ENGLISH FOR CIVIL ENGINEER

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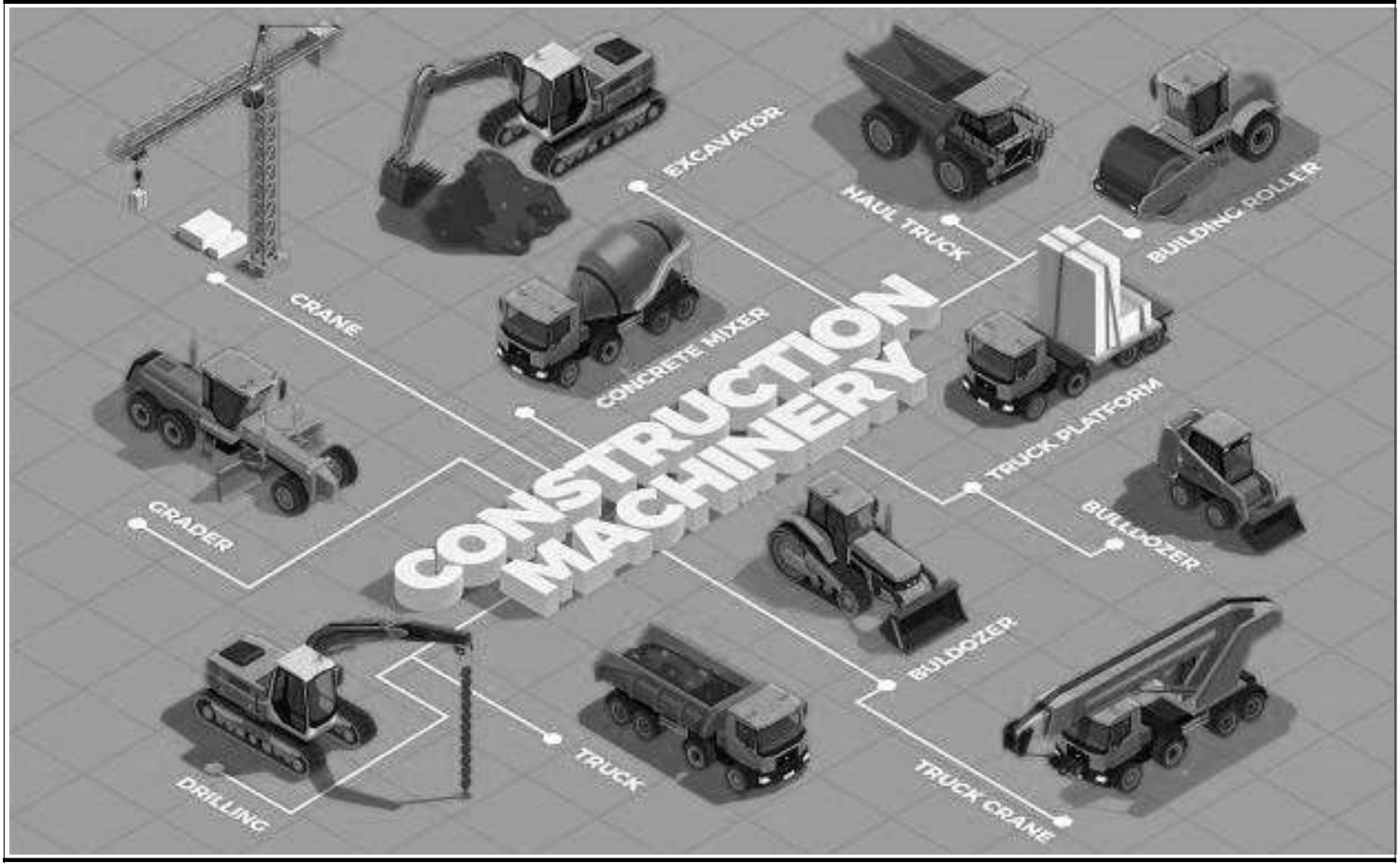
6.1 Construction equipment classification

Depending on the application, construction machines are classified into various categories:

1. Earth-moving equipment
2. Hauling equipment
3. Hoisting equipment
4. Conveying equipment
5. Aggregate and concrete production equipment
6. Pile-driving equipment
7. Tunneling and rock drilling equipment
8. Pumping and dewatering equipment

Operations involved in construction of any project:

+ Excavation
+ Digging of large quantities of earth
+ Moving them to distances which are sometimes fairly long
+ Placement
+ Compacting
+ Leveling
+ Dozing
+ Grading
+ Hauling



6.2 Excavating and earthmoving equipment

1. Excavators

+ Excavators are heavy construction equipment consisting of a boom, stick, bucket and cab on a rotating platform (known as the "house").

+ Excavators are used in many ways:

a. Digging of trenches, holes, foundations; b. Material handling

c. Brush cutting with hydraulic attachments

d. Forestry work e. Demolition

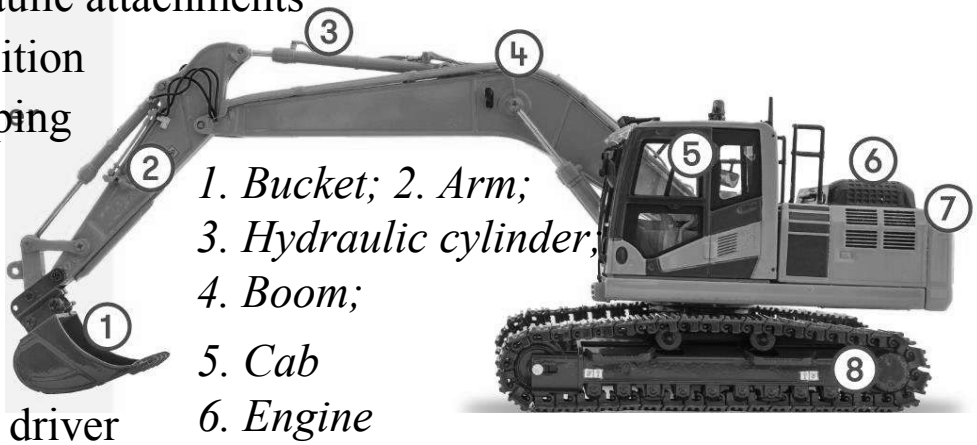
f. General grading/landscaping

g. Heavy lift, e.g. lifting and placing of pipes

h. Mining

i. River dredging

j. Driving piles, with a pile driver



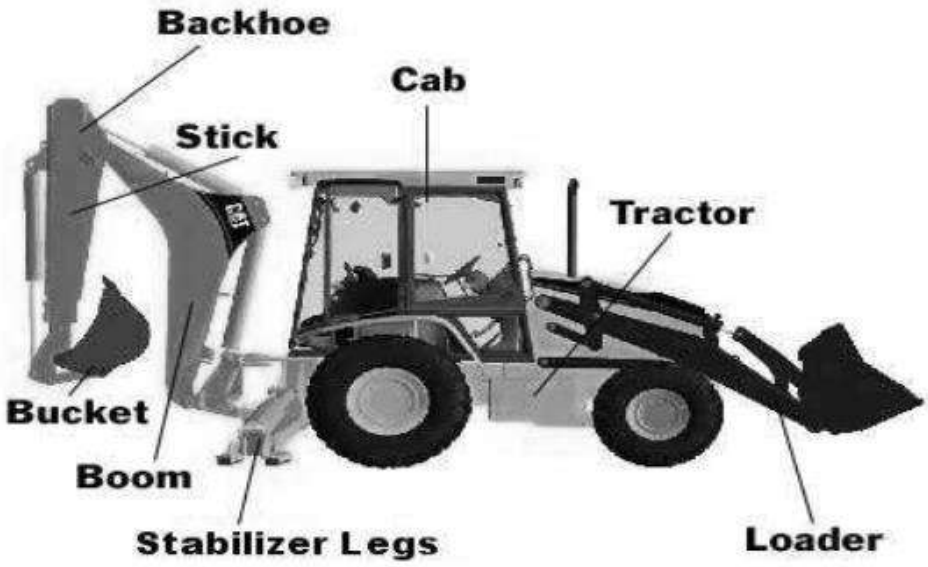
1. Bucket; 2. Arm;
3. Hydraulic cylinder;
4. Boom;
5. Cab
6. Engine
7. Counterweight 8. Track frame

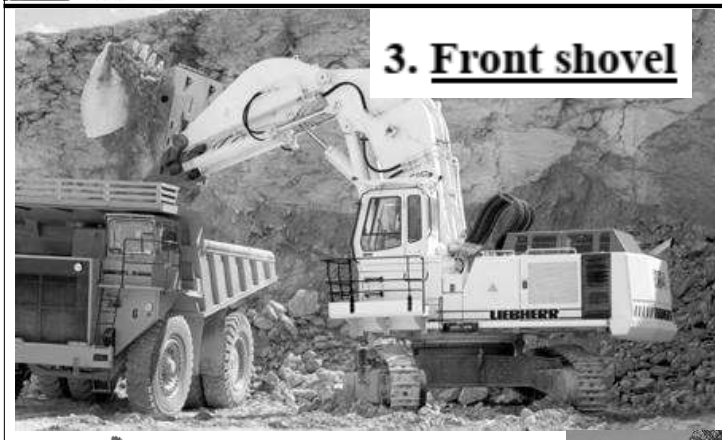
6.2 Excavating and earthmoving equipment

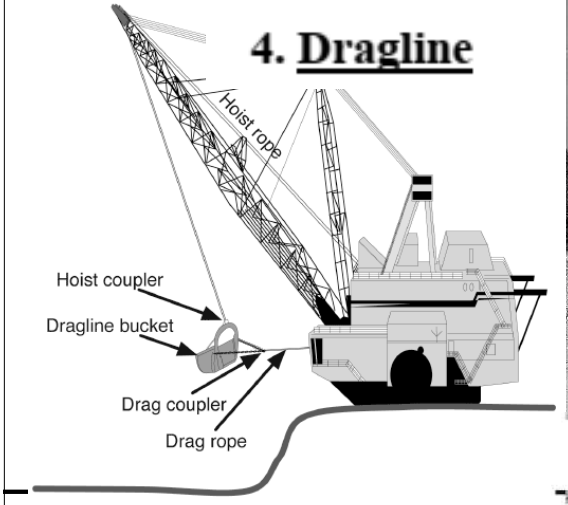
2. Back hoe

+ A backhoe, also called a rear actor or back actor, is a piece of excavating equipment or digger consisting of a digging bucket on the end of a two part articulated arm. They are typically mounted on the back of a tractor or front loader.

+ Backhoes are mainly used to clean up construction areas, to dig holes in the ground, to smooth uneven ground, to make trenches, ditches and to help remove deep roots from trees.







6.2 Excavating and earthmoving equipment

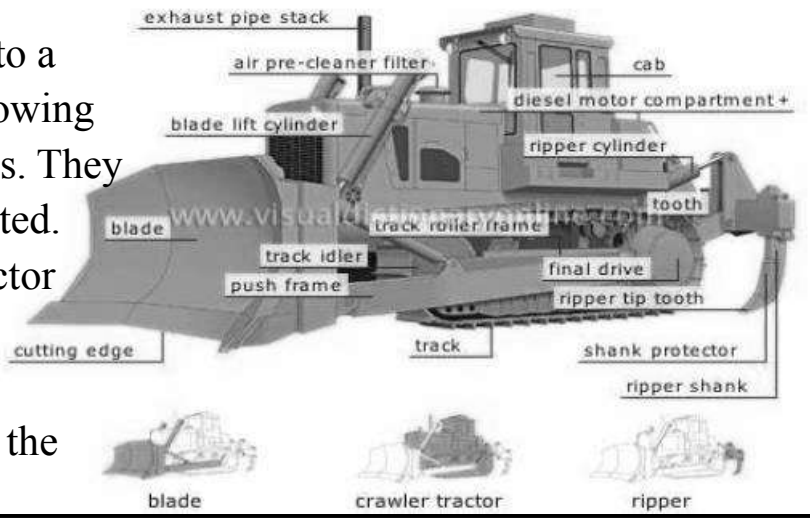
6. Bulldozers

+ A bulldozer is a crawler (continuous tracked tractor) equipped with a substantial metal plate (known as a blade) used to push large quantities of soil, sand, rubble, or other such material during construction or conversion work and typically equipped at the rear with a claw-like device (known as a ripper) to loosen densely-compacted materi

+ They are used for moving earth up to a distance of about 100m and act as a towing tractor and pusher to scraper machines. They can be track-mounted or wheel-mounted.

+ The heavy blade attached to the tractor pushes the material from one place to another.

+ The tractor can be of the crawler or the wheeled type



6.2 Excavating and earthmovi

7. Scraper

8. Loaders

6.2 Excavating and earthmoving equipment

9. Grader

+ A grader, also commonly referred to as a road grader, a blade, a maintainer, or a motor grader, is a construction machine with a long blade used to create a flat surface.

+ Typical models have three axles, with the engine and cab situated above the rear axles at one end of the vehicle and a third axle at the front end of the vehicle, with the blade in between.

+ In civil engineering, the grader's purpose is to "finish grade" (refine, set precisely) the "rough grading" performed by heavy equipment or engineering vehicles such as scrapers and bulldozers.

6.3 Hauling equipment

Side dump truck

Rear dump truck

6.4 Compaction equipment

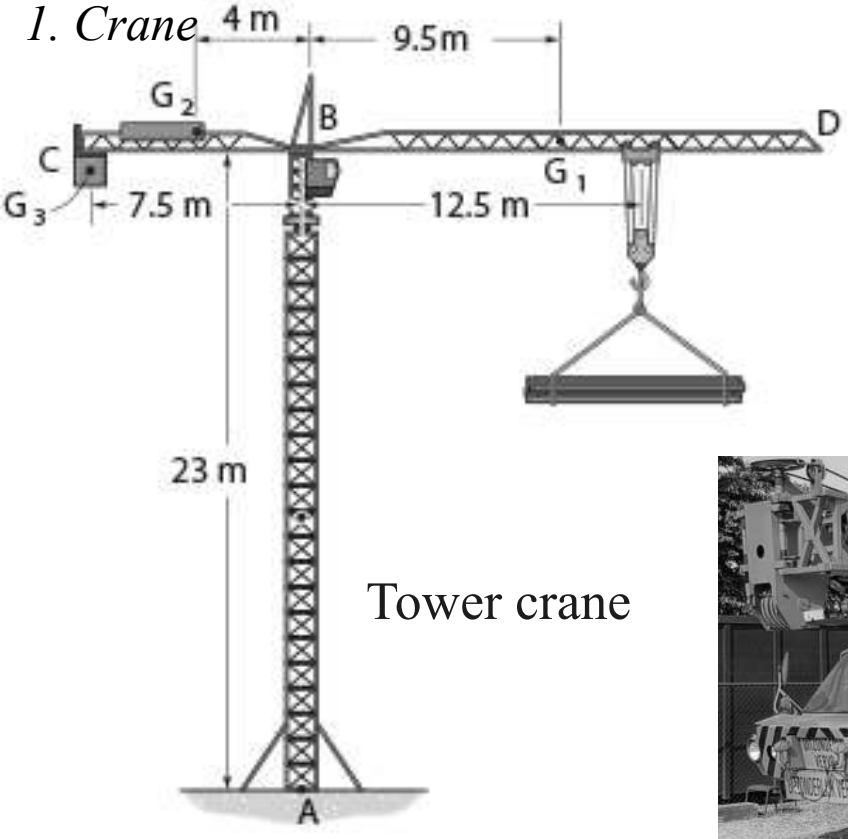
Compactors are machines frequently used to compact materials such as soil in order to increase its density for construction.

1. In addition, compactors are utilized in landfill tasks.
2. Common varieties are plate tampers (also known as rammers)
3. Vibratory plates, compactors (also known as tamping foot rollers) &
4. Vibratory pad foot compactors.

Smooth-wheel rollers **Sheep-foot rollers** **tyred rollers**

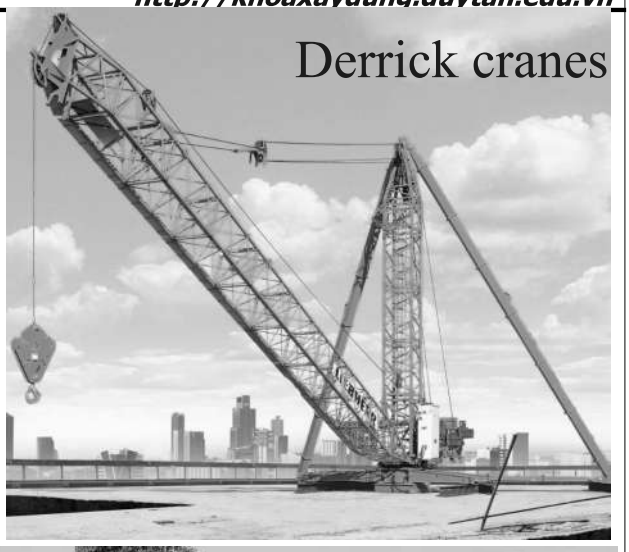
6.4 Hoisting equipment

1. Crane



Tower crane

Derrick cranes



Mobile cranes

6.5 Concreting equipment

1. Concrete production plants

2. Concrete mixers

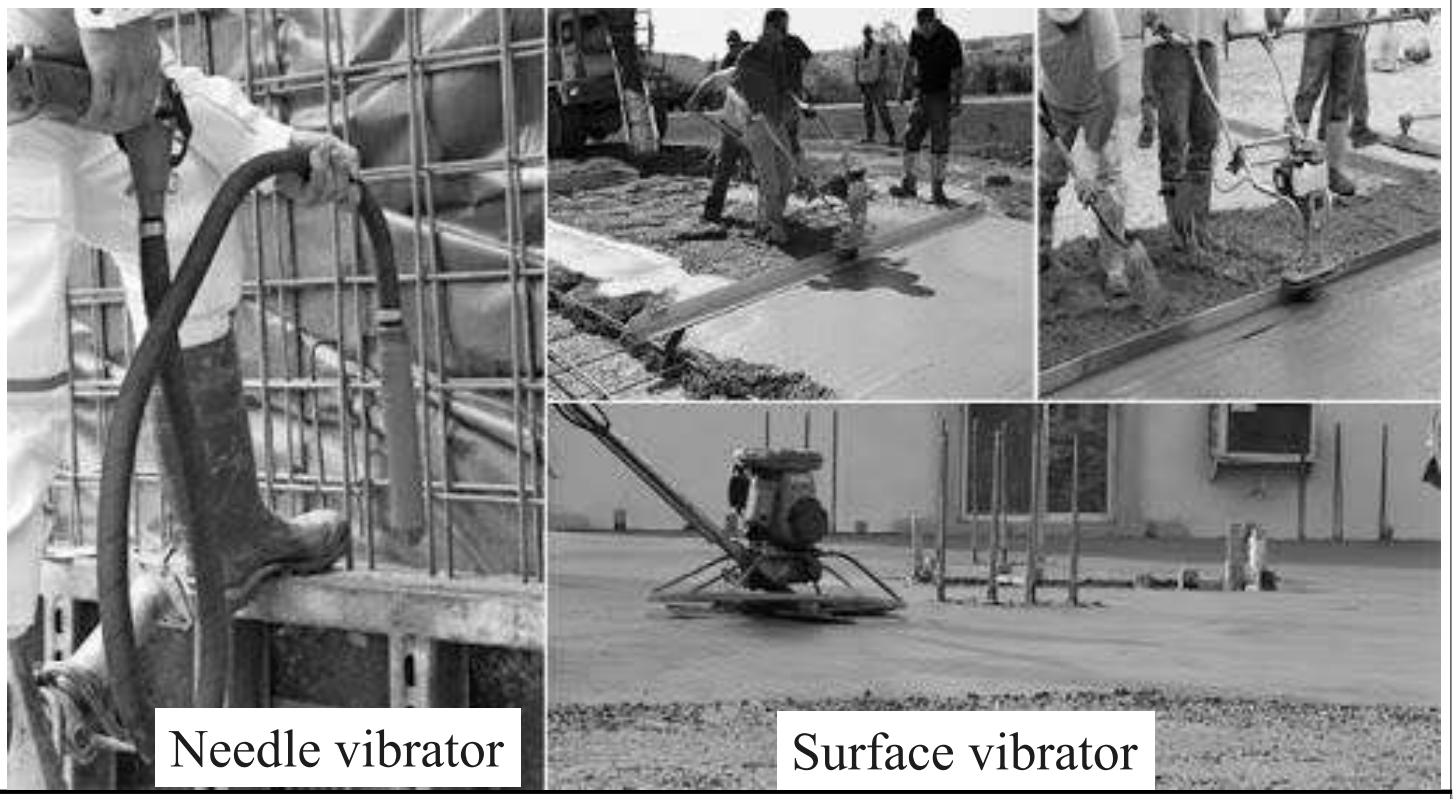
6.5 Concreting equipment

3. Concrete transit mixers

4. Concrete pumps

6.5 Concreting equipment

5. Vibrator



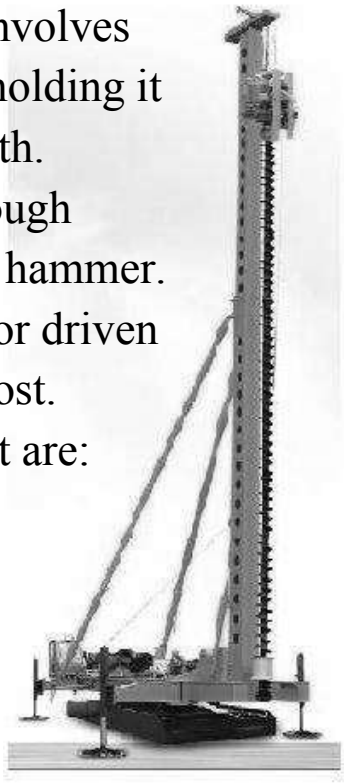
6.5 Concreting equipment

5. Vibrator

External Vibrator / shutter vibrator

6.6 Pile driving equipment

- The process of pile driving involves lifting the piles into position, holding it to refusal or to a specified depth.
- Driving is accomplished through hammering the pile top with a hammer.
- Equipment are so designed for driven effectively at an economical cost.
- Major pile driving equipment are:
- Pile driving rigs
- Pile driving hammers



CFG pile driving machine

Rotary drill rig

6.7 Exercise

1. Match 1-10 with their meanings a-j

1	track (n)	a	a large digging machine used for making roads, etc.
2	stabiliser (n)	b	a powerful vehicle with a broad metal blade, used for moving earth and rocks, destroying buildings, etc.
3	lift (v)	c	to move something or someone upwards into the air
4	trench (n)	d	a continuous metal band that goes over the wheels of a vehicle allowing it to move over uneven ground
5	bulldozer (n)	e	a long narrow hole dug into the surface of the ground
6	jackhammer (n)	f	a large powerful tool used by hand to break hard materials, e.g. the surface of a road, concrete
7	pile driver (n)	g	a machine for pushing heavy posts into the ground
8	backhoe (n)	h	a piece of equipment that helps make something steady

6.7 Exercise

2. Listening

Put one word in each gap. Then listen and check your answers.

1. This machine is.....driving piles into the soil.
2. This machine has a bucket which is used.....scoop soil out of the ground.
3. This machine…….....lift heavy loads high in the air.
4. You.....this machine to move large amounts of earth.
5. This machine.....electricity from petrol.
6. This machine.....used for transporting concrete to high parts of a construction site.
7. This machine is.....to transport people to high parts of a construction site.

6.7 Exercise

3. Read this text about mixing concrete and choose True (T) or False (F)

Concrete mixers mix and pour concrete. For small quantities of concrete, hand mixers are ideal. The portable mixer has wheels and uses electricity. It has a small drum which rotates. Concrete transport trucks, or in-transit mixers, transport large quantities of concrete to the site. The drum rotates during transport. The chute man pours the concrete down the chute, or uses a pump to get the concrete to difficult locations. Sometimes a crane lifts a hopper full of concrete to the job site.

1. Concrete mixers mix and pour concrete.

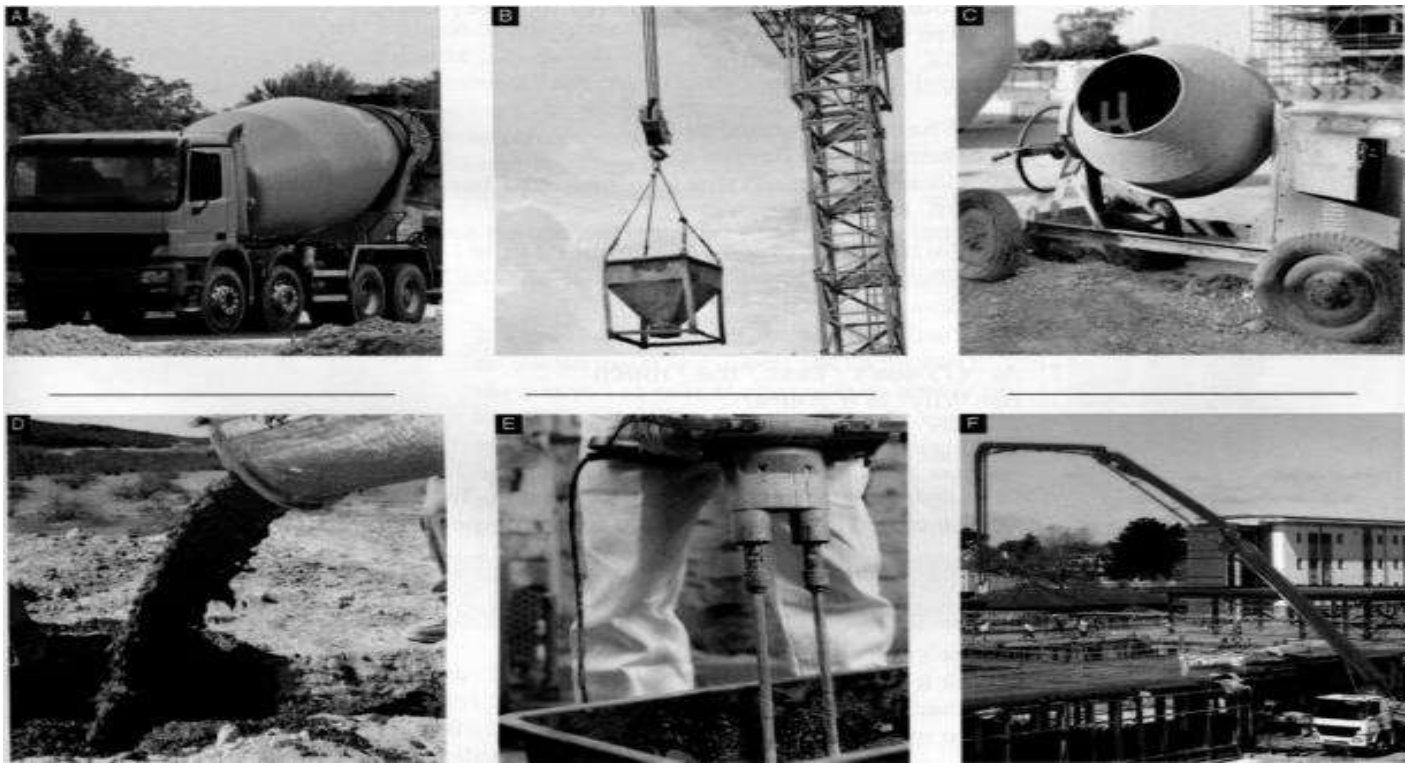
2. For small quantities of concrete, transport trucks are ideal.

3. Portable mixers use electricity.

4. Cranes lift hoppers full of chute men to the job site.

5. In- transit mixers rotate during transport.

Chute; Concrete pump; Concrete transport truck;
Hand mixer; Hopper; Portable mixer.



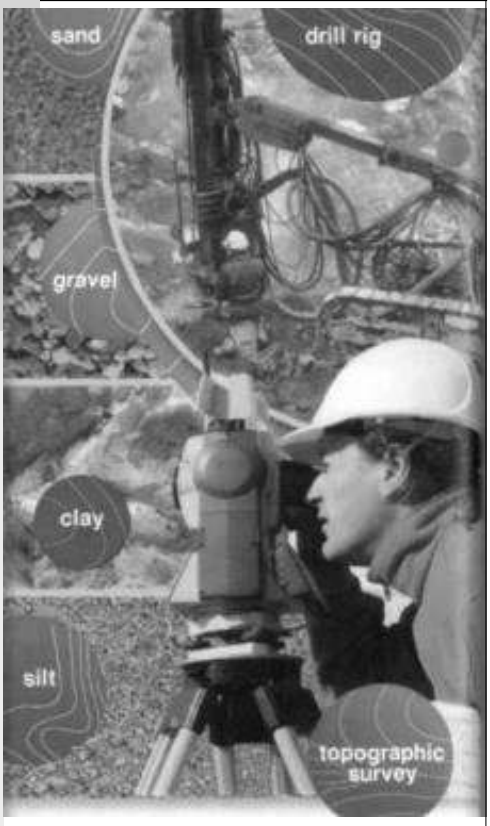
7.1 Site investigation

1. Reading then mark the statements as true (T) or false (F)

Before we begin construction on your property, we must conduct a thorough site investigation. This letter explains the steps in that process. First, we will do a complete **surface evaluation**. This will include a **topographic survey** of the surface features. The designers will use this data to design appropriate landscape features. We will also know if we need to move soil to make the site level.

Next, a subsurface investigation will be necessary. We need to know what kind of soil the foundation will rest on. A preliminary check showed mostly sand and larger pieces of gravel. However, there may also be weaker silt or clay soils present. We will dig several **test pits** to obtain a complete **soil profile.** Some of these will only be a few meters deep. For others we will use a drill rig to dig twenty meters down.

1. The topographic survey provides data for landscape design
2. The preliminary investigation showed silt soil to be present
3. The soil profile includes soil from twenty meters below the surface.



2. Choose the correct word

1.The contractor will need a test pit / surface investigation ten feet deep at this location.
2. Some soil will have to be moved to make this area sand / level
3. Can that test pit / drill rig make a hole 25 meters deep?
4. Conduct a subsurface investigation / topographic survey to determine the foundation requirements.
5. The drill rig / soil profile shows a mix of clay and silt in this area

7.1 Site investigation

3. Match the words (1-6) with the definitions (A-F)

1. Sand; **2. clay;** **3. gravel;**
4. surface evaluation; **5. silt;** **6. topographic survey**

A. a soil type with particles measuring between 0.002 mm and 0.02 mm in diameter

B. a soil type with particles measuring between 630 micrometers and 5 mm in diameter.

C. an examination of the top layer of soil at a construction site

D. a soil type with particles measuring less than 0.002 mm m diameter

E. a soil type with particles measuring between 5mm and 75mm in diameter.

F. an examination and description of the surface features of a construction site.

7.2 Site layout

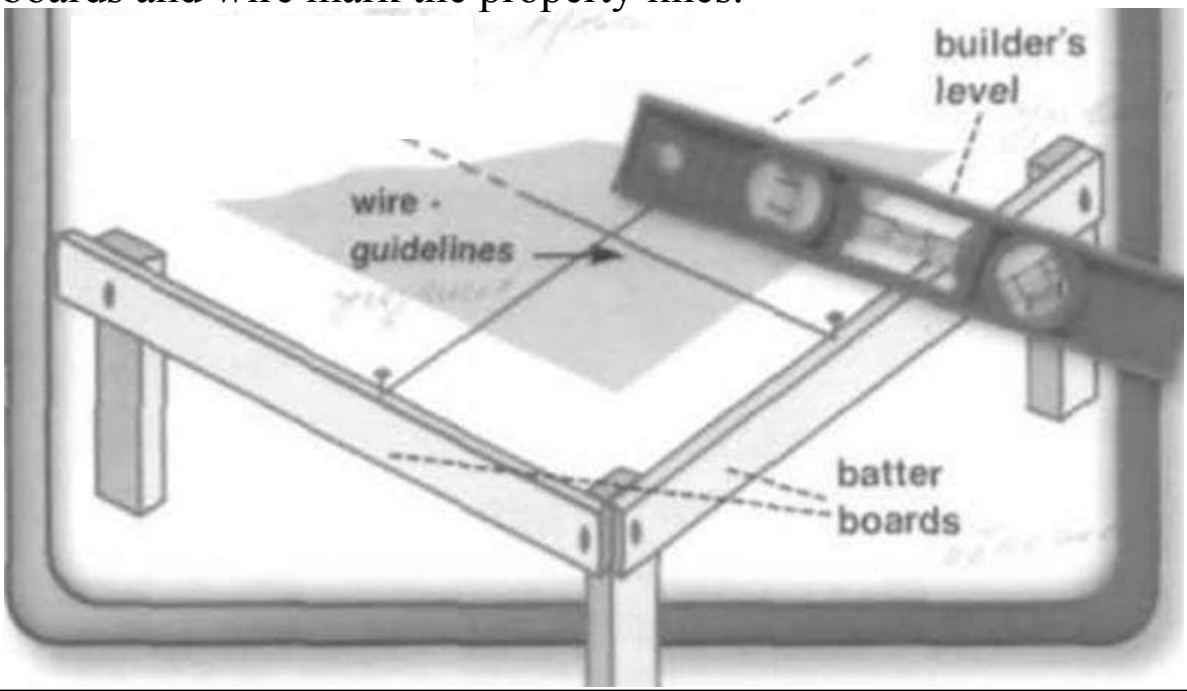
1. Read the email , then, mark the statements as true (T) or false (F).

Today we'll finish the site layout for the office building on Lincoln Boulevard. We'll need to have a complete site plan by the end of the day. It should show the **property lines**, available utilities and all significant changes in elevation.

I know this is your first time leading the crew. So I'll just give you a few reminders. Be sure your crew brings all the necessary equipment. Don't forget the **builder's level** and **grade rod**. You can't establish horizontal planes or measure elevation changes without them. There are already **bench marks** set at the site to help with that. You'll also need some **monuments** to stake out the property lines. Last, bring several **batter boards** and at least 100 meters of string or wire. Put the boards at the building comers Then run the wire between them to show the wall outlines.

7.2 Site layout

1_The grade rod is needed to measure elevation changes.
2_ The team has to set bench marks by the end of the day
3_ Batter boards and wire mark the property lines.



7.2 Site layout

2. Match the words (1-6) with the definitions (A-F).

1_site plan **2_horizontal** **3_batter board**
4_ utilities **5_ property line** **6_ wire**

A .a set of services required at most buildings including electricity, natural gas, water and sewage

B. parallel to the plane of the horizon, or flat

C. a drawing for a building project that shows its location, utilities, and property lines

D. a piece of metal shaped into a thin, even thread.

E. a horizontal board fastened to a post and located at the corners of an excavation to mark the desired level

F. the legal boundary of a piece of land owned by someone

7.3 Excavation

1. Read the email then mark the statements as true (T) or false (F).

I just wanted to let you know about a delay in construction.

We ran into a problem during today's excavation. While drilling, we encountered a large amount of **seepage** from **groundwater**. The **water table** in this area was unexpectedly high. Before we can proceed, we need to extract the water.

Since this isn't runoff or standing water, it won't be possible to let the water collect in a sump. The best way to solve this problem is by lowering the water level with a **dewatering system**. We will install a series of **well-points** throughout the area. As the water fills the well-points, we will use a pump to empty them. We will have to lower the water table by several feet.

I expect the process to take a few days. In the meantime, our crews will check the other areas of the construction site and make sure that this isn't a problem anywhere else.

If you have any questions, feel free to call me. Marcus Adams

7.3 Excavation

1. The worksite was flooded by runoff._____
2. The crew cannot use a sump to solve the problem._____
3. Work cannot continue until the water table is lowered._____

2. Fill in the blanks with the correct words and phrases.

water table groundwater pump drill dewatering system

1. A _____is a good way of lowering the underground water levels
2. He attempted to _____ a hole in the ground, and hit a massive piece of rock.
3. The _____ rises and lowers according to environmental conditions, such as the amount of rainfall
4. They used a _____ to collect the standing pool of water
5. Most of our drinking supply comes from sources of _____below the earth's surface

7.3 Excavation

3. Read the website, then mark the statements as true (T) or false (F).

After your site is laid out, we will dig and remove earth for the foundation. Many jobs are general excavations that use standard machinery. Others may be special excavations requiring explosives or other equipment.

Please verify that the **payline** is marked accurately. This way we will only remove what is necessary. We will **haul** the earth and **deposit** it where you choose. Please note that soil swell can lead to more earth being hauled from that site. This can lead to additional charges for removal.

We will also talk to you about the best way to protect the dig site. The method selected depends on site conditions and project budget. Laying timber lagging between **steel soldier piles** is inexpensive and effective. **Interlocking sheet piling** creates a solid steel wall. If there is water nearby we may need to construct a concrete **slurry wall**. A **tieback** can protect a sloping excavation site while keeping it free of obstructions.

7.4 Excavation

1. General excavations usually require explosives
2. Soil swell can increase hauling costs.
3. Timber lagging is used with interlocking sheet piling

4. Match the words (1-7) with the definitions (A-G).

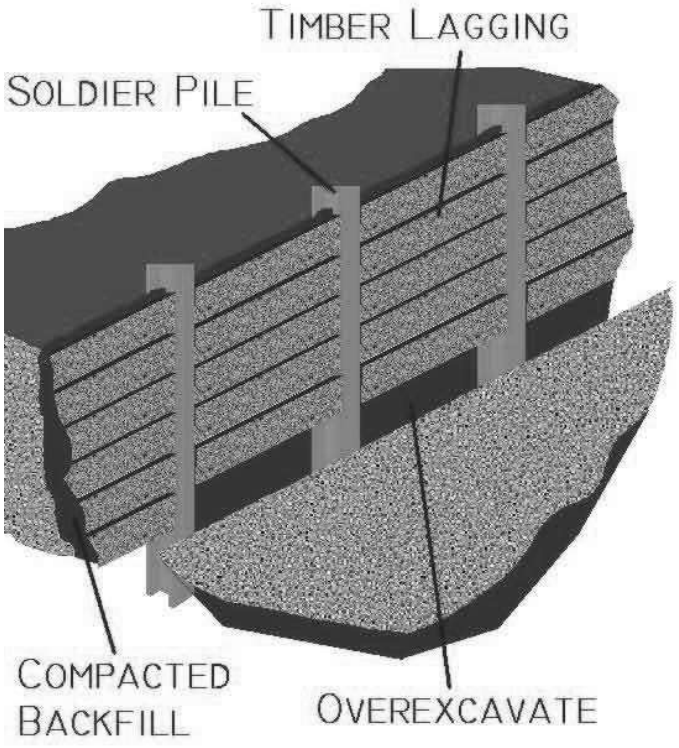
1. dig
2. haul
3. sloping
4. interlocking sheet piling
5. steel soldier piling
6. deposit
7. concrete slurry

A. running evenly upward or downward
B. a method of supporting an earth wall using sheets of steel to form a single wall in the ground
C. a material used to make protective excavation walls when the earth is very wet
D. to remove earth from the ground
E. sections of steel driven into the ground used with timber sheeting to protect an excavation
F. to carry something from one place to another
G. to place something somewhere after it was moved from its original location

7.4 Excavation

5. Read the sentence and choose the correct word.

1. The contractor will need to use explosives in this special excavation / general excavation
2. Mark the *tieback / payline* correctly so the excavator doesn't remove more earth than we need.
3. Run some *timber lagging / concrete slurry* between those soldier piles to form a wall
4. Soil *swell / deposit* often leads to higher than expected hauling costs.
5. A *general excavation / special excavation* is one that can be completed using regular machines
6. The subcontractor will use a *tieback/soil swell* here to keep the excavation area clear



7.4 Formwork

1. Read the advertisement, then mark the statements true (T) or false (F)

At PXT Formwork we specialize in the production of high-quality prefabricated **molds**.

These molds have steel or aluminum frames. The side facing the concrete is covered with the desired surface material. This may be steel or plywood. This type of formwork system is quick and easy to set up. The units are lightweight and easy to transport.

Prefabricated, **temporary formwork** molds are also easy to **strip** after the consolidation process. This occurs only after the concrete has **cured**. The beams are left behind until the structure has achieved its design strength. The concrete walls formed by these molds are capable of supporting any building's framing. The module frames can be reused thousands of times. You'll appreciate the time and money you save!

Our staff would be happy to provide a free consultation about your project's formwork needs.

7.4 Formwork

1. The molds have frames made of plywood.
2. The formwork is difficult to strip
3. The frames can be used many times

2. Fill in the blanks with the correct words

Temporary mold lightweight prefabricated strip

1. Plastic formwork panels are _____, so even one person can lift them.
2. _____formwork systems arrive already _____ in the necessary shapes.
3. _____formwork is only used for a short periods of time.
4. The contractor will _____ this formwork after the concrete is dry
5. Pour concrete into a _____ to shape it correctly

7.4 Formwork 1

3. Match the words (1-6) with the definitions (A-F)

1. consolidation
2. design strength
3. formwork
4. framing
5. reuse
6. cure

A. To use something again
B. mold into which concrete or another material is poured to form a building structure
C. to dry until solid
D. the process of concrete becoming solid and denser, thereby taking less space.
E. the assumed load-bearing capacity of steel or concrete
F. the use of structural pieces to support building and provide places to attach exterior and interior walls

7.4 Formwork

4. Read the article, the choose the correct answers.

Several kinds of formwork are used in the construction industry today. The use of **modular systems, permanent insulated formwork**, and **stay-in-place** formwork is on the rise. However, the most common and affordable system remains wood formwork.

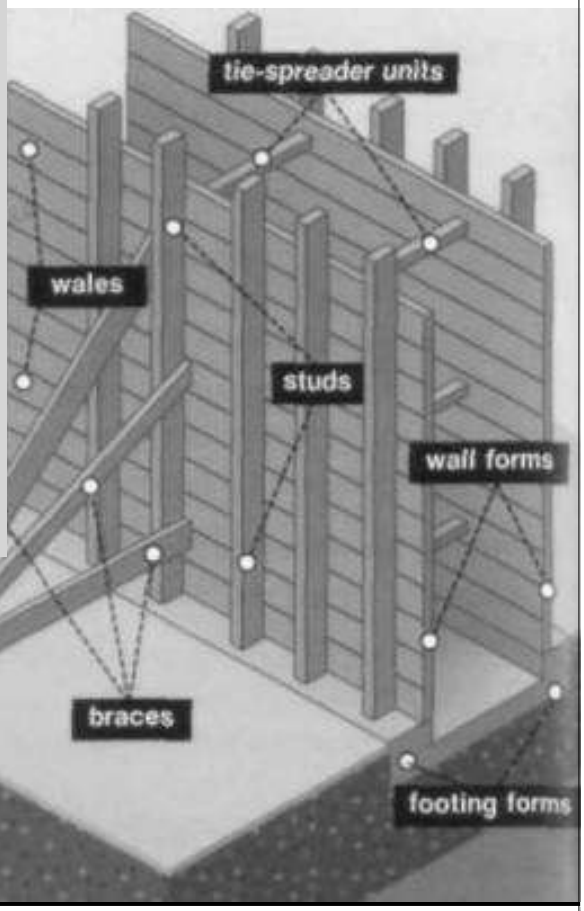
Wooden formwork is made of timber and plywood. It is assembled at the building site.

Wood can be used to make both **wall forms** and **footing forms**. Footing forms produce concrete columns and walls to serve as structure bases.

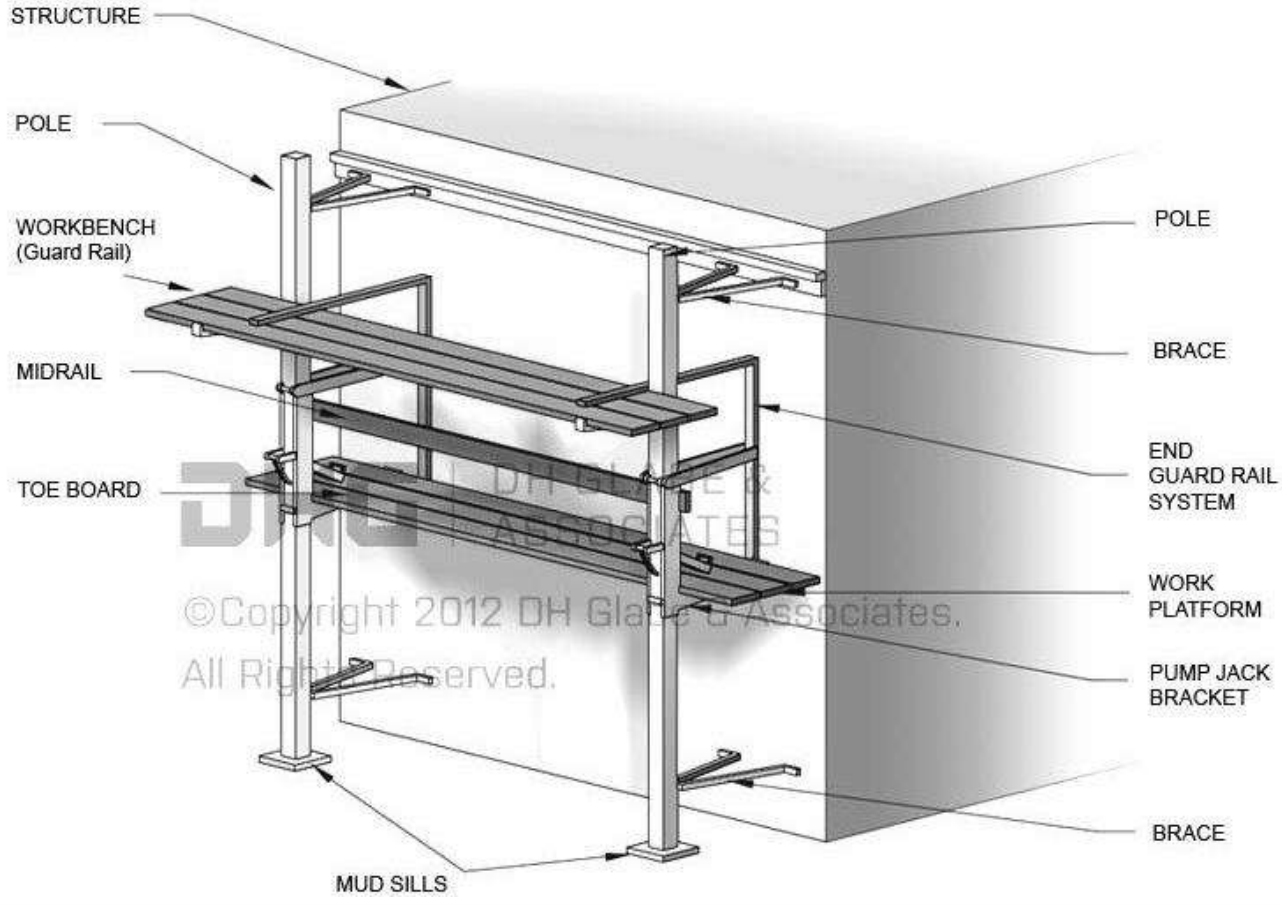
There are five essential parts to a wooden wall form. **Sheathing lines** the inside of the form to shape and hold the concrete. Vertical **studs** make a framework and support the sheathing. Horizontal **wales** serve to align the form and keep the studs in place. **Braces** help to keep the form standing up. Last, **tie-spreader** units maintain the correct spacing of the form. This basic structure has helped to erect buildings around the world.

1. What type of formwork is used most often?
A. wooden formwork
B. modular formwork
C. stay-in-place formwork
D. permanent insulated formwork

2 Which of the following is NOT part of a wall form?
A. braces B. sheathing
C. tie-spreader unit D. concrete column



3 What do wales do in a wall form?
A. hold the concrete
B. make the framework
C. maintain form spacing
D. keep the studs in position



7.4 Formwork

5. Match the words (1-6) with the definitions (A-F).

1. sheathing
2. line
3. wale
4. tie-spreader unit
5. stay-in-place
6. footing form

A. a horizontal piece of lumber used to support or retain earth.
B. a device that holds the sides of a wall form at the correct spacing.
C. made from prefabricated plastic forms that remain after the concrete has cured.
D. a tube used to pour a concrete base column for a building structure.
E. something that wraps around or surrounds something else.
F. to cover the bottom or sides of something with a thin material.

7.5 Concrete work

1. Read the website, then choose the correct answers.

MVJ Construction Supply can provide your company with everything it needs for concrete projects. We have equipment for every step of the process.

Mixing

Drum Mixers: These mixers are available in sizes from 0.10 cubic meters to 15 cube meters. They either tilt to unload or have a discharge chute.

Countercurrent Mixers: These mixers create more agitation than a drum mixer for greater uniformity. They are especially useful when mixing additives and colors.

7.5 Concrete work

Transport

Wheelbarrows: The average capacity of our wheelbarrows is 170 liters. Smaller and larger sizes are available.

Buggies: Both our pushcarts and motorized buggies. I have pressurized tires for easy, smooth operation. Their capacity ranges from 0.10 to 030 cubic meters.

Bucket: We stock many kinds of buckets from small hand-held buckets to large crane-lifted containers.

Belt Conveyor: Portable belt conveyors are always available. We can work with you to design and build a larger system.

Finishing

Screeds: After placing concrete, don't forget to finish it! These large bars strike off a concrete surface, removing the excess and leaving an even surface behind.

Floats and trowels: For the final touches, we have a variety of floats and trowels available. They come in various shapes and sizes. They are either hand tools or motorized.

7.5 Concrete work

Transport

Wheelbarrows

Buggies:

Bucket:

Belt Conveyor:

Finishing

Screeds:

Floats and trowels:

7.5 Concrete work

1. Why is a countercurrent mixer especially useful?

A. It has a discharge chute
B. It produces more agitation
C. It has a capacity of 170 liters
D. It can be moved with a crane

2. Which of the following is not readily available in multiple sizes?

A. buggies
C. wheelbarrows
B. buckets
D. belt conveyors

3. What is the purpose of a strike-off bar?

A. to remove excess concrete
B. to mix additives and colors
C. to move concrete around a worksite
D. to put the finishing touches on concrete

7.5 Concrete work

2. Match the words (1-7) with the definitions (A-G)

1. finish; 2. mixing; 3. float; 4. buggy
5. belt conveyor; 6. uniformity; 7. place

A. to put concrete in its final position
B. a small man-powered or motorized vehicle used to transport materials at a construction site
C. the process of combining and stirring cement water, and aggregate until it forms a concrete mix
D. a rectangular tool used to smooth and level the top layer of concrete
E. the state of being the same or alike through out
F. to alter concrete surfaces to produce the desired final appearance and texture
G. a machine for transporting concrete or other material that consists of two pulleys and a continuous loop of material that rotates around them

8.1 Read the poster on worksite safety. *Mark the statements as true (T) or false (F).*

Follow the guidelines below at all times. In the event of an accident, notify a supervisor and call **emergency** services.

When working on **ladders** follow the 4:1 rule. Avoid falls from **scaffolds** and pump jacks by wearing a **safety harness**. Pay attention to the platform's weight limit. Exceeding that limit can cause a collapse.

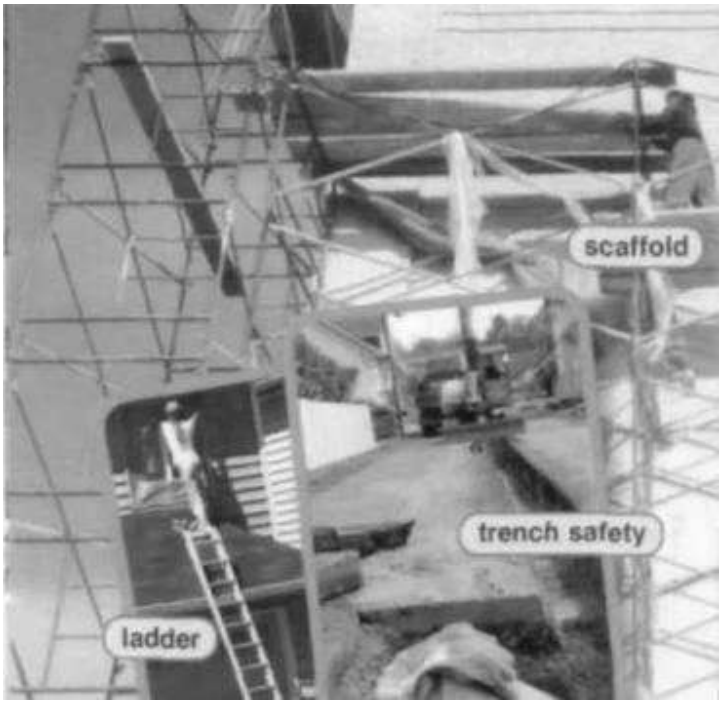
Ensure proper **ventilation** when working with toxic chemicals in closed spaces. Read the Material Safety Data Sheets (MSDS) thoroughly and take all recommended **precautions**.

Know the causes of each class of fire and the correct type of **extinguisher** to use on each type. Keep fire extinguishers on hand for Class A and B fires.

Never take water near an electrical ground. Wear **rubber-soled boots** to protect against electric shock

Practice good trench safety. Never stack equipment or pile dirt near trench edges

1. Not following the 4:1 rule can cause a scaffold to collapse.
2. Different classes of fire need different types of fire extinguishers.
3. Not wearing rubber-soled boots violates trench safety.



8.2 Fill in the blanks with the correct words and phrases

toxic **pump jack** **trench safety** **4:1 rule**
Material Safety Data Sheet **position** **the ladder**

1. According to the _____, you should wash your eyes thoroughly if the chemical gets in your eyes.
2. Position the ladder according to the_____
3. Most deaths occur when the walls cave in, so it is important to follow _____ guidelines.
4. When he finished installing the windows. Tim lowered the _____to the ground.
5. This substance is _____ and will cause illnesses if inhaled.

8.3 Choose where the words best fit the blanks

1. class / accident

A. The _____ A fire occurred when a piece of paper got too close to a stove

B. An employee broke his leg in the _____ at the construction site.

2. scaffold / fall

A. Avoid a _____ by wearing a safety harness.

B. John stood on a _____ that was fifteen feet off the ground.

3. ground/ladder

A. The _____ was a metal rod installed into the foundation of the building.

B. Use a _____ to repair the gutter on the roof.

4. closed space / ventilation

A Keep the window open to ensure proper_____

B Never use a toxic chemical in a _____