



Pro-Practicum School
Building
Year 4
Term 2



Name: _____

Group: _____

Revision Activity 1

1. Listen to the discussion about the school rules and center rules.
Look at the picture and circle the dangers.
2. Write the rules that have not been followed.



Rules that was not followed and what they should have done.



1. _____

2. _____

3. _____

4. _____

5. _____

PPE Safety wear

1. Look at the following picture of the PPE wear.
2. Listen to the discussion.
3. Select and collect your PPE wear and put it on. Your educator will do a checklist if you are wearing the correct PPE wear.
4. Look at the picture and put a harness on. Your educator will do a checklist if you don a harness on correctly.



Activity 2

Check list PPE Wear

Name: _____ Date: _____

Criteria	Yes	No
Overall		
Gloves		
Safety boots		
Safety glasses		
Hear protection		
Dust Mask		

Comments:

Checklist Harness

Name: _____ Date: _____

Criteria	Yes	No
Harness held correctly and shanked		
Unbuckle all straps		
Straps over shoulders correctly		
Leg strap between legs and connected		
Chest strap connected		
All straps are connected		

Comments:

6 Easy Steps That Could Save Your Life

How To Don A Harness



1 Hold harness by back D-ring. Shake harness to allow all straps to fall in place.



2 If chest, leg and/or waist straps are buckled, release straps and unbuckle at this time.



3 Slip straps over shoulders so **D-ring is located in middle of back between shoulder blades.**



4 Pull leg strap between legs and connect to opposite end. Repeat with second leg strap. If belted harness, connect waist strap after leg straps.



5 **Connect chest strap and position in midchest area.** Tighten to keep shoulder straps taut.



6 After all straps have been buckled, **tighten all buckles so that harness fits snug but allows full range of movement.** Pass excess strap through loop keepers.

First Aid

First Aid is emergency help given to a person injured or ill, so as to prevent complications or death. It seeks to relieve pain, stop bleeding, combat shock and prevent infection, until the patient receives the required medical attention.

There are three types of injuries

- Cuts
- Burns
- Fractures



Activity 3

1. Look at the first aid kit below and check if the center has all the required medical equipment needed use the list below.

Safety pins		Gauze swabs		First aid dressing	
Roller bandages		CPR mouth piece		Cotton wool	
Plaster oil		Plaster strips		Scissors	
Examination gloves		Antiseptic solution		Tweezers	
Paper tape		Triangular bandages		First aid box/kit	



2. What to do in case of an accident.

1

Emergency Response



Your employee's wellbeing is the immediate priority. Ensure they are safe. If they have a treatable injury like a cut, make sure a first aid kit is provided and available at all times.



If the injury is serious, the emergency services should be called promptly to avoid the situation getting worse.

2

Secure the Surroundings



After the employee is considered to be safe or the incident is being dealt with, it is important to ensure the area of the incident has been cleared of any obstruction.



Remove any dangerous equipment from the scene. If a notice needs to be put up warning other staff of a hazard, ensure this is implemented.

3

Conduct a Report



You are by law required to report any workplace incidents in a written format.



Firstly - make a note of who was involved, the date and time, why it occurred and if there was a witness.

Secondly - identify the type of injury that the employee suffered and any symptoms they experienced. Note if they required any additional support.

4

Prevent Recurrence



Identify what went wrong. What could have been done differently to prevent the accident from occurring?

If the incident occurred due to faulty equipment, ensure regular procedures are put in place to check this before work is carried out. Escalate this information alongside a risk assessment to all staff so that they are aware of the dangers that their job entails.



Implement safety training sessions.

1. Practice reacting to an accident in group by doing a roll play.

5 HIV FACTS

1 PEOPLE ON EFFECTIVE HIV TREATMENT CAN'T PASS IT ON

Effective treatment for HIV suppresses the virus to such low levels that it can't harm you and you can't pass it on.

2 HIV CAN'T BE PASSED ON THROUGH DAY-TO-DAY CONTACT

HIV can't be passed on through things like touching, kissing, sharing cutlery or glasses.

HIV can be passed on through sex without a condom but only if a person is not on effective treatment. It can also be passed on through sharing needles and during pregnancy (but in the UK this is extremely rare because we have great treatment).

3 HIV CAN AFFECT ANYONE

Some groups of people are affected by HIV more than others, but it can be passed on to anyone.

4 PEOPLE LIVING WITH HIV CAN LIVE LONG AND HEALTHY LIVES

There isn't a cure for HIV, but there is excellent treatment. If you are diagnosed in good time and take your medication, you can have as long and healthy a life as everyone else.

5 THERE ARE MANY WAYS TO PREVENT HIV

- Getting regularly tested for HIV if you are sexually active
- Taking PrEP or PEP (tablets which prevent HIV either before or just after you've been exposed to it)
- Using condoms
- Never sharing needles
- Taking your medication if you are living with HIV

TRANSFORMING
THE UK'S
RESPONSE
TO HIV



www.nat.org.uk

Revision Activity 4

Listen to the educator and complete the task.



Types of Sand used for Construction

Building

Find Granular Sand



Fine granular or fine sand has the shape of round and solid grains. It is the cleanest among the other types of sand. It is suitable for plastering works that require fine texture and to be used at the golf course. It can also be used to produce light weight brick

Concrete

Coarse Sand



Coarse sand is rather large size and unequal forms with edges. It is suitable for structural construction work that requires stronger forces e.g. bridges, reinforced structure, footing, land, land slide prevention etc.

Plastering

Fill Sand



Fill sand is commonly used for leveling and or used together with sandbags that help prevent flood and road filling

1. Use the information above and select and collect the correct sand for the job.

Job	Yes	No
Building		
Plastering		
Concrete		

Next is the knowledge building of foundations.

- ❖ What is a foundation?
- ❖ Why is it important?
- ❖ Can you build a wall with having a foundation?

WHAT IS FOUNDATION?

Foundation of a structure is always constructed below the ground level so as to increase the lateral stability of the structure. It includes the portion of the structure below the ground level and is built, so as to provide a firm and level surface for transmitting the load of the structure on a large area of the soil lying underneath. The solid ground on which the foundation rests is called the Foundation Bed.

Purpose of Foundation:

All engineering structures are provided with foundations at the base to 11level the following objectives and purposes;

- i. To distribute the load of the structure over a large bearing area so as to bring intensity of loading within the safe bearing capacity of the soil lying underneath.
- ii. To load the bearing surface at a uniform rate so as to prevent unequal settlement.
- iii. To prevent the lateral movement of the supporting material.
- iv. To secure a level and firm bed for building operations.
- v. To increase the stability of the structure as a whole.

Types of Foundations

Foundations are broadly classified into two categories:

1. Shallow Foundations

- i. Spread footing or open trench foundations
- ii. Grillage foundations
- iii. Raft foundations
- iv. Stepped foundations
- v. Inverted arch foundations

2) Deep Foundations

- i. Pile foundations
- ii. Well foundations
- iii. Caisson foundations

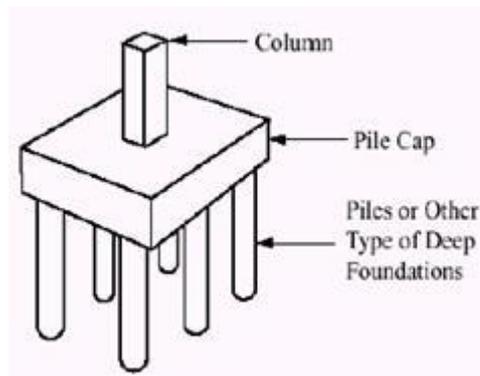
LET US TAKE A LOOK AT THE DIFFERENT TYPES OF FOUNDATION

2. Spread Footing Foundations :

Foundations constructed by increasing the area at the base of the structure by means of offsets, are called spread footing foundations. In such foundations, spread is given under the base of a wall or a column by providing offsets. This spread is known as footing and the foundation itself is called spread footing.

Broadly speaking, all types of shallow foundations can be referred to as spread footing foundations. However, from design and construction point of view, they have been designated separately. The various types of spread footing foundations are;

i. Wall footings:



This is a common and the simplest type of spread footing foundation; it consists of a number of courses of bricks, the lowest being usually twice the thickness of wall above. In this type of foundation, the base width of the wall is increased by providing 5cm (one-fourth of brick length) offsets on either side of the wall. The depth of each course is usually 10 cm

In some cases, however, the bottom course is made 20cm deep. In the case of footing for store walls, the size of offset is slightly more than that of the brick wall footing.

Method of Construction of Wall Footing:

For constructing wall footing, a bed of lean cement concrete (1:8:16) is first laid over the entire length of the wall. The thickness of this lean concrete bed is usually kept 15cm and its width is kept 20 to 30 cm more than that of the bottom course.

In no case, the depth of the concrete bed should be less than its projection beyond the wall base. For foundations over firm soil or compacted ground, the concrete bed below the brick wall footing may be dispensed with.

After laying the concrete for constructing the concrete bed, it should be properly compacted and cured before laying the base course of the wall.

Suitability:

This is the cheapest type of spread footing foundations and is largely used for walls of ordinary buildings.

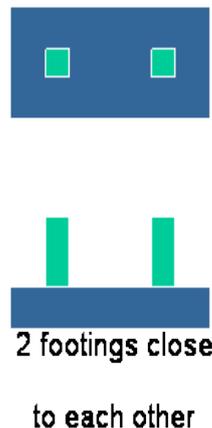
3. Masonry Pillar Footing:

Isolated footings are used to support the individual pillars and columns constructed in brick or stone masonry. They are stepped down in the wall footing after providing 15cm offset of foundation concrete on all the sides.

4. Concrete Column Footing:

These are either stepped type, slate type or slope type, having projections in the vae concrete. To support heavy loads, reinforcement is also provided at the base. The reinforcement provided is in the form of steel bars and is placed in both directions. Concrete column footings may be either isolated footings or combined footings. Isolated footings are used to support the individual columns, whereas combined footings are used where projections of different columns are not possible on all the sides, due to limited space.

The combined footings are generally rectangular in shape when both columns are of same sections and trapezoidal in shape when the columns are of different sections.



2) Grillage Foundation:

The foundation which consists of one or two tiers of wooden or rolled steel section with space filled up with concrete is known as Grillage foundation. This is so called because the bed constructed in this type of foundation is called grillage. This type of construction avoids deep excavation and provides the necessary area at the base of the structure to reduce the intensity of pressure within the safe bearing capacity of the soil.

OBJECT:

The object of this type of foundation is to spread the load over a large horizontal area at the base of a structure.

Types of Grillage Foundation

Depending upon the material used in construction, grillage foundations are further classified into two types.

1. Steel Grillage Foundation
2. Timber Grillage Foundation

Steel Grillage Foundation

Method of construction of steel grillage foundation:

2. For constructing steel grillage foundation, a trench is excavated to the calculated width and about 0.90 m – 1.50 m deep. Bottom of the trench is rammed and levelled.
3. Then a layer of lean cement concrete (1: 8: 16), about 30cm thick, is laid and compacted.
4. After this, a layer of rich cement concrete (1: 2:4), about 15cm thick is spread and compacted to form a concrete bed.
5. Over the concrete bed thus prepared, the bottom tier consisting of a number of steel I – beams of designed dimensions are placed at specified distance apart, using spacer bars. The space in between and around the steel beams is then filled with cement concrete.
6. On this bottom tier, a second layer of steel I – beam is placed, if required.
7. The entire space is then filled with cement concrete 1: 2: 4. On the grillage bed thus prepared, the structure in the form of a steel stanchion, column, and pier is built.

For timber grillage foundation construction

1. Wooden planks, usually 5 to 8 cm in thickness, are laid side by side longitudinally on the prepared bed of the trench excavated for this purpose.
2. The planks should be arranged in a width 45 to 60 cm more on either side than the designed width of the base course of the structure.
3. On this bottom layer of planks, rectangular timber sections of suitable size are laid at about 35 cm centre to centre.
4. Then a top layer of planks, usually 8 to 10 cm in thickness, arranged side by side, in width equal to that of the base course of the structure is to be built over it
5. On the timber platform thus prepared, the structure in the form of a timber column or even a masonry wall is built.

Suitability of steel grillage foundation:

Steel grillage foundations are useful for structures like columns, piers, stanchions subjected to heavy concentrated loads and hence are employed for foundations of the buildings such as theatres, factories, town, halls etc. Timber grillage foundations are usually provided for timber columns subjected to heavy concentrated loads. This type of grillage foundation can also be safely used for light buildings where the soil encountered is soft and is permanently water-logged.

3) RAFT FOUNDATION:

The foundation consisting of a thick R.C.C slab covering the whole area of a mat is known as raft foundation.

Method of construction of Raft Foundation:

1. In Raft Foundation construction the whole area is dug out to the specified depth and 30 cm more wide than the area to be covered.
2. The bed is compacted and sprinkled over with water.
3. Then a layer of lime concrete or lean concrete (1: 8: 16) is laid to a suitable thickness to act as a bottom cover.
4. After this, the reinforcement is laid. The reinforcement consists of closely spaced bars placed at right angles to one another.
5. Then the cement concrete (1: 2: 4) is laid and compacted to the required thickness.
6. The concrete slab so laid is then properly cured
7. When loads are excessive, thick concrete beams running under the columns can also be constructed.

SUITABILITY:



This type of foundation is useful for public buildings, office buildings, school buildings, residential quarters etc., where the ground conditions are very poor and bearing power of the soil is so low that individual spread footing cannot be provided.

4) STEPPED FOUNDATION:

Another types of foundation is stepped foundation, For Stepped Foundation Construction, excavation is done into steps having short length and uniform thickness and the masonry work is done on the horizontal bed of concrete thus prepared.

If there is any possibility of slipping of the structure bodily, R.C.C piles can be driven along its base concrete on the sloping side.

5) INVERTED ARCH FOUNDATION:

The foundation consisting of inverted arches between the piers is known as inverted arch foundation. In this type of foundation, the load from the piers is transferred to the soil by constructing arches in inverted position at their base. The rise of the inverted arches is about one – fifth to one – tenth of the span and they are usually build in half-brick rings. The position of arches may be either along the row of piers or across the row of piers in both the directions depending upon the nature of soil and the type of land to be taken by them.

METHOD OF CONSTRUCTION:

For constructing this type this type of foundation;

1. Excavation is done to the required depth.
2. The bottom of the excavation is levelled and compacted
3. Then the foundation concrete is laid to the required thickness and finished according to the layout of the arches to be constructed under the piers.
4. The arch rings, usually half brick thick, are then built in cement mortar and piers are constructed.
5. The end piers should be designed and constructed to take the outward thrust caused by arch action.

SUITABILITY:

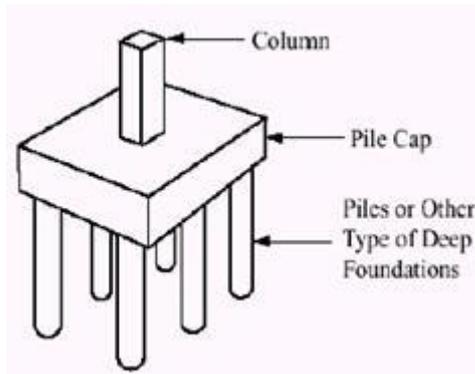
This of foundation is not commonly used for buildings, but it is quite suitable for other structures like bridges, reservoirs, tanks, supports for drainage lines etc.

DEEP FOUNDATION:

The foundation constructed sufficiently below ground level with some artificial arrangements such as piles, wells etc., at their base are called deep foundations. Deep foundation are further classified into the following types;

1. Pile foundation
2. Well foundation
3. Caisson foundation

1. PILE FOUNDATION:



A foundation (spread footing or grillage) supported on piles is called a pile foundation. A pile foundation usually consists of a base of spread footing or grillage supported by piles at their bottom. Piles distribute the load of structure to the soil in contact either by friction alone or by friction combined with bearing at their ends.

SUITABILITY:

This type of foundation is suitable under the following situations;

1. When the soil is very soft and solid base is not available at a reasonable depth to keep the bearing power within safe limits.
2. When the grillage and raft foundation are very expansive.
3. When the building is very high carrying heavy concentrated loads.
4. When it is necessary to construct a building along the sea shore or river bed

TECHNIQUE TO TRANSFER LINES OF A FOUNDATION

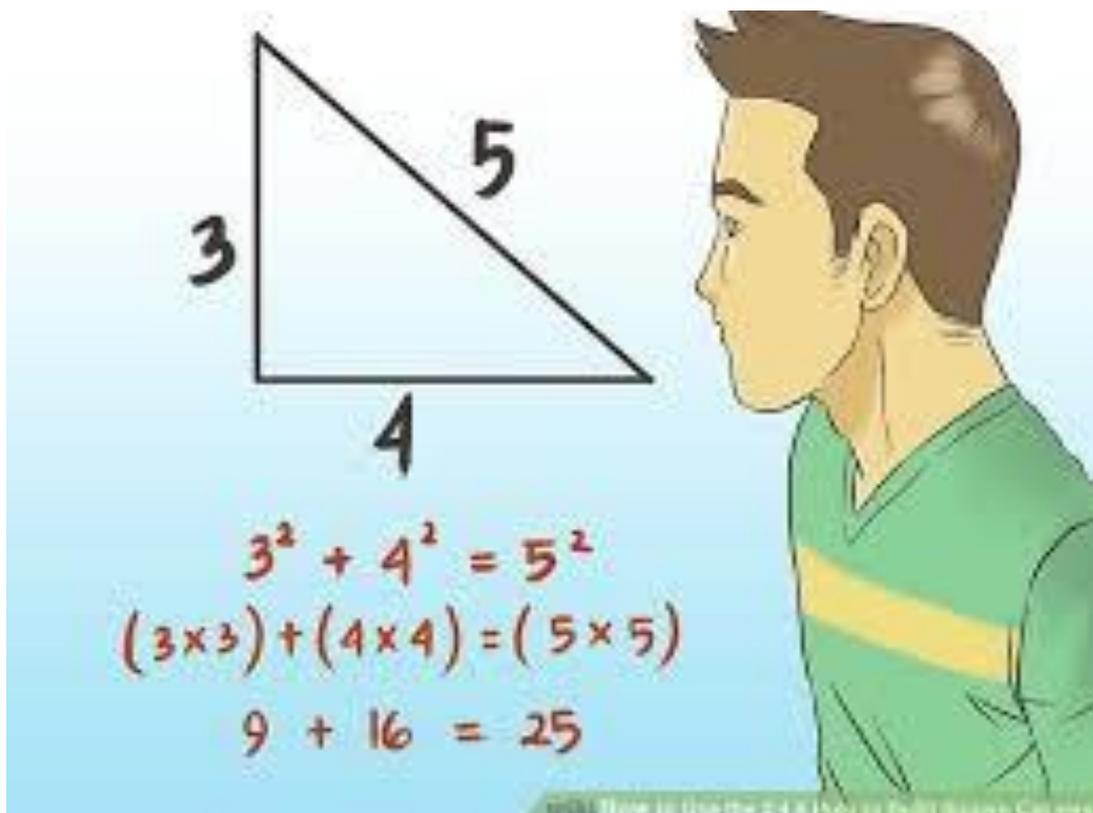
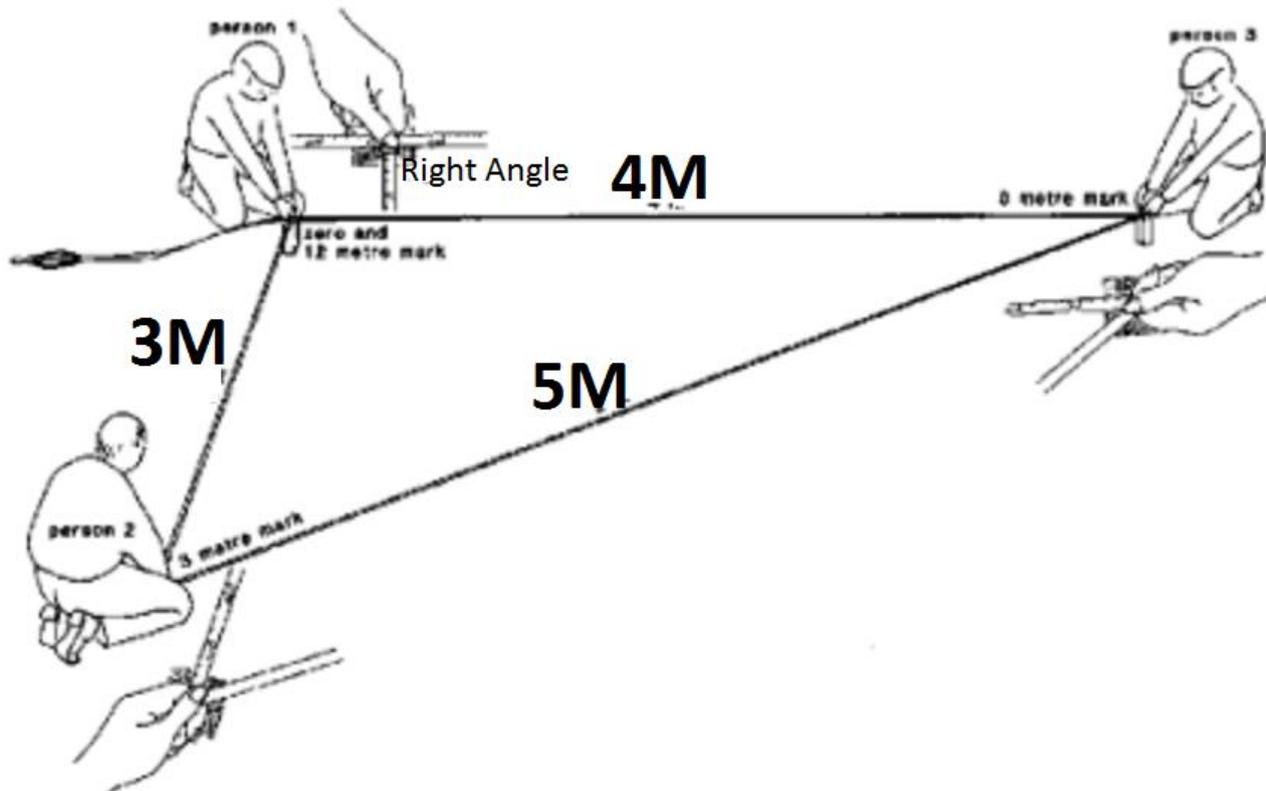
Measuring tools

Watch the video on transferring foundation lines accurately. Identify the following tools in the video.

Setting out tools

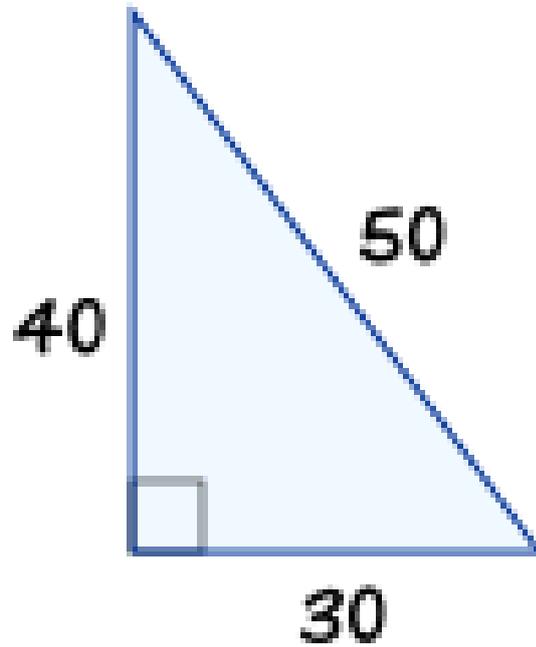
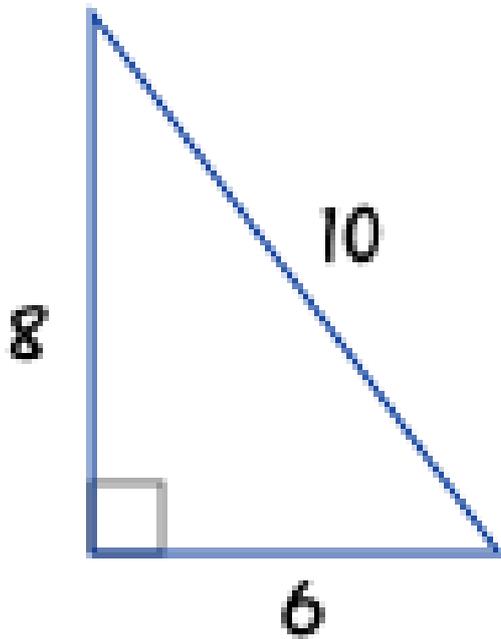
<p>Steel Tape</p> 	<p>Measuring tape</p> 	<p>Steel square</p> 
<p>Steel pegs</p> 	<p>Building line</p> 	<p>Straight edge</p> 
<p>Leveling pipe</p> 	<p>Spirit level</p> 	<p>Chalk line</p> 

1. Look at the following methods of squaring.



Activity 5

2. Choose one and demonstrate it to the group and educator.

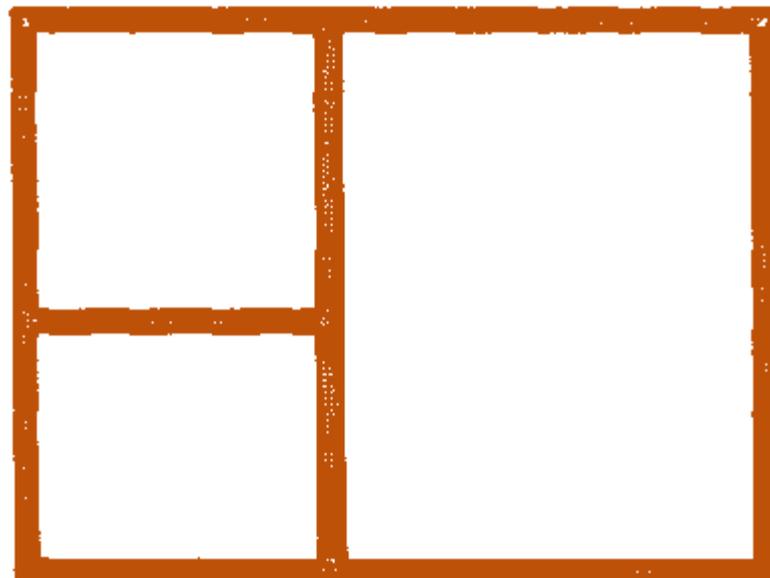


A large empty rectangular box for writing or drawing.

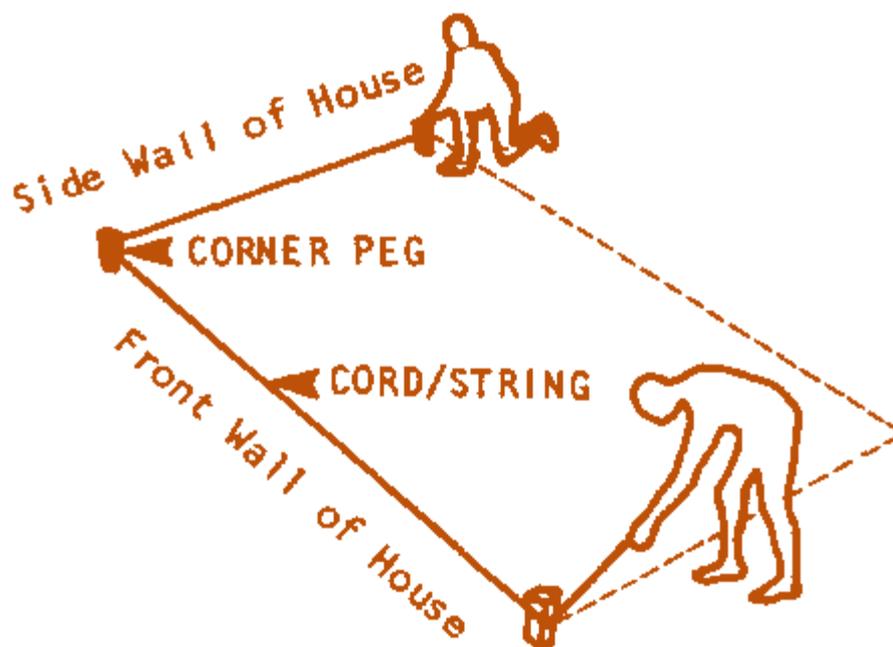
Setting out (laying out)

In order to begin digging the trenches required for a building's foundation, the builder must first transfer the lines and measurements indicated on his or her foundation plan to the building site. That is, the exact length, width, depth, and position of the foundation trenches must be marked on the ground.

This movement from the plan to the actual site is called setting out. It is probably the most critical step in the entire construction process.



FLOOR PLAN



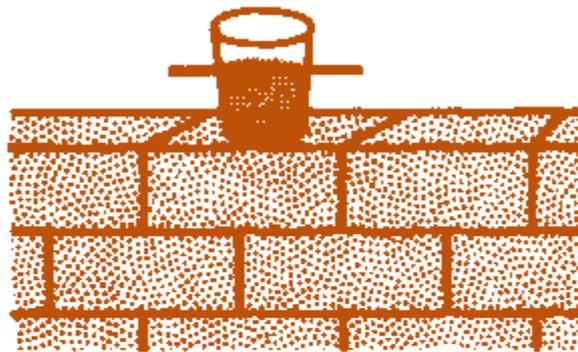
Floor plan

A building that is set out accurately will be:

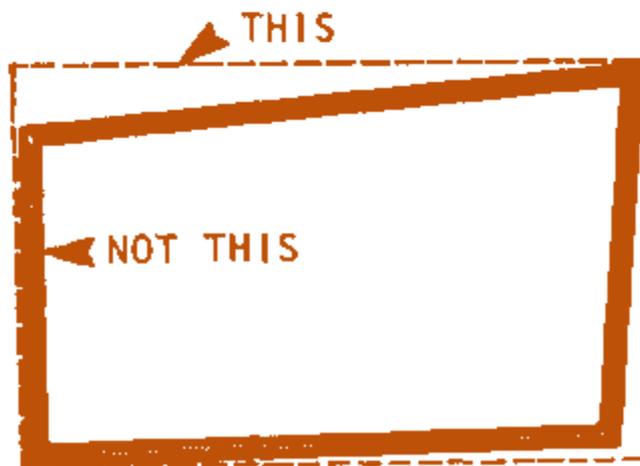
- Level: no part of the floor or foundation higher than another;
- Square: walls parallel and the same length;



NOT THIS

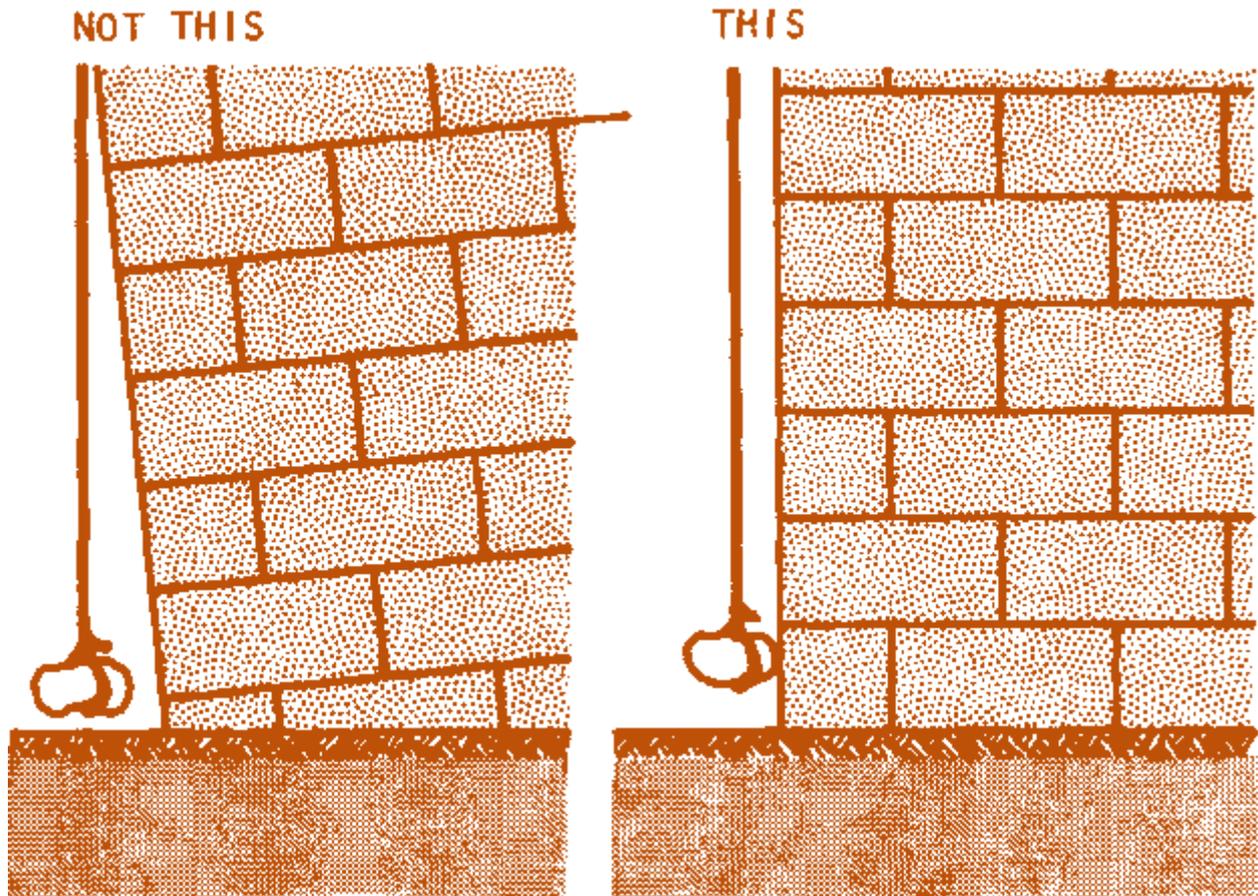


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Level

- Plumb: straight up and down, not leaning to one side or the other



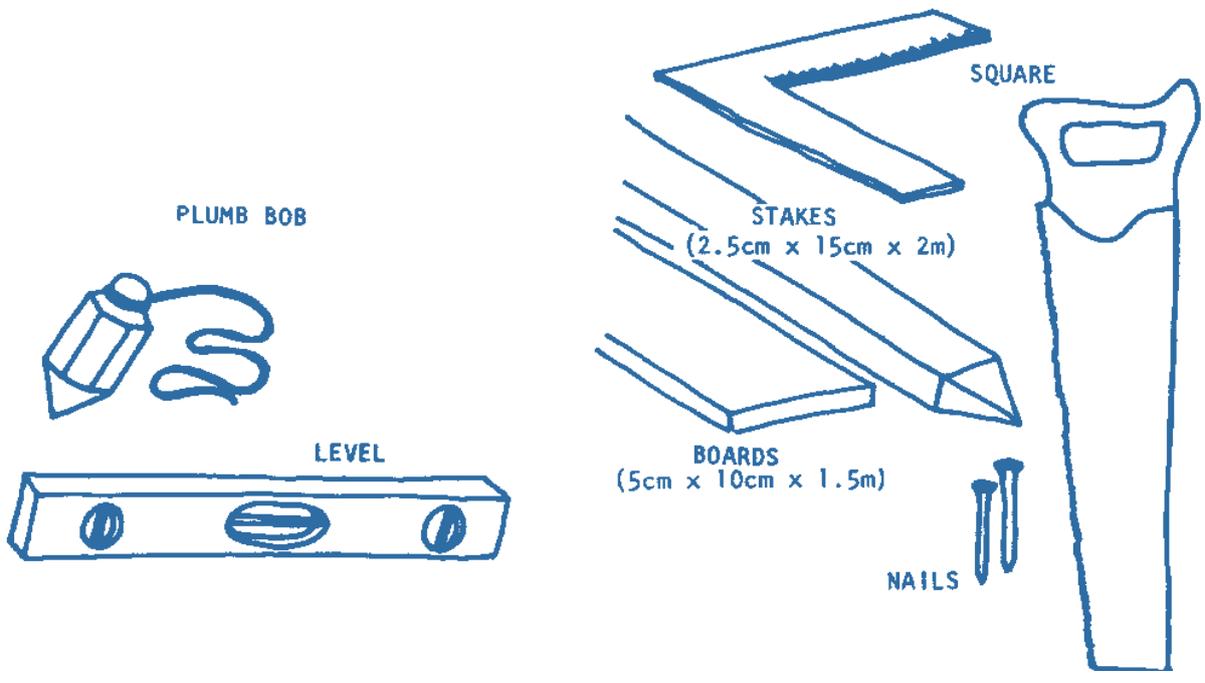
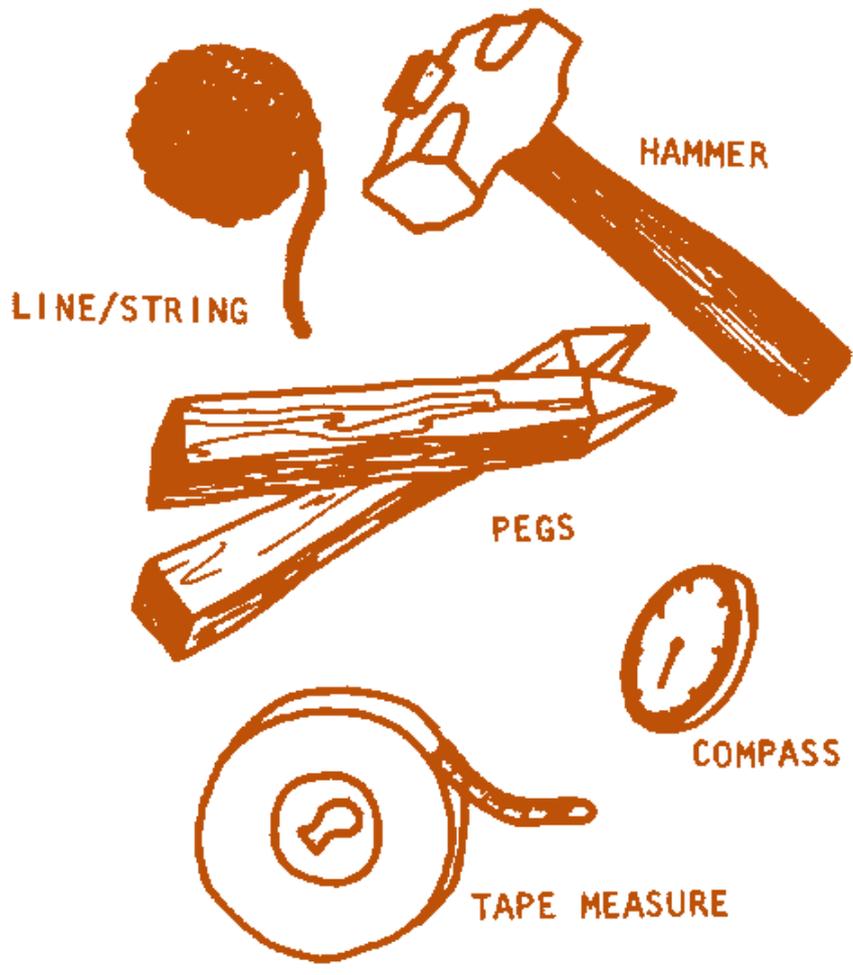
Plumb

A building that is set out carelessly will be difficult or impossible to construct according to plan. As a result, the finished structure may be expensive to maintain and unhealthy. So it is important to take special care when setting out.

There are three major steps to setting out:

- Orientation of the building on the site;
- Marking a simple outline of the building's foundation on the ground;
- Placing "batter boards" around the foundation outline and marking the position of inside walls, doors, and windows on the boards.

The tools shown on this page are needed to set out a building so that it will be level, square, and accurately measured.



Orientation

The orientation of a building is the direction its front walls face: north, east, south, west or something in between.

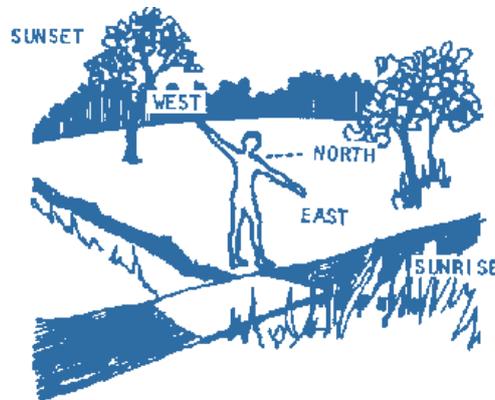
To mark the orientation on the site, first find north. This is easiest with a compass. But if no compass is available, finding north is still fairly simple.

The builder should stand at the building position so that his/her right arm points at the spot where the sun rose in the morning while the left arm points to where the sun set the last night. In this position the builder will be facing north.

Standing in the same position, if the builder moves his/her arms so they form a straight line to the sides, they will be pointing due west (left arm) and east (right arm).

Once the main compass points have been established, use a stick to mark out the shape and position of the building. Add about 2 meters to the dimensions of the building on all sides: the extra space will be needed for supplies and work space during construction.

Next, clear the ground inside this area of trees, shrubs, and loose plant growth. If the topsoil is loose, clear away the top 15cm or so to get down to hard earth: loose soil will not support a building.



Approximate building site

If clearing the land at the position outlined proves too difficult, or if it would require felling trees that are desired for their shade or beauty, consider moving the building a short distance before clearing the land.

Marking the foundation outline

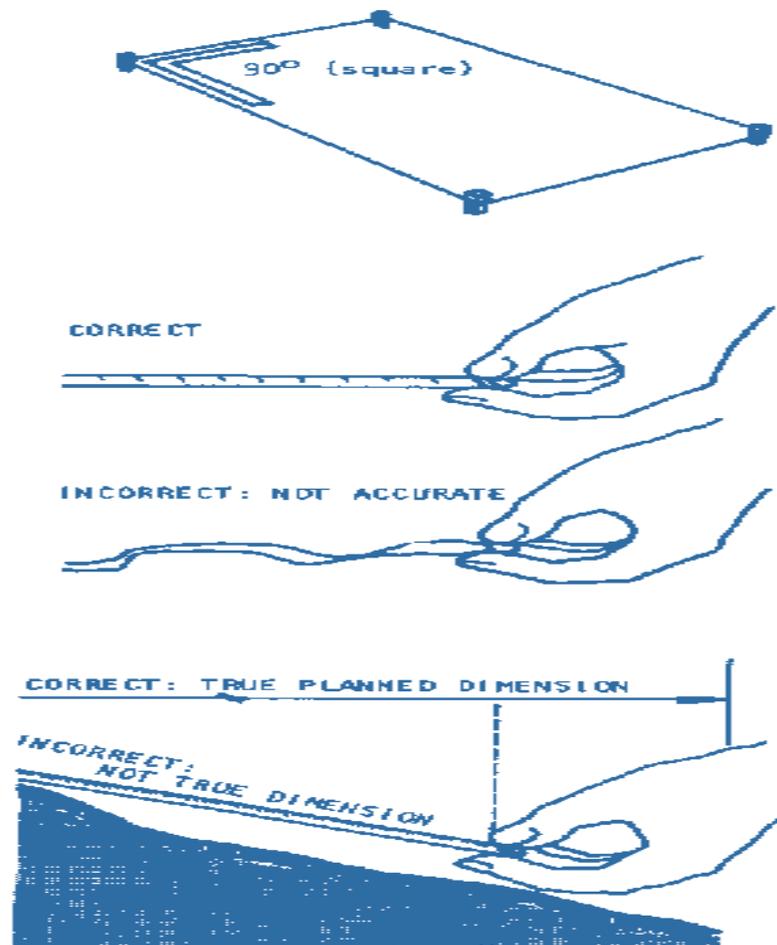
The next step is to mark the outline of the foundation on the site using string and pegs.

Three measures are very important:

- * The length of each wall must be marked exactly;
- * The string must be exactly level;
- * The corners must be square: exactly 90°

The length of each wall is easy to set out on level ground. Simply measure it with a tape measure, making sure to pull the measure tight.

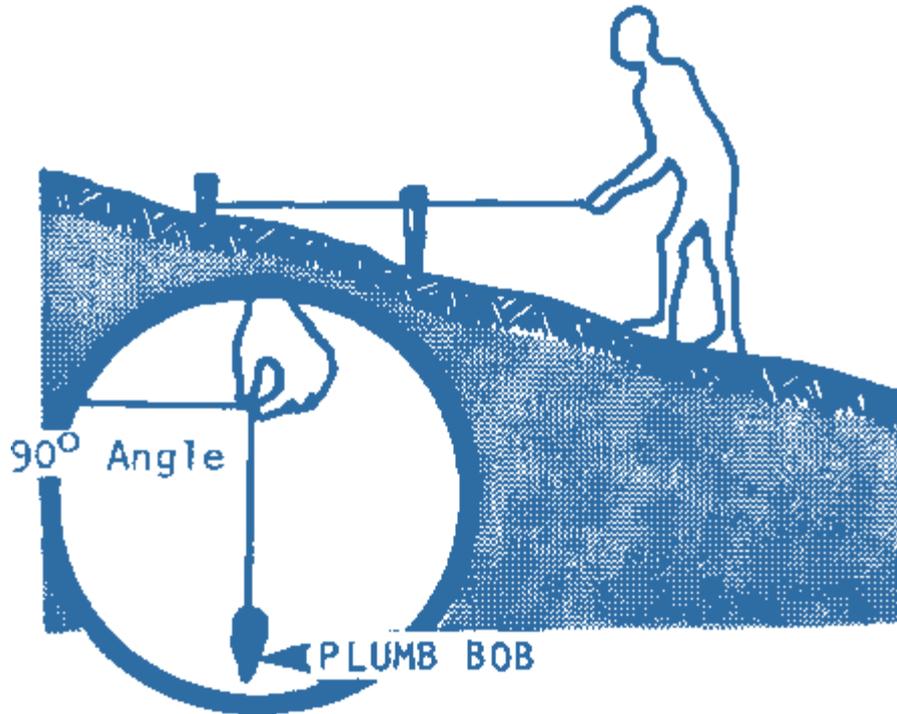
When the site is on uneven ground, care must be taken to measure the length of the wall along a level line: following the slope of the ground will throw off the measurements.



Marking the foundation outline

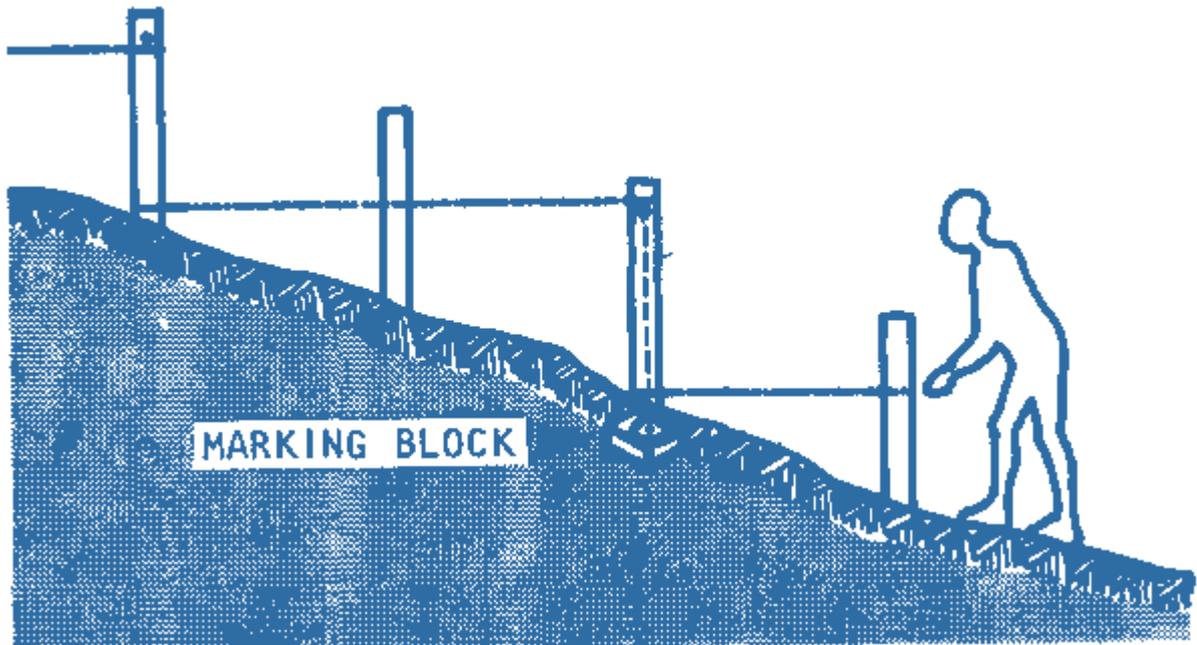
To prevent errors, begin at the highest end of the first wall's length and attach the string to a peg planted at the end-point. Set a new peg every 2 meters to prevent the string from sagging, and test to make sure the string is level by using a plumb bob and mason's square as shown: when the plumb bob stops swinging it will be plumb (straight up and down); the string will be exactly level when it is a 90° to the bob string.

Repeat this process until the length of string set out is equal to the planned length of the first wall.



Plumb bob

If the ground is sloped very steeply, it may be easier and more accurate to measure the wall's length in steps or stages. To do this run a new length of string from the bottom of every second peg (that is, every 4 meters). Test with a plumb bob to be sure that every peg is straight up and down. In addition, to be sure there are no gaps or overlaps in the measurement of each new stage, plant a small block with a circle on it right next to every other peg: then in measuring the next stage (or step) along the wall, hold the tape measure to the point in the circle that marks the end of the last stage.

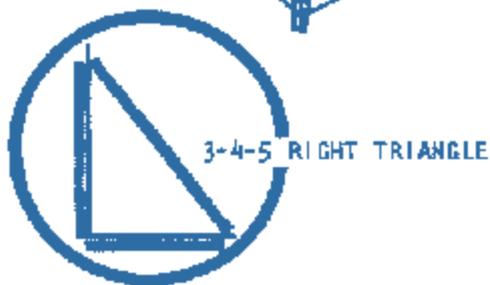


Marking block

Once the first wall has been set out, the second wall should be set out at right angles to it (90°). There are several ways to make sure that this angle, and the angles between all the walls set out are square:

- A mason's square is good for distances up to 3 meters. Use it to get started, but don't use it to check the entire outline.
- One of the easiest and most accurate methods of checking large distances for squareness is to compare the diagonals. Simply measure the diagonal lines from opposite corners of the foundation. When they are exactly equal in length, all the angles will be 90° . On uneven ground, be sure to use the tape measure along a level line'
- If measuring the diagonals is inconvenient, or if the building is not a simple rectangle, another method is the 3-4-5 calculation:

If the wall on one side of a right angle is 3 units long and the wall on the other side is 4 units long, a line drawn between their ends will always be 5 units long. Here's how to use this rule to test whether the angle between two walls is square: Along the string set out for one wall, measure and mark off 1.5 meters ($3 \times .5\text{m}$). Then, along the string set out for the second wall, measure and mark off 2 meters ($4 \times .5\text{m}$). Next, measure and cut a piece of string 2.5 meters long ($5 \times .5\text{m}$) and hold its ends to the points marked off along each wall. When the 2.5 meter string just touches both marks with no slack left over, the angle between the two wall strings will be exactly square. If the 2.5 meter string is too short or long, adjust either one of the wall strings until it fits exactly.

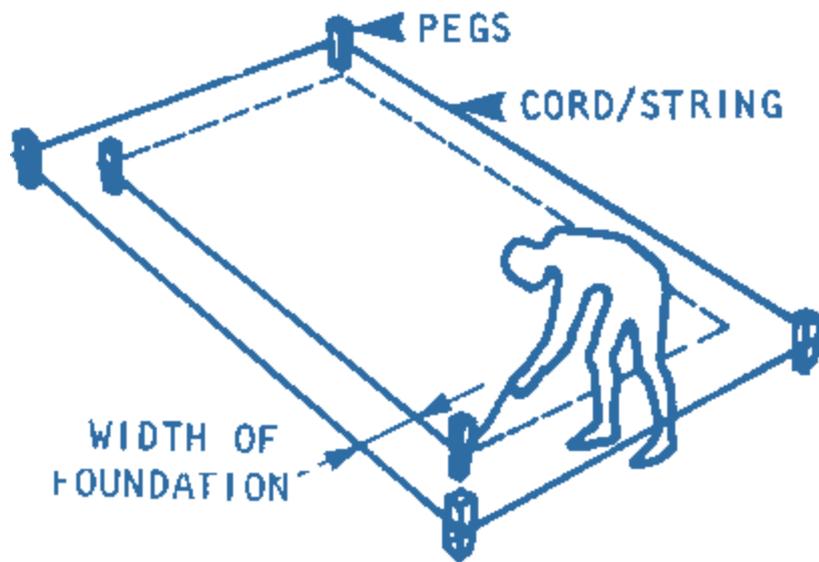


MARKING THE INSIDE FOUNDATION LINES

Once the outside walls of the foundation have been set out with pegs and string, the next step is to set out a second set of lines to mark the inside of the foundation walls. Use the same procedures to keep them level, accurate in length, and square.

The easiest way to begin is to measure the width of the foundation wall and mark it along the strings set out for two opposite walls. Then set out a string between these two points and fasten the ends with pegs. Use a plumb bob to be sure each peg is directly beneath the outside foundation line.

Next, repeat this process for each of the remaining walls. Place a peg at every point where the new lines cross: these are the inside corners of the foundation walls.

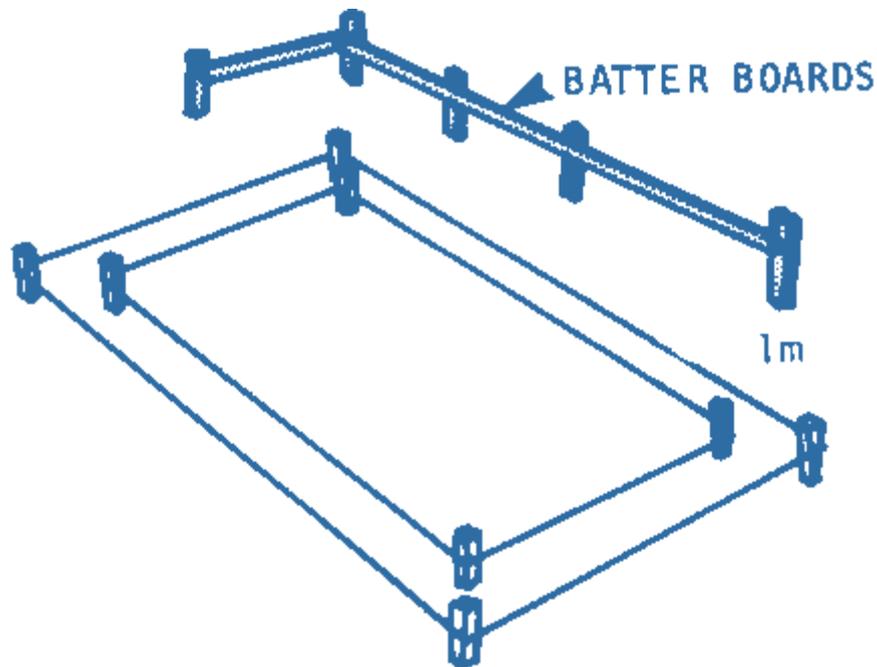


Batter boards

Batter boards are like a single rail fence placed around the building position. They should be placed after the foundation lines have been set out and before any digging for construction begins. Batter boards are essential for two reasons:

- They provide permanent reference points for the position of the foundation walls: these will be needed once the string markings have been removed during construction;
- They can be used to measure and mark off the exact position of doors, windows, and floors, thus making it much easier to build the walls accurately.

To be useful, batter boards must be exactly level and should be set about 1 meter back from the string marking the outside foundation line.



Batter boards

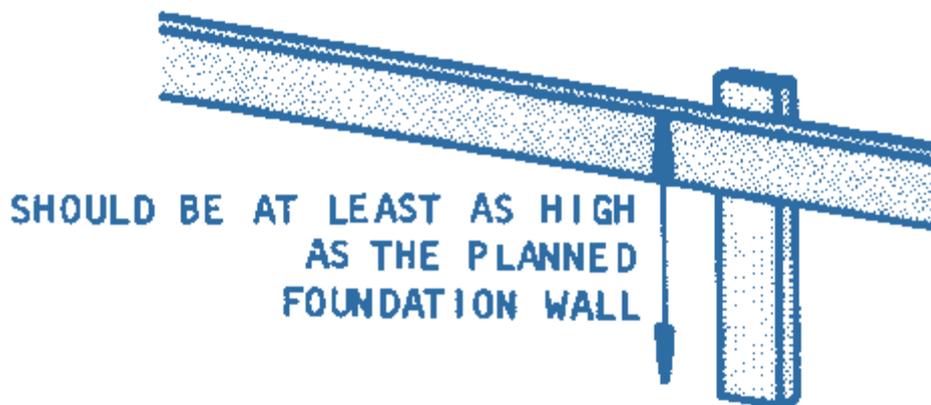
ENRICHMENT

PLACING BATTER BOARDS

To place batter boards around the building position, first find the highest point on the site about 1 meter outside the outer foundation line and place a wooden stake firmly in the ground.

Nail the first board to this stake so that the top of the board is at least as high as the top of the foundation walls will be. Since the foundation walls must be as high as the floor, this will be at least 20-30cm. Above the ground.

Next, place a second stake 2 meters from the first and 1 meter outside the outer foundation line. When this stake is secure, nail the other end of the first batter board to it, taking care that the batter board is level. Nail a second board to this same stake and repeat the process of placing new stakes, levelling, and nailing the boards, until the batter boards form a fence that goes completely around the building position.



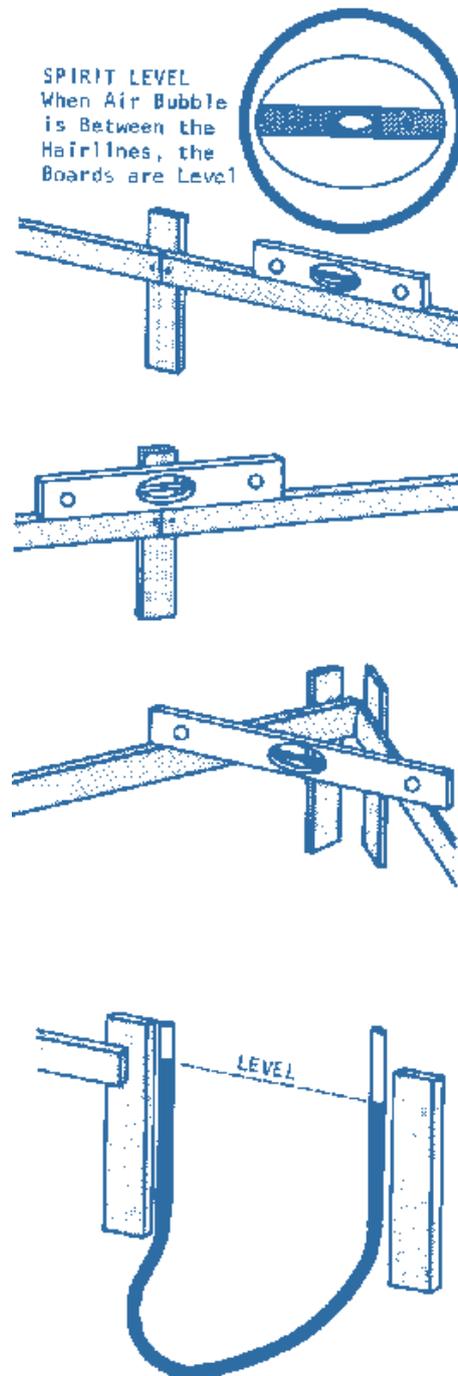
HOW TO LEVEL BATTER BOARDS

A commercially made “spirit level” is the easiest levelling device to use. Place it on the surface – in this case the top edge of the batter board – and keep adjusting the height of the board at the opposite end until the bubble is in the centre.

When joining boards at stakes, place the level over the seam of the board to maintain a continuous level line.

An additional check on level can be made at the corners: use an extra board to provide a surface for the level.

Another method is to use a water level: this is a clear plastic hose that is filled with water. Adjust the first end of the hose to a known level mark. When the other end of the hose is placed at the next stake, the water inside will be at the same level as at the first end. To prevent spillage the ends may be plugged until the hose is in position, but all plugs must be removed to get an accurate measurement.



TRANSFERRING MARKS TO BATTER BOARDS

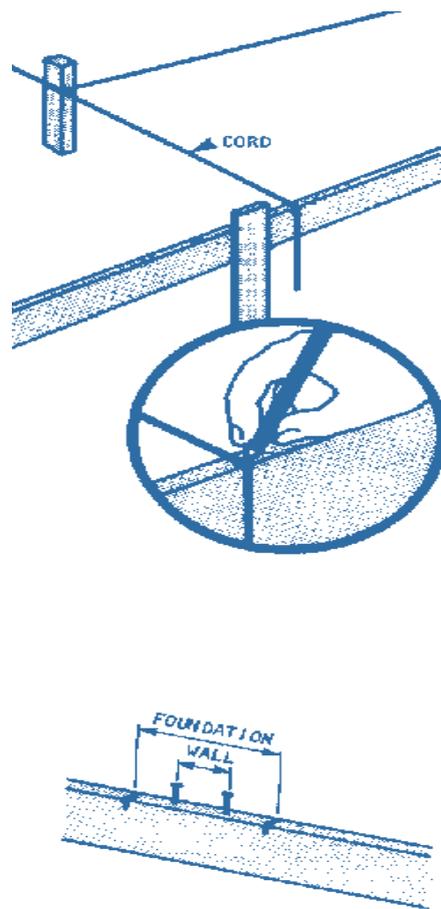
Once the batter boards are complete, all the measurements shown on the written foundation plans should be marked on the boards.

First, transfer the foundation lines marked by the strings set out earlier: run a string from one board to the opposite board directly over each foundation line. Use a plumb bob to make sure this new string is over the corner pegs.

Next, place nails or saw cuts in the tops of the boards where they intersect the strings.

A good system is to use different marks for the foundation lines than those to be used for other important measures such as wall lines and the positions of doors and windows. For example, use small notches cut with a saw to indicate the foundation lines. Then use nails to indicate the wall lines.

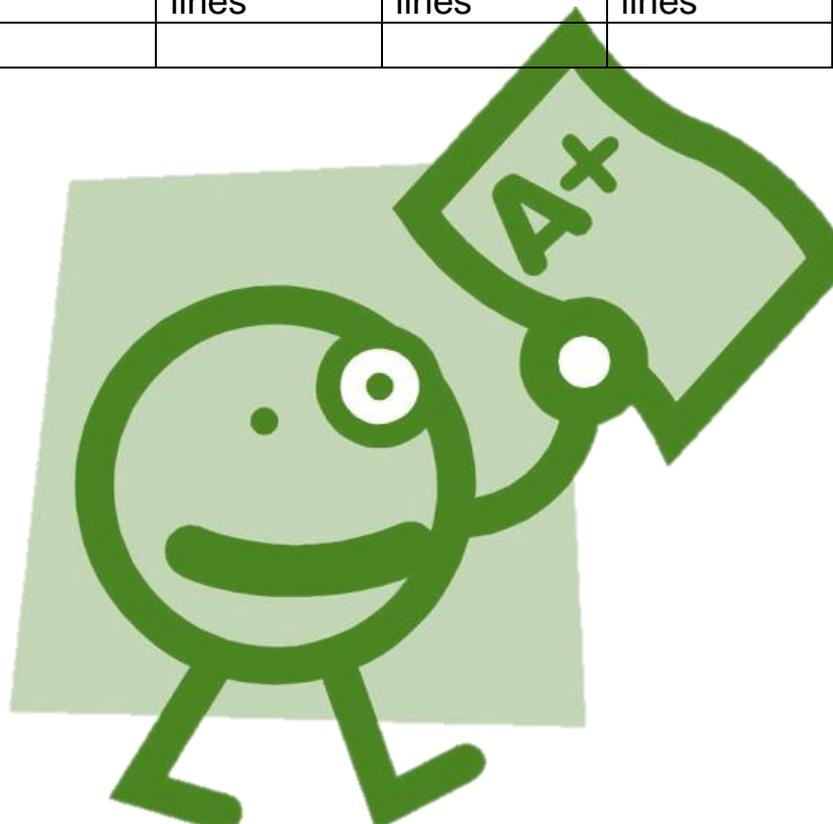
Once the foundation lines and wall lines have been marked on the batter boards, the builder is ready to start digging the foundation trenches. Note: the digging will be easier if the strings are left in place until the trenches have been well started.



Demonstration

Practice the transfer of foundation lines.

Criteria	5	4	3	2	1
PPE safety wear is worn	All safety wear is worn	4 of the required PPE is worn	3 of the required PPE is worn	2 of the required PPE is worn	1 of the required PPE is worn
Tools and equipment	All the tools and equipment is selected and collected.	Most the of tools and equipment is selected and collected	Less than 4 of the tools and equipment is selected and collected	Less than 3 of the tools and equipment is selected and collected	Less than 2 of the tools and equipment is selected and collected
Firm and level ground	Selection of ground is done very well	Selection of ground is done well	Selection of ground is done fairly well	Selection of ground is done with support	Selection of ground is not done appropriately.
All steps is followed in transferring foundation lines	All steps is followed in transferring foundation lines	Most steps is followed in transferring foundation lines	Less than 4 steps is followed in transferring foundation lines	Less than 3 steps is followed in transferring foundation lines	Less than 2 steps is followed in transferring foundation lines
Total 20					



Mixing of concrete and laying a slab



In Term one you we taught the ratios of mixing cement. Let us revise Mixing cement.

Step 1: Spread a Plastic Sheet on the Ground



A large sheet of polythene keeps the ground clean, prevents contamination of the concrete by leaves, mud and other debris and you can scrape up all the



Leftovers | Source

Cement is available in 25kg bags.

Step 2: Measure out the Materials



It's a good idea to use 3 buckets: One for cement, water and stone/sand | Source

Step 3: Place the Stone and Sand on the Sheet



Measure out the stone first and tip the sand on top. Keep the pile to one side of centre so you can mix sideways | Source

Step 4: Place the Cement on Top of the Sand and Stone



Measure out the cement on top



Crumble up any lumps of cement



Step 5: Shovel to One Side from the Edge of the Pile and Repeat Three Times



Shovel the pile to one side, taking the material from the bottom edge. Do this 4 times in total

Step 6: Make a Deep Crater and Add Water



Make a crater in the pile and add water | Source

Step 7: Fold the Mix in From the Sides



Shovel the mixture from the edges into the centre of the crater | Source

Step 8: Continue to Fold Inwards and “Chop” the Pile to Distribute Water through the Mix



“Chop” the pile with the edge of the shovel to help distribute the water. Continue to add water | Source



Continue to add water as needed and walk around the perimeter of the pile, folding the mixture towards the centre and “chopping” | Source



Eventually the mix should look like this

Activity 6

1. Practice the mixing of cement and laying a slab.

Criteria	5	4	3	2	1
PPE					
Tools and equipment					
Step 1-4					
Step 4-8					

Comments: _____



CURING OF CONCRETE

During *curing* or hardening of concrete, a process called *hydration* occurs where water chemically bonds to cement. So some of the water you added actually never dries out. It is locked to the cement in a bond forever!

Important!!

Don't allow concrete to dry out in hot weather or if there are strong drying winds. It needs to cure slowly, so ideally cover with plastic to prevent moisture loss

Protecting Concrete in Cold Weather (or Dry Weather)

The best time to make concrete is when the weather is mild. Freezing weather conditions can weaken concrete and hot dry weather can cause water to evaporate too quickly so that there is insufficient water for it to cure properly, resulting in cracking.

Until concrete cures, it should be protected from the weather and never allowed to freeze for the first 24 hours. Minimum curing temperature should be 40 F (4C). In freezing weather conditions, water in concrete expands as it freezes. As ice crystals grow, they push the concrete outwards, breaking bonds between cement, stone and sand. Then when they melt, they leave millions of micro-cavities, so the concrete ends up porous like a sponge, potentially weakening it.

You can cover concrete slabs after laying with blankets/polystyrene/bubble wrap or whatever to help prevent it freezing. If frost is due to set in at night, lay your concrete early in the day so that it firms up, before covering with insulating material (otherwise it'll get marked by the covering).

In hot, dry weather, wait for a few hours until the concrete firms up. Then cover it with polythene to prevent moisture loss and cracking.

Slump test

Activity 7

1. Look at the video and then the demonstration by the educator and demonstrate how to take a slump test.

Criteria	Yes	NO
PPE		
Tools and equipment		
Mortar		
Plaster mix		
Concrete mix		

Types of bricks

Activity 8

2. Look at the picture below and listen to the explanation on the different types of bricks and their uses.

Types of Bricks

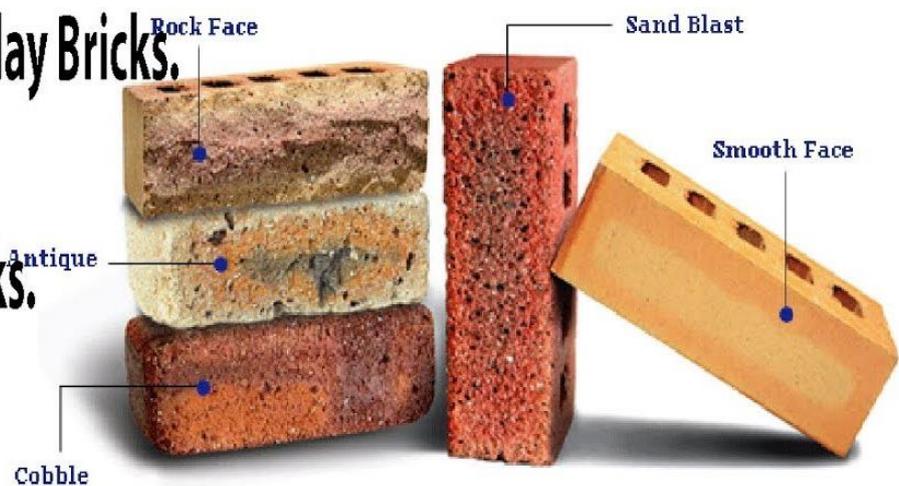
1. Common Burnt Clay Bricks.

2. Sand Lime Bricks

3. Engineering Bricks.

4. Concrete Bricks.

5. Fly ash Clay Bricks.



3. Write next to the type of brick where you will use it.

Types of bricks	Use
Common Burnt Clay Bricks	
Sand lime Bricks	
Engineering Bricks	
Concrete Bricks	
Fly ash Clay Bricks	

HOW TO MAKE BRICKS MANUALLY

Clay bricks have been used for construction for thousands of years – and while some advances have been made, and mechanization has made the process easier and faster, the essential technique for making bricks from clay has remained unchanged. The process requires only a few basic tools and materials, and can be accomplished just about anywhere. This is why clay bricks are still used to build houses and walls all over the world – from handmade clay bricks in the developing world to redbrick blocks common in modern construction.

Take a look at the sizes of bricks and then pay attention to the steps to making brick.

Standard sizes of bricks

- Stock Bricks (220mm×110mm×75mm)
- Building Blocks (140mm×390mm×190mm) Outside wall
- Building

Step 1

Dig up clay soil with a shovel to use as the material to build the bricks. You can identify clay soil because it is sticky and gummy when wet.

Step 2

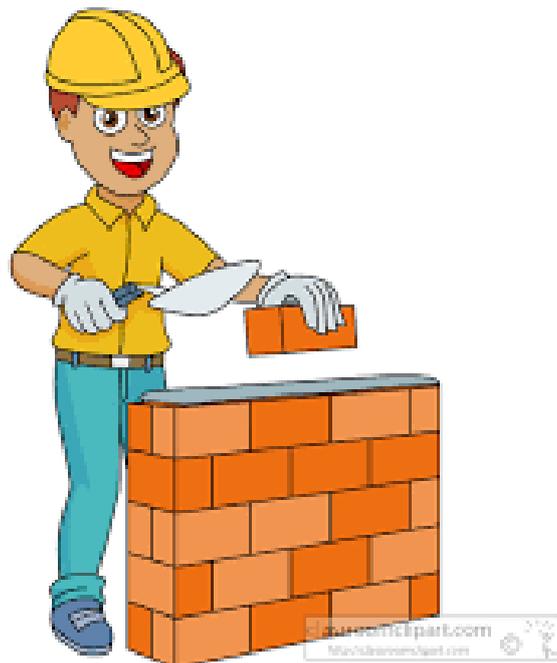
Grind the clay soil into a fine powder or paste using large, flat stones as “grinding stones.” This will assist in the bonding process. Some clay soil is already at the right consistency, but grinding will generally improve the end result of your brick building.

Step 3

Mix the ground clay soil with water to make a thick malleable paste. Traditionally, clay bricks were moulded by hand or with wooden tools. Today, many clay bricks are made in purpose-built moulds. Whichever moulding method you use, aim to produce clay bricks of the same size and shape.

Step 4

Leave the bricks out in the sun to dry, or dry them in an oven to remove the moisture. Traditionally, brick builders lay bricks out in the sun to dry – and this is still a method used in many countries as it does not require fuel or electricity.



Activity 10

Verbally translate the steps on brick making. You must be able to identify and select the tools and equipment.

Name: _____ Date: _____

Criteria	5	4	3	2	1
Safety wear was identify					
Correct tools was selected					
Correct equipment was selected					
Steps was named in correct order					
Step was explained correctly					
Total	/25				



Bonding of walls is to insure the stability of the structure and to produce pleasing appearance.

Purposes of Brick Bonding

- Obtain maximum strength whilst distributing the loads to be carried throughout the wall, column or pier.
- If bonds in brick work are not arranged properly, then a continuous vertical joint will result. This is called an unbounded wall having little strength and stability. (See fig. below)

Unbounded wall & Load Distribution in a Well Bonded Wall

- To ensure lateral stability and resistance to side thrusts.
- To create an acceptable appearance.

Rules for Bonding in Brickwork

For getting good bond, the following rules should be observed.

Rule-1

The bricks should be of uniform size. The length of the brick should be twice its width plus one joint, so that uniform lap is obtained. Good bond is not possible if lap is non-uniform.

Rule-2

The amount of lap should be minimum $\frac{1}{4}$ brick length along the length of the wall and $\frac{1}{2}$ brick length across the thickness of the wall.

Rule-3

Avoid using brick bats unless it is necessary or required in special locations.

Rule-4

In alternate courses, the centre line of header should coincide with the centre line of the stretcher, in the course below or above it.

Rule-5

The vertical joints in the alternate courses should be along the same vertical axis.

Rule-6

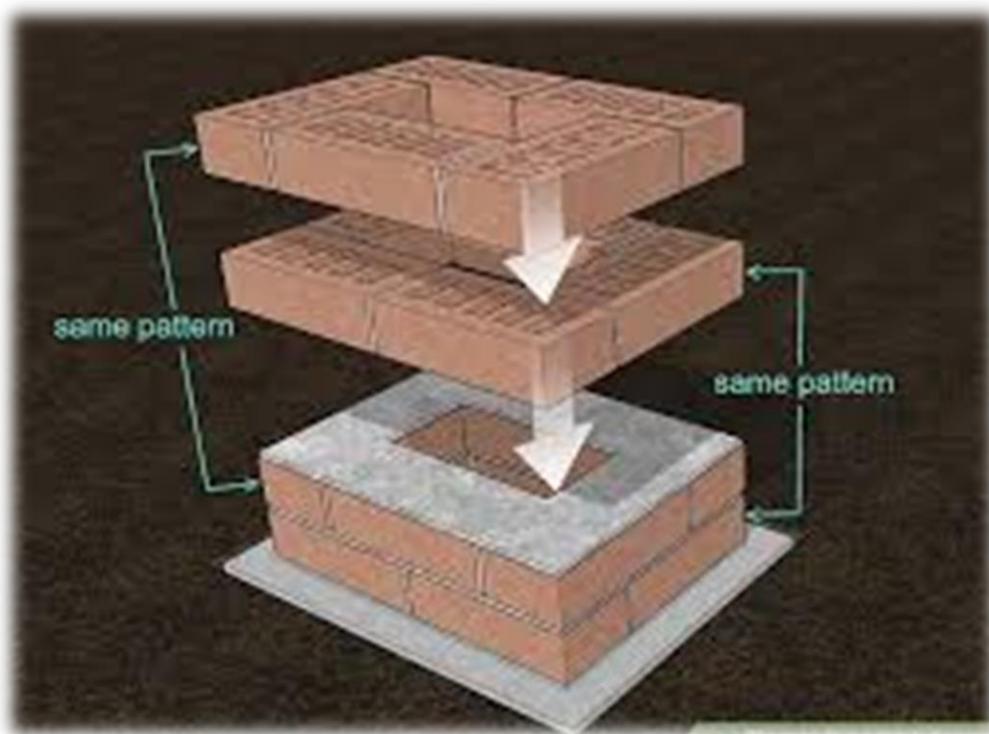
The stretcher should be used only in the facing; they should not be used in the hearing. Hearting should be done in headers only.

Rule-7

It is preferable to provide every sixth course as a header course on both the sides of the wall.

Rule-8

Use of raked and other joints that provide horizontal water tables should be avoided. Concave and weathered joints should be provided.



Tool

Mortar tools

1. Look at the pictures and listen to the explanation for the uses of each tools.

Trowels



Use: To build with

Maintenance: Clean after use and oil lightly to prevent rust

Wheelbarrow



Use: Carry and move building material

Maintenance: Clean after use and oil lightly to prevent rust.

Block Brush



Use: To sprinkle water when plastering and cleaning

Maintenance: Clean after every use.

Measuring and alignment tools

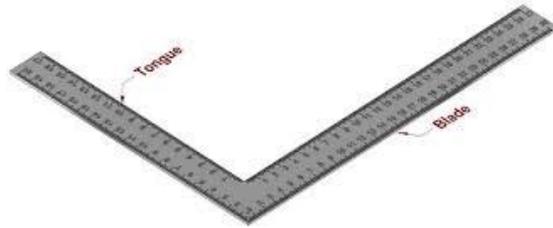
Spirit level



Use: Check that wall is level
(Straight)

Maintenance: Clean after every use. Oil lightly.

Steel square



Use: To see if a corner is 90°

Maintenance: Clean after every use. Oil lightly.

Line and pins



Use: To build in a straight vertical line.

Maintenance: Clean after every use. Oil lightly.

Straight edge



Use: To check over long distance if it is level.

Maintenance: Clean after every use. Oil lightly.

Corner blocks



Use: To set a line on the level

Maintenance: Clean after every use.

Cutting tools

Brick hammer



Use: To break bricks

Maintenance: Clean after every use. Oil lightly.

Club hammer



Use: To hit in nails, pegs or any other objects.

Maintenance: Clean after every use. Oil lightly.

Brick Bolster



Use: To cut a brick

Maintenance: Clean after every use. Oil lightly.

Cold Chisel



Use: For any chipping work

Maintenance: Clean after every use. Oil lightly.

Digging tools

Pick



Use: To dig holes or trenches

Maintenance: Clean after every use. Oil lightly.

Spade/shovel



Use: To dig holes and trenches to mix cement

Maintenance: Clean after every use. Oil lightly.

Plastering tools

Hand hawk



Use: To hold the cement while plastering

Maintenance: Clean after every use. Oil lightly.

Plastering trowel



Use: To plaster and finish off

Maintenance: Clean after every use. Oil lightly.

Block Bluster



Use: To sprinkle water when plastering and cleaning

Maintenance: Clean after every use.

Wooden float



Use: Finishing off plastering and cement slabs.

Maintenance: Clean after every use.

Activity 11

2. Look at the tools and match it with the job to use it for.

Tool	Nr	Job
1. 		To plaster and finish off
2. 		To check if wall is level
3. 		To sprinkle water when plastering and cleaning.
		To cut brick.
		To build in a straight vertical line.

2. Name the tools you will use when doing the following jobs.

Job

Digging trenches for a foundation of a house.

Tools:

Job

The wall is done and now you need to plaster the wall.

Tools:

Job

You are building a wall and some of the bricks are too big you need to cut the bricks.

Tools:

Job

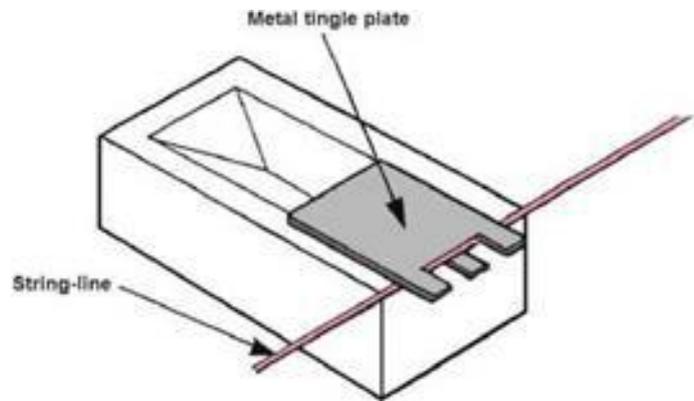
You need mix cement.

Tools:

Enrichment

Making sure a wall is level or straight different tools can be used.

1. Look at the next picture and discuss between group, how you think this is used.
2. Report back to the educator and the educator will make any correction.



We think

Real use

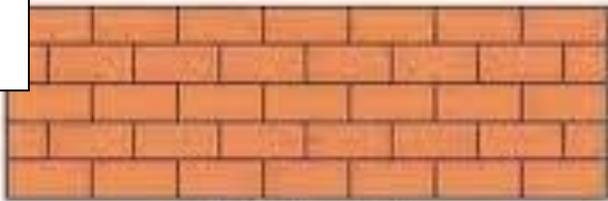
Building of different types of walls

Activity 12

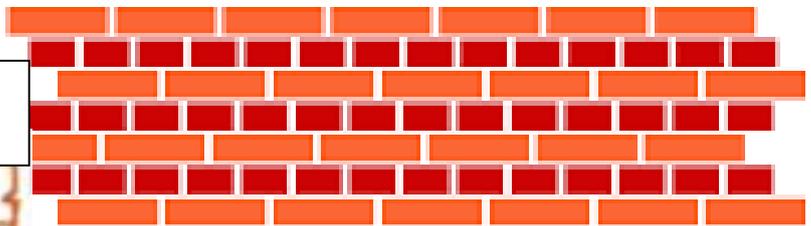
Look at the pictures and try and identify the type of walls by using the words in the block below.

Return Angle	T-Junction	Basic brick piers or columns	Stretcher bond	English bond
---------------------	-------------------	-------------------------------------	-----------------------	---------------------

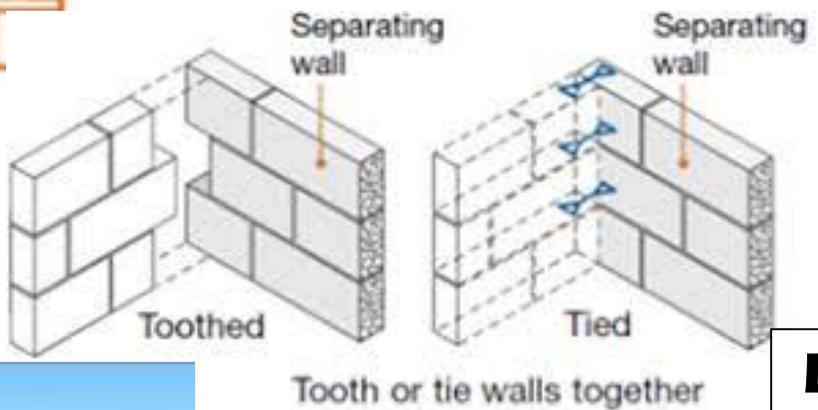
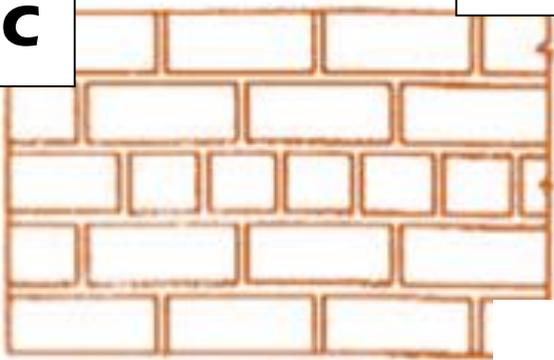
A



B

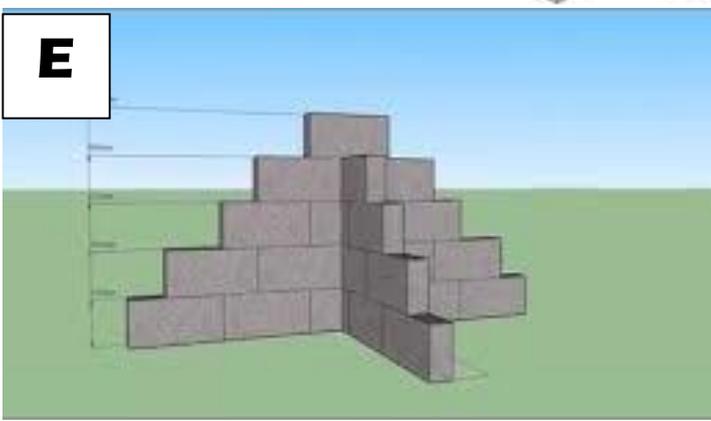


C



D

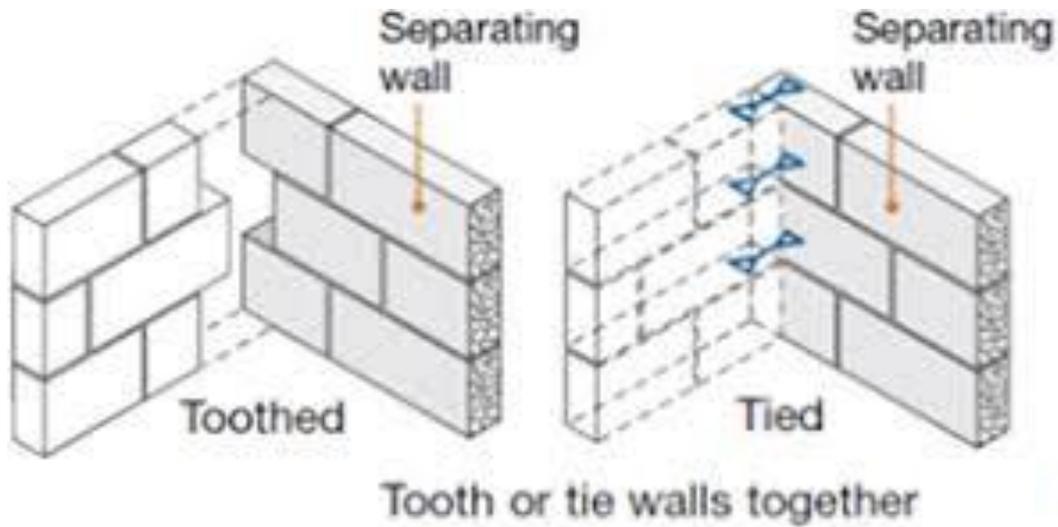
E



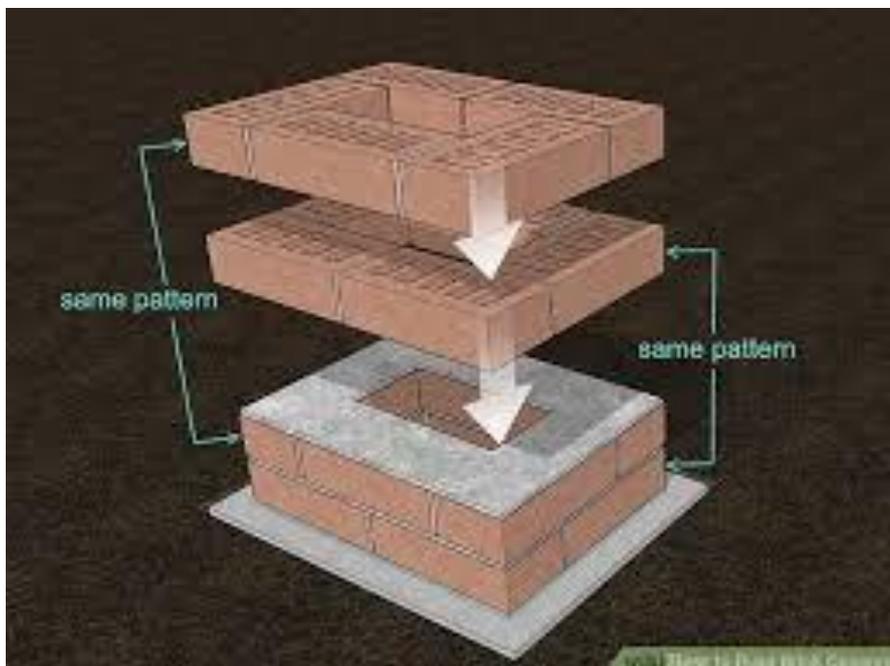
Activity 13

Take a look at the following and pay attention to the educators' demonstration of each bonding technique

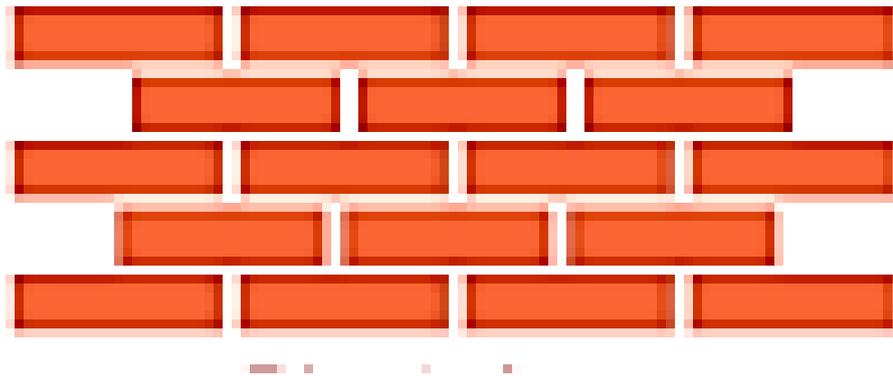
Return angle



Basic brick and column

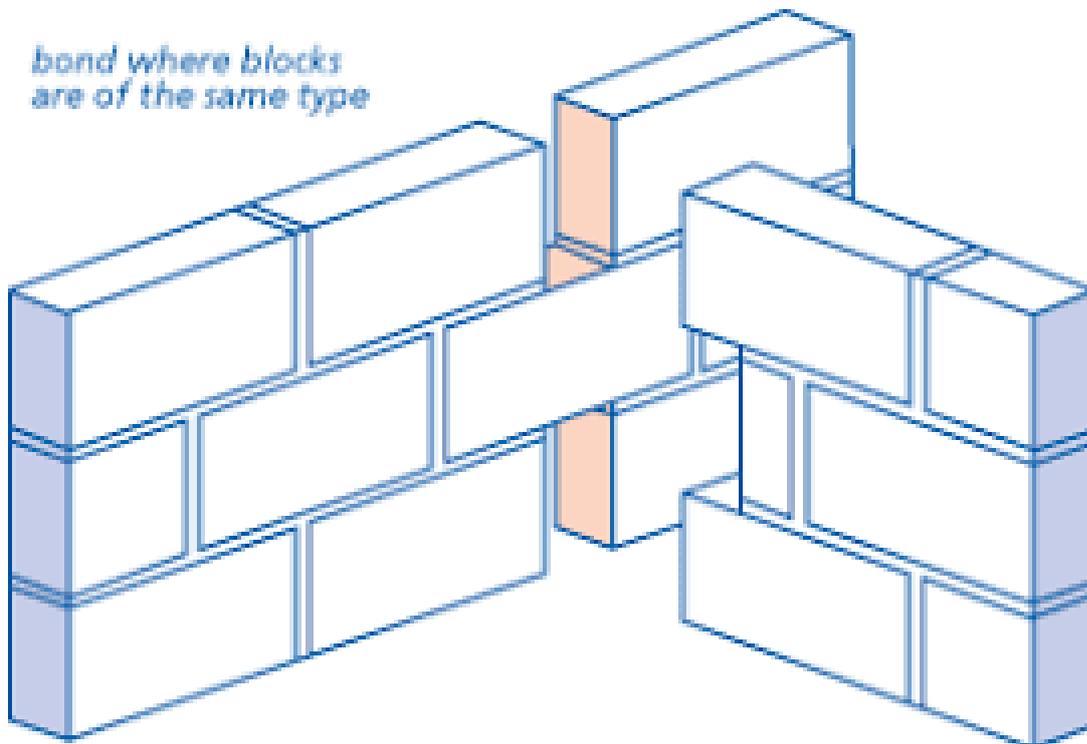


Stretcher bond

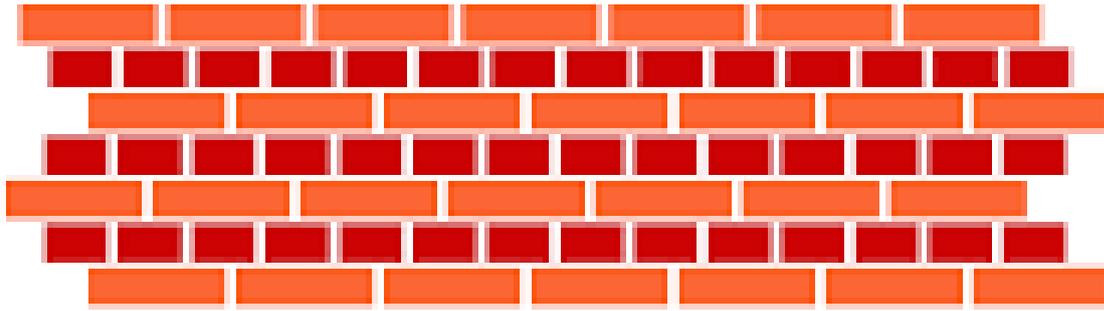


T-Junction

bond where blocks are of the same type



English bond



Activity 14

1. Which one of the bondings above do most construction site use for building houses?

2. Which bonding type is suitable for building columns or pillars? And why?

3. What is the difference between a smooth and toothed edge?



Activity 15

Practice the building of the different types of bonding

Rubric

Criteria	5	4	3	2	1
PPE safety wear is worn	All safety wear is worn	4 of the required PPE is worn	3 of the required PPE is worn	2 of the required PPE is worn	1 of the required PPE is worn
Tools and equipment	All the tools and equipment is selected and collected.	Most the of tools and equipment is selected and collected	Less than 4 of the tools and equipment is selected and collected	Less than 3 of the tools and equipment is selected and collected	Less than 2 of the tools and equipment is selected and collected
English bond	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Return angle	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
T-Junction	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Basic brick	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Total 30					

ASSESSMENT

TERM 2

Demonstration

Assessment 1

Demonstrate the making of bricks by following the 4 steps.

Rubric

Name: _____ Date: _____

Criteria	5	4	3	2	1
PPE safety wear is worn	All safety wear is worn	4 of the required PPE is worn	3 of the required PPE is worn	2 of the required PPE is worn	1 of the required PPE is worn
Tools and equipment	All the tools and equipment is selected and collected.	Most the of tools and equipment is selected and collected	Less than 4 of the tools and equipment is selected and collected	Less than 3 of the tools and equipment is selected and collected	Less than 2 of the tools and equipment is selected and collected
Selection of soil and grinding	Correct soil was chosen and grinding proses was done perfectly	Correct soil was chosen and grinding proses was done correct	Correct soil was chosen and grinding proses was done fairly well	Correct soil was chosen and grinding proses was not done to standard	Incorrect soil was chosen and grinding proses was not done correctly
Mixing and molding	Mixture was done perfectly and molding by hand done perfectly	Mixture was done correctly and molding by hand done correctly	Mixture and molding by hand done fairly well	Mixture and molding of brick was done not to standard	Mixture and molding was not done correctly
Drying and results	Bricks are laid in sun correctly and results are perfect	Bricks are laid in sun correctly and results are acceptable	Bricks are laid in sun correctly and results are fairly acceptable	Bricks are laid in sun correctly and results are not up to standard	Bricks are not laid in sun and bricks are un-usable
Total 25					

Practical

Assessment 2

- Learners must be able to build the different types of bonding

Rubric

Criteria	5	4	3	2	1
PPE safety wear is worn	All safety wear is worn	4 of the required PPE is worn	3 of the required PPE is worn	2 of the required PPE is worn	1 of the required PPE is worn
Tools and equipment	All the tools and equipment is selected and collected.	Most the of tools and equipment is selected and collected	Less than 4 of the tools and equipment is selected and collected	Less than 3 of the tools and equipment is selected and collected	Less than 2 of the tools and equipment is selected and collected
English bond	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Return angle	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
T-Junction	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Basic brick	Correct method. Perfect	Correct method. Very Good	Correct method. Fairly good	Correct method. Not to standard	Incorrect method. Not complete
Total 30					