building applications. Mixers can range from small mobile pieces of equipment to agitating transit trucks or even entire on-site batch plants used from the mixing to spreading stage.

### How to Address the Common Problem of Setting Concrete

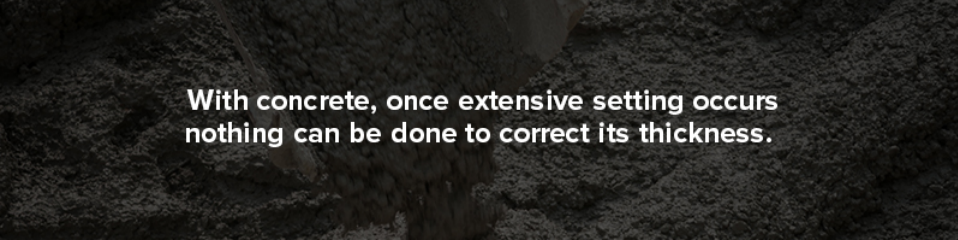
Unfortunately, concrete may begin to set before it can even be placed, spread or finished. Once extensive setting occurs, nothing can be done to correct the thickness. This potential issue is why agitating trucks are sometimes used to haul large quantities of the material directly to the site. Agitation helps keep the material moving so that the batch has enough integrity to do the job correctly at the desired thickness and grade.

Dry-batch concrete can help mitigate the setting problem but needs to be hauled by large dump trucks to the work site and put into the paving equipment. In the case of plant-mixed concrete, pump trucks may be used to distribute and place the concrete.

## The Advantages of a Concrete Plant

For large projects, a concrete plant, or batch plant, might be one of the most useful assets for your operation. Batch plants combine all of the dry and wet ingredients that comprise concrete, which includes:

- Aggregate
- Sand
- Water
- Fly ash
- Cement

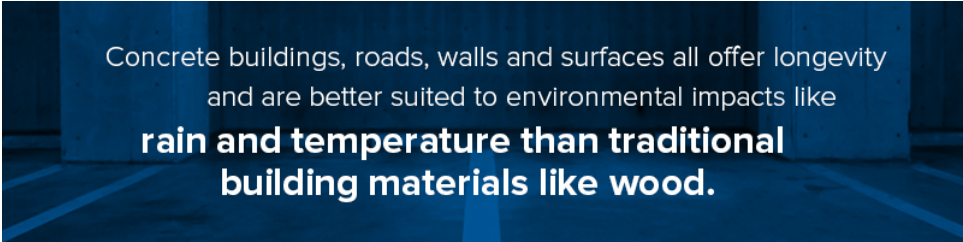


**With concrete, once extensive setting occurs nothing can be done to correct its thickness.**

A concrete plant allows for mixers, both tilt and horizontal, batchers, conveyors, stackers, bins, heaters, chillers, cement silos and more. The concrete batching plant acts as the mixer and can produce a large output with consistency, resulting in much lower labor and production costs.

In most cases, crews employ mid-sized mobile transit mixers because they offer mobility across the job site. Concrete typically is used in foundations for building projects but can be used to create entire structures like dams.

Concrete buildings, roads, walls and surfaces all offer longevity and are better suited to environmental impacts like rain and temperature than traditional building materials like wood. Depending on the amount needed, the specific design of the project, or the location of implementation, concrete demands will vary. Below we look at some of the most common pieces of equipment used to mix, spread and finish this vital building material.



Concrete buildings, roads, walls and surfaces all offer longevity and are better suited to environmental impacts like **rain and temperature than traditional building materials like wood.**

## 1. Concrete Pumps: Distributing Liquid Concrete

Before concrete sets, its viscous, liquid-like state allows machines to pump it. Concrete pumps transport and pump high volumes of the liquid material for quicker and more efficient placement. While pump designs may vary, line pumps are some of the most common and can create:

- Concrete slabs
- Swimming pools
- Walkways
- Steps
- Sidewalks

Line pumps are long pipes, while the pump itself pushes the amount of material through the end to be distributed. In mines and other job sites, concrete pumps may be mounted in a way to make them more flexible and maneuverable, depending on the desired application.

## 2. Concrete Mixers: Combining Wet and Dry Ingredients for Concrete

Concrete mixers vary in size and mobility. A concrete mixer, or cement mixer, combines all the wet and dry ingredients to prepare the concrete for placement. This includes sand, aggregate, water, fly ash and cement, which acts as the binding agent. To achieve consistency of the mixture and ensure the proper thickness of the material, a large drum rotates, providing even distribution of the ingredients. For small projects:

- A simple portable mixer may be used directly on the job site.
- Because of the need for less volume, workers can employ a small mixer to tend to the concrete before it sets.
- However, larger projects need much more working time and large volumes of

the material.

Concrete begins to harden quickly. Getting it to a proper thickness and grade after spreading requires time. Finishing work cannot occur once concrete hardens, so it is important to use large transit mixers. They can be filled with batch-mixed concrete or dry material ready to be mixed on the job site.

Through constant agitation, the truck's concrete load maintains its liquid state and allows workers to work at a reasonable pace for the more extensive areas. Workers use trowels and other tools to smooth and finish the surface once the concrete has been poured.

### 3. Concrete Vibrators: Reducing Air Pockets and Improving Longevity

As with compactors used to create a desired grade, concrete vibrators serve the same purpose but operate on different mechanics. Consolidating concrete helps avoid air pockets, creating a more compact and dense material for setting. This step prevents future damage to concrete and ensures the material has longevity.

When concrete is first poured, it can contain anywhere between 5 and 20 percent entrapped air. Through the proper use of concrete vibrators, you can mitigate the problem of air pockets, which can reduce the material's strength once it hardens. Displacing any excess air that may be entrapped during the mixing and pouring phases for thinner areas of concrete can eliminate weaknesses in the material.

**When concrete is first placed, it is estimated that it can contain anywhere between**

**5 and 20 percent entrapped air.**




## 4. Concrete Pavers: Assisting With Grade and Surface

Depending on the project, a paver may be needed. There are different types of concrete pavers, but they are designed to travel over an area and establish the grade and surface of the pavement. Pavers often utilize steel wheels to help establish this surface profile in the case of roadways. For more specific applications, such as bridges, airports and concrete canals, traditional paving equipment may be a poor fit.

Bridge pavers and canal pavers are specifically designed to meet these needs. These specialized types of pavers are not as common on most construction sites but still play a vital role in the creation of infrastructure we utilize daily.





# Chapter 5: The Heavy Hammers of Pile-Driving Equipment

Pile drivers represent some of the unique and specialized pieces of heavy machinery you will find at a construction site. Crews typically utilize them during projects that require the use of deep foundations over shallower foundations.

The site may need a deep foundation due to soil composition and other types of constraints. Laying a deeper foundation means building loads must be transferred much further down into the earth happens through the use of:

- Piles
- Poles
- Columns
- Shafts
- Caissons

Pile drivers, which are incredibly powerful hammers, push piles deep into the ground. Extensive excavation and drilling may be needed to prepare the site beforehand, but the pile drivers will do the rest of the work.

## The Power Behind Pile Drivers

Numerous types of building materials, most often steel and concrete, comprise the reinforced foundations that transfer the load deeper into the earth. The construction of highway systems, bridges and other building projects that require a deep foundation and support also rely on piles. Micro-piles, or mini piles, might be used for this type of structural support and are commonly made of steel.

Pile drivers are large mechanical devices operated through hydraulics, steam power or diesel fuel. The large weight drives the pile into the earth. It is raised like a hammer and then, when it reaches the designated high point, it is released and the force of it falling drives the pile into the ground.



Pile drivers are large mechanical devices that can be operated through hydraulics, steam power or diesel fuel.

Pile drivers can be static or mobile, depending on the amount of force needed and requirements of the job site. As with cranes and excavators, pile drivers come in different shapes, sizes and designs, offering flexibility for specific tasks. Below we look at some of the most common pieces of equipment used for creating foundation supports.

## 1. Diesel Hammers: The Engine That Moves the Weight

Through the utilization of diesel fuel, the hammer acts like a very large engine. A crane hoists the weight, which acts as a large piston. Hoisting allows air to flood into the cylinder, or pile, below. When the fuel is added and injected, the weight drops quickly. This compression of air and fuel creates friction and heat, leading to ignition.

The force of the mixture's combustion then has enough power to drive the piston, or dropped weight, back upward. Again, this process draws in air and will continue repeating itself until manually stopped or the fuel is expended. This continuous motion of the weight hitting the pile acts as the hammer, slowly driving the pile into the desired spot.

## 2. Vertical Travel Lead Systems: An Alternative to Traditional Pile Driving

These types of pile drivers are unique in that they use a vertical lead. This setup is particularly useful when limitations inhibit traditional pile driving mechanisms. Originally, the hanging lead of early designs could be released at different elevations, but that required more time to position.

The vertical travel lead reduced this time, and it has been developed further to allow for much faster positioning. The lead connects to a boom and then a sliding connection. This

formation allows for the lead to lower or elevate at the desired height.

### 3. Hydraulic Hammers: Driving in Pipes, Concrete and Timber

These are the most modern type of pile driver used in construction today. By using hydraulics, these hammers drive pipes, concrete and even timber deep into the earth. They also cause less environmental damage than diesel hammers because they are:

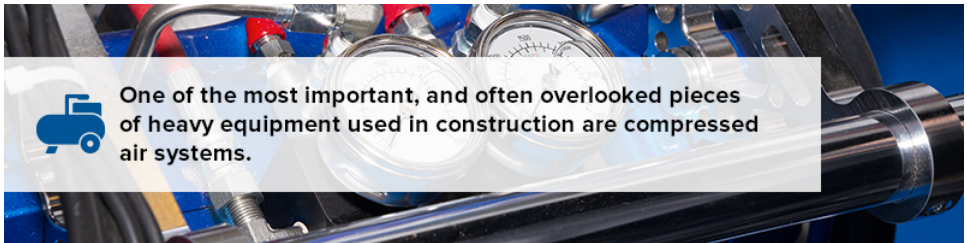
- More efficient
- Generate less pollution
- Create less noise

However, the impact of the hammer itself and the sheer force of the weight hitting the pile always produces a very loud sound.

# Chapter 6/Conclusion:

## Other Pneumatic Tools and Equipment — How Compressed Air Systems Benefit Industrial Construction

Air compressors represent one of the most important and often overlooked pieces of heavy equipment used in industrial construction. Mining and construction used compressed air dating back to the earliest days of humankind. From creating fires hot enough to forge metal with bellows to providing ventilation to miners working deep below Earth's crust, compressed air has long been a vital resource.



While many of the large pieces of industrial equipment, such as excavators, tanker pumps, concrete vibrators, pneumatic hoists and some conveyors, rely on compressed air, there are numerous other uses for it in the industry. Many essential tools for bolting, nailing, drilling and other woodworking tasks also depend on clean, pressurized air flow.

One of the main advantages compressed air provides during construction comes with woodworking applications. Even with the most modern advances in building materials, wood remains the most valuable natural resource in construction. After excavating crews finish the ground work and the construction crews install the concrete foundation, the carpenters begin their work.

Critical factors in performance during a building project include temperature, precipitation, dirt and power demands. Maintaining productivity and efficiency depends on having reliable and durable air compressors for construction use to meet these demands. Many industries consider compressed air a fourth utility because of the high electrical demands for a single HP of compressed air. Inspecting your system for air leaks ensures it works at peak performance and reduces waste.

## Air Compressors in Construction: Helping and Working Across Projects

Your compressed air needs are determined by the types of tools used for the job:

- **Air Drills:** Pneumatic drills operate similarly to electric drills but run on compressed air power. These devices are often used for their speed and efficiency.
- **Impact Wrench or Pneumatic Wrenches:** Tightening and removing bolts traditionally can be a very time-consuming process. Industrial applications prioritize speed in getting the job done on budget and on time. Impact wrenches use compressed air to expedite the process.
- **Nail Gun:** Traditional hammering consumes a lot of time, making the pneumatic nail gun one of the most common and useful tools in the compressed air arsenal. Framing, roofing, installing siding, flooring and finishing tasks may require nail guns. They act as invaluable assets to any commercial or residential building project.

## How Can Quincy Help You With Air Compressors for Industrial Construction Use?

Quincy offers extensive industry experience in supplying our clients with the finest air compressors and vacuum pumps on the market. Because of the strict and demanding environments encountered during building projects, you must have a reliable air compressor system that can meet your requirements while maintaining its longevity. Costly repairs and inefficient operation can become costly. At Quincy Compressor, we offer a wide range of support and options to meet all your business needs. Look at a few of our recommended air compressor systems designed to meet the demands of industrial construction projects both small and large.

For additional information, please contact one of our professional sales and service representatives to learn more about the legendary performance and reliability of Quincy compressors, or contact us directly today.

The Quincy Compressor QSI line models offer:

- 220 to 1500 CFM
- TEFC (Total Enclosed Cooled Fan) and other NEMA (National Electric Manufacturers Association) motor casing options
- Air- or water-cooled design
- 5.7" color display screen

Our QGV model offers:

- 82 to 982 CFM
- Reduced operating noise as low as 68 dBA
- A full-color touch display screen

Our QR-25 is a heavy-duty reciprocating model that will stand up to various high-demand applications. Capable of producing a high CFM per brake horsepower, this series is well known in the industry for low energy consumption and reliable performance. This line offers:

- 1 to 25 hp motors
- Up to 175 PSIG
- Single- and two-stage compression
- A rating for 100% duty cycle

Our QSVI is one of our direct drive industrial vacuum pump lines and is a top choice for high-capacity applications. This is a stand-alone system that adjusts the flow as demand changes and can be set to run on a start/stop basis or continuously. This vacuum pump offers:

- 25 to 200 hp direct drive motors
- SCFM ratings of 365 to 3000
- High discharge temperature shutdown
- A fully equipped control panel

Our customers value the QGD line, a line of rotary screw compressors, for toughness and efficiency. You can network up to a half-dozen of these machines, so many companies choose to use them for big tasks. The line provides:

- A standard NEMA Premium TEFC Motor
- Sound levels that go as low as 66 dBA
- Belt-free assistance
- Airlogic 2 Advanced control

If you need continuous operation, the QP series from Quincy offers an advanced pressure lubricated system, which also lasts longer than similar air compressors. Its features include:

- Oil filter gauge
- Highly effective intercooler
- Flywheel and cylinder made from cast iron

## **Conclusion: Heavy Equipment Helps Move Construction Forward**

The construction industry uses many more specialized vehicles and tools in addition to the pieces of heavy equipment we've looked at in this guide.

Architectural to civil engineering projects — from residential homes to great, colossal dams with enough strength to hold back raging rivers and provide energy to entire cities — are all built using the power of man-made machinery and with the desire to create something big. Hardworking men and women utilize industrial machinery every day to keep our infrastructure safe and maintain the roofs over our heads.

None of these engineering feats would be possible without the right tools for the job. Each tool offers its own strengths in terms of performance and versatility in the building process.

As technology continues to advance, many of the old tools used in construction have adapted to become more modern — and that includes the use of powerful, pressurized air.

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