BA SANGAM COLLEGE

YEAR 13

APPLIED TECHNOLOGY

WORKSHEET 5

Previous Knowledge
Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

Learning Outcomes

OUTCOME

After completing this strand students will be able to:

Classify and disseminate with applied engineering skills.

Carpentry and joinery.

Safe Working Practice

Health and safety is a vital part of all construction work. All work should be completed in a way that is safe not only for the individual worker, but also for the other workers on the site, people nearby and the users of the building. Health and safety is not optional in your career, but an essential part of working in the industry.

Accident, first aid and emergency procedures and reporting

. Reporting accidents all accidents need to be reported and recorded in the accident book and the injured person must report to a trained first aider.

Health and hygiene

One of the easiest ways to stay healthy is to wash your hands on a regular basis to prevent hazardous substances from entering your body. You should always clean any cuts you may get to prevent infection. Welfare facilities should be provided for employees. These include toilets, washing facilities, drinking water, and storage and lunch areas. Health effects of noise Damage to hearing can be caused by one of two things:

● Intensity you can be hurt–in an instant from an explosive or very loud noise which can burst your ear drum.

● Durationnoise– doesn‘t have to be deafening to harm e.g. a 12-hour shift.

Safe handling of materials and equipment

Manual handling is the lifting and moving of a piece of equipment or material from one place to another without using machinery. This is one of the most common causes of injury at work and can cause injuries such as muscle strain, pulled ligaments and hernias. Spinal injury is the most common injury and is very serious because, very often, there is little doctors can do to correct it.

Adhesives

All adhesives should be stored and used in line the manufactures instructions. They are usually stored on shelves, with labels facing outwards, in a safe, secure area (preferably a lockable store room). It is important to keep the labels facing outwards so that the correct adhesive can be selected.

Paint and decorating equipment

Type	Storage issues
Oil-based and Water-based paint	Store at a constant temperature in date order (new stock at the back) on clearly marked shelves with the labels turned to the front. Regularly invert to prevent settlement or separation of ingredients, and keep tightly sealed to prevent skinning. Water-based paint should be protected from frost to prevent freezing.
Powdered materials	Heavy bags should be stored at ground level. Smaller items should be stored on shelves with loose materials in sealed containers. Protect from frost, moisture and high humidity.

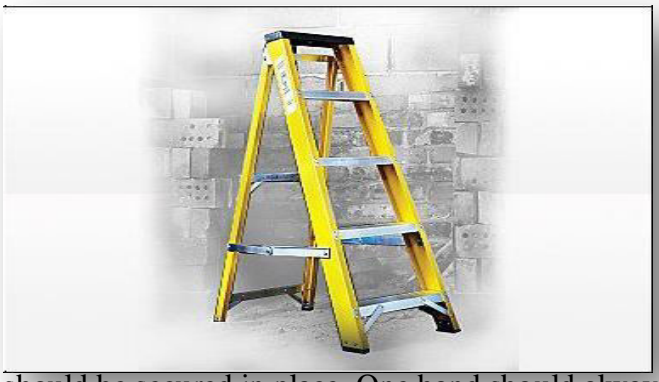
Basic working platforms

With any task involving working at height, the main danger is falling. There are certain tasks where edge protection or scaffolding simply cannot be used. In these instances some form of fall protection must be used.

Type of fall protection	Description
Harnesses and lanyards	A harness is attached to the worker and a lanyard to a secure beam/eyebolt. If the worker slips, they will fall only the length of the lanyard
Safety netting	Used on the top floor where there is no point for a lanyard. Nets are attached to the joists to catch any falling workers.

Air bags	Made from interlinked modular air mattresses that expand together to form a soft fall surface. Ideal for short-fall jobs

Stepladders and ladders



Ladders should only be set up on ground that is firm and level. All components should be checked fully before use.

Using ladders

Ladders are not designed for work of a long duration and should be secured in place. One hand should always be free to hold the ladder and you should not have to stretch while using it. You should also observe the following points when erecting a ladder:

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Never rest on plastic guttering as it may break causing the ladder to slip.

- If the base of the ladder exposed, ensure it is guarded so it is not knocked.
- Secure the ladder at top and bottom. The bottom can secured by a second person, but they must Not leave while the ladder is in use.
- The angle of the ladder should be a ratio of 1:4 (or 75°)

Scaffolding

Tubular scaffold is the most commonly used type of scaffolding within the construction industry. There are two types of tubular scaffold:

● Independent–free-standing scaffold and does not rely on the building to support it.

● Dependent–attached scaffold to the building via poles (putlogs) into holes left in the brickwork. The poles stay in position until work is complete and give the scaffold extra support.

Mobile tower scaffolds

Mobile tower scaffolds can be moved without being dismantled. They have lockable wheels and are used extensively by many different trades. They are made from either traditional steel tubes and fittings or aluminum, which is lightweight and easy to move. The aluminum type of tower is normally specially designed and is referred to as a _proprietary tower‘. A low tower scaffold is designed for use by one person at 2.5m height. Tower scaffolds must have a firm and level base. The stability of the tower depends on the height in relation to the size of the base:

- For use inside a building, the height should be no more than three and a half times the smallest base length.

Working with electricity

Live - brown
neutral - blue
Earth - yellow and green. 230 V has been deemed as unsafe on construction sites, so 110 V must be used. This is identified by a yellow cable and different style plug. A transformer converts the 230 V to 110 V. In domestic situations a portable transformer should be used

Dealing with electric shocks

Always disconnect the power supply. If the victim is in contact with something portable machine (e.g. a drill), move it away using a non-conductive object such as a wooden broom. Do not attempt to touch the person until he or she is Clear of the supply. Be especially careful in wet areas. People hung up in a live current to make a sound. Their muscles may also contract, preventing them from moving. Use a wooden object to swiftly and strongly knock the person free.

ACTIVITY

1. Label th following parts of the scaffolding

(ii) State Ohms Law in relation to electricity.

_____
_____
_____

(iii) Explain the purpose of the earth wire in an electrical circuit.

_____
_____
_____
_____

(iv) For most electrical machines used at home, there are three wires which are connected to the power outlet. Name and explain the function of each of the three wires with the aid of a sketch.

_____
_____
_____
_____
_____

LESSON PLAN

Subject: Applied Technology		**Year/Level:** 13
Week: 5	**Lesson 2**	**Date:**
Topic: APPLIED ENGINEERING		

Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

Learning Outcomes

Using appropriate personal protective equipment (PPE)

Personal protective equipment (PPE) forms a defense against accidents or injury. PPE should be used with all the other methods of staying safe in the workplace. It must be regularly maintained; otherwise its effectiveness may be compromised. This means that PPE needs to be cleaned and examined on a regular basis and, where necessary, replaced or repaired.

Fire and emergency procedures

Fires can start almost anywhere and at any time, but a fire needs all the ingredients of the triangle to burn.
Remove one side of the extinguished. Fire moves by consuming all these ingredients and burns fuel as it moves. Fires can be classified according to the type of material that is involved:

- Class–wood, paper, A textiles, etc.
- Class–€flammable B liquids, petrol, oil, etc.
- Class–€flammable C gases, liquefied petroleum gas (LPG), propane, etc.
- Class–metal, D metal powder, etc.
- Class–electrical E equipment. There are several different types of fire extinguisher and it is important that you learn which type should be used on each class of fires.

Fire extinguisher	Color band	Main use	Detail
water	Red	Class A fire	Never use for an electrical or burning fat/oil re. Water will conduct electricity and res.
foam	cream	Class A fire	Can also be used on Class B res if no liquid is ¤ owing and on Class C res if gas is in liquid form.
Carbon dioxide(co2)	black	Class E fire	Can also be used on Class A, B and C res.
Powder	blue	All classes	Commonly used on electrical and

			liquid res. Powder puts out the fire by smothering the flames.

What to do in the event of a fire

During your induction you will be made aware of points. These should be clearly indicated by signs, and a map of their location displayed in the building. On hearing the alarm make your way calmly to the nearest muster point. This is so that everyone can be accounted for and prevents someone searching for you.

CONSTRUCTION EQUIPMENTS.

The selection of the appropriate type and size of construction equipment often affects the required amount of time and effort and thus the job-site productivity of a project. It is therefore important for site managers and construction planners to be familiar with the characteristics of the major types of equipment most commonly used in construction

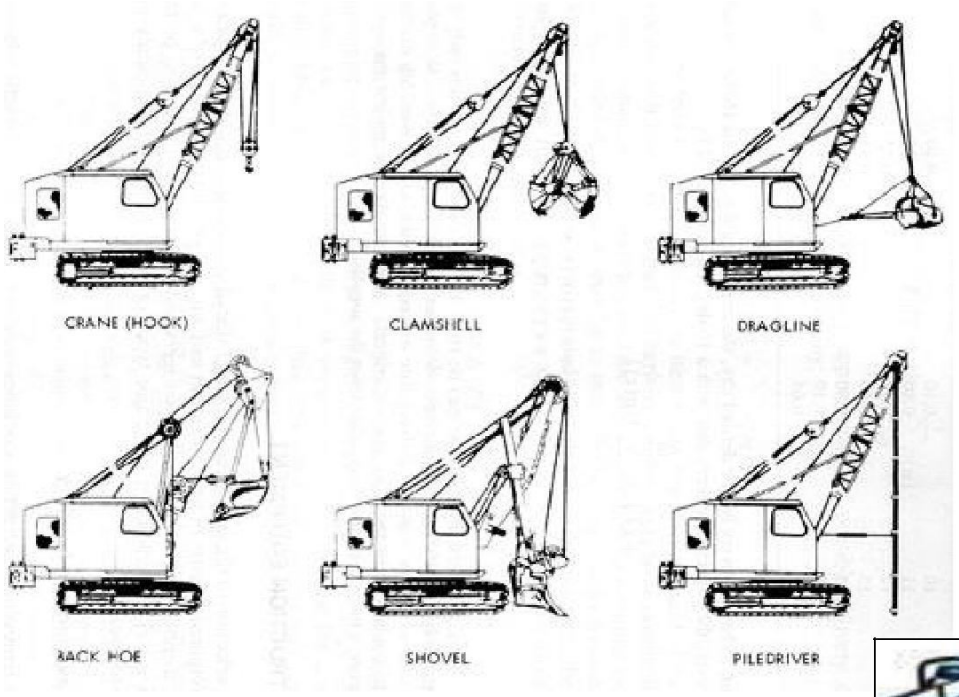
Excavation and Loading

One family of construction machines used for excavation is broadly classified as a crane-shovel. The crane-shovel consists of three major components: a carrier or mounting which provides mobility and stability for the machine. a revolving deck or turntable which contains the power and control units. a front end attachment which serves the special functions in an operation.

The type of mounting for all machines is referred to as crawler mounting, which is particularly suitable for crawling over relatively rugged surfaces at a job site. Other types of mounting include truck mounting and wheel mounting which provide greater mobility between job sites, but require better surfaces for their operation. The revolving deck includes a cab to house the person operating the mounting and/or the revolving deck. The types of front end attachments in might include a crane with hook, claim shell, dragline, backhoe, shovel and pile driver.

A tractor consists of a crawler mounting and a non-revolving cab. When an earth moving blade is attached to the front end of a tractor, the assembly is called a bulldozer. When a bucket is attached to its front end, the assembly is known as a loader or bucket loader. There are different types of loaders designed to handle most efficiently materials of different weights and moisture contents.

Scrapers are multiple-units of tractor-truck and blade-bucket assemblies with various combinations to facilitate the loading and hauling of earthwork. Major types of scrapers include single engine two-axle or three axle scrapers, twin-engine all-wheel-drive scrapers, elevating scrapers, and push-pull scrapers.
Each type has different characteristics of rolling resistance, maneuverability stability, and speed in operation.



Typical Machines in the Crane-Shovel Family

Compaction and Grading

The function of compaction equipment is to produce higher density in soil mechanically. The basic forces used in compaction are static weight, kneading, impact and vibration. The degree of compaction that may be achieved depends on the properties of soil, its moisture content, the thickness of the soil layer for compaction and the method of compaction.

The function of grading equipment is to bring the earthwork to the desired shape and elevation. Major types of grading equipment include motor graders and grade trimmers. The former is an all-purpose machine for grading and surface finishing, while the latter is used for heavy construction because of its higher operating speed.

Some Major Types of Compaction Equipment

Drilling and Blasting

Rock excavation is an audacious task requiring special equipment and methods. The degree of difficulty depends on physical characteristics of the rock type to be excavated, such a*s* grain size, planes of weakness, weathering, brittleness and hardness. The task of rock excavation includes loosening, loading, hauling and compacting. The loosening operation is specialized for rock excavation and is performed by drilling, blasting or ripping.

Major types of drilling equipment are percussion drills, rotary drills, and rotary-percussion drills. A percussion drill penetrates and cuts rock by impact while it rotates without cutting on the upstroke. Common types of percussion drills include a jackhammer which is hand-held and others which are mounted on a fixed frame or on a wagon or crawl for mobility. A rotary drill cuts by turning a bit against the rock surface. A rotary-percussion drill combines the two cutting movements to provide a faster penetration in rock.

Blasting requires the use of explosives, the most common of which is dynamite. Generally, electric blasting caps are connected in a circuit with insulated wires. Power sources may be power lines or blasting machines designed for firing electric cap circuits. Also available are nonelectrical blasting systems which combine the precise timing and flexibility of electric blasting and the safety of non-electrical detonation.

Tractor-mounted rippers are capable of penetrating and prying loose most rock types. The blade or ripper is connected to an adjustable shank which controls the angle at the tip of the blade as it is raised or lowered. Automated ripper control may be installed to control ripping depth and tip angle.

In rock tunneling, special tunnel machines equipped with multiple cutter heads and capable of excavating full diameter of the tunnel are now available. Their use has increasingly replaced the traditional methods of drilling and blasting.

Lifting and Erecting

Derricks are commonly used to lift equipment of materials in industrial or building construction

Tower cranes are used to lift loads to great heights and to facilitate the erection of steel building frames. Horizon boom type tower cranes are most common in high-rise building construction. Inclined boom type tower cranes are also used for erecting steel structures.

Mixing and Paving

Basic types of equipment for paving include machines for dispensing concrete and bituminous materials for pavement surfaces. Concrete mixers may also be used to mix portland cement, sand, gravel and water in batches for other types of construction other than paving.

A truck mixer refers to a concrete mixer mounted on a truck which is capable of transporting ready mixed concrete from a central batch plant to construction sites. A paving mixer is a self-propelled concrete mixer equipped with a boom and a bucket to place concrete at any desired point within a roadway.

A bituminous distributor is a truck-mounted plant for generating liquid bituminous materials and applying them to road surfaces through a spray bar connected to the end of the truck..

Construction Tools and Other Equipment

Air compressors and pumps are widely used as the power sources for construction tools and equipment. Common pneumatic construction tools include drills, hammers, grinders, saws, wrenches, staple guns, sandblasting guns, and concrete vibrators.

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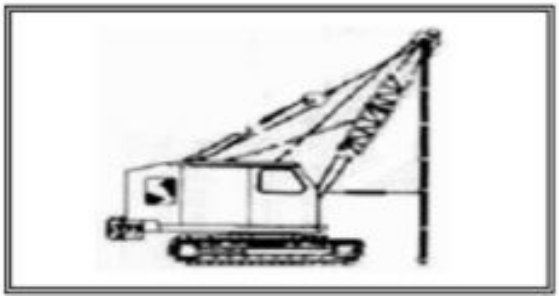
Tunneling Equipment

When a tunnel is dug through soft earth, as in San Francisco, it must be maintained at a few atmospheres of pressure to keep it from caving in.

ACTIVITY

(a) Study the diagram below and answer the questions that follow.



(i) Identify the construction equipment shown above.

_____
_____
_____

(ii) State two advantages of using the above equipment in the building industry.

_____
_____
_____

2. (i) List two reasons for using the rammers in building industry.

_____
_____
_____

(iii) Differentiate between fabric and foam as materials used in building.

_____
_____
_____

LESSON PLAN

Subject: Applied Technology		**Year/Level:** 13
Week: 5	**Lesson 3**	**Date:**
Topic: APPLIED ENGINEERING		

Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

Learning Outcomes

Calculation method

Quantities of materials for the production of required quantity of concrete of given mix proportions can be calculated by absolute volume method. This method is based on the principle that the volume of fully compacted concrete is equal to the absolute volume of all the materials of concrete, i.e. cement, sand, coarse aggregates and water.

A Concrete structure may consist of beams, slabs, columns and foundations etc. based on type of structure. The volume of concrete required for concrete structure can be calculated by summing up the volumes of each structural member or each parts of members. The volume of a rectangular cross sectional member can be calculated as length x width x height (or depth or thickness). Suitable formula shall be used for different cross-sectional shapes of members.

The formula for calculation of materials for required volume of concrete is given by:

$$V_C = \frac{W}{1000} + \frac{C}{1000S_C} + \frac{F_a}{1000S_{fa}} + \frac{C_a}{1000S_{ca}}$$

Where, V_c = Absolute volume of fully compacted fresh concrete

W =Mass of water

C = Mass of cement

Fa = Mass of fine aggregates

Ca = Mass of coarse aggregates

S_c, S_{fa} and S_{ca} are the specific gravities of cement, fine aggregates and coarse aggregates

respectively. The air content has been ignored in this calculation.

This method of calculation for quantities of materials for concrete takes into account the mix proportions from design mix or nominal mixes for structural strength and durability requirement.

Now we will learn the material calculation by an example.

Calculating Quantities of Materials for per cubic meter or cubic feet or cubic yards concrete

Consider concrete with mix proportion of 1:1.5:3 where, 1 is part of cement, 1.5 is part of fine aggregates and 3 is part of coarse aggregates of maximum size of 20mm. The water cement ratio required for mixing of concrete is taken as 0.45.

Assuming bulk densities of materials per cubic meter, cubic feet and cubic yards as follows:

Cement = 1500 kg/m^3 = 93.642 lb/ft3 = 3.4682 lb/cubic

yards Sand = 1700 kg/m^3 = 105 lb/ft3 = 3.89 lb/cubic yards

Coarse aggregates = 1650 kg/m^3 = 105 lb/ft3 = 3.89 lb/cubic yards

Specific gravities of concrete materials are as follows:

Cement = 3.15
Sand = 2.6
Coarse aggregates = 2.6.

The percentage of entrained air assumed is 2%.

The mix proportion of 1:1.5:3 by dry volume of materials can be expressed in terms of masses as:

Cement = 1 x 1500 = 1500
Sand = 1.5 x 1700 = 255
Coarse aggregate = 3 x 1650 = 4950.
Therefore, the ratio of masses of these materials w.r.t. cement will as follows =

$$1 : \frac{2550}{1500} : \frac{4950}{1500}$$

= 1 : 1.7 : 3.3
The water cement ratio = 0.45

Now we will **calculate the volume of concrete** that can be produced with one bag of cement (i.e. 50 kg cement) for the mass proportions of concrete materials.

Thus, the **absolute volume of concrete** for 50 kg of cement =

$$V_c = \frac{0.45 \times 50}{1000} + \frac{1 \times 50}{1000 \times 3.15} + \frac{1.7 \times 50}{1000 \times 2.6} + \frac{3.3 \times 50}{1000 \times 2.6} = 0.1345 m^3$$

Thus, for the proportion of mix considered, with one bag of cement of 50 kg, 0.1345 $m^3$of concrete can be produced.

We have considered an entrained air of 2%. Thus the actual volume of concrete for 1 cubic meter of

compacted concrete construction will be = 1 -0.02 = 0.98 m^3.
Thus, the quantity of cement required for 1 cubic meter of concrete = 0.98/0.1345 = 7.29 bags of cement.

The quantities of materials for 1 m3 of concrete production can be calculated as follows:
The weight of cement required = 7.29 x 50 = 364.5 kg.
Weight of fine aggregate (sand) = 1.5 x 364.5 = 546.75 kg.
Weight of coarse aggregate = 3 x 364.5 = 1093.5 kg.

TRADE CALCULATIONS

Calculate the number of tiles needed
To calculate the square footage of the work board, multiply the length by the width of the space in inches and divide the result by 144. Multiply the new result by 1.1.

Example: 30‖ x 60‖ = 1800
1800 / 144 = 12.5
12.5 x 1.1 = 13.75 square feet

You will need 14 tiles for this space.

Calculate size of end tiles

The wall (or ending) to your left/right should be the first place to have an end tile; the last tile laid in this section would be the upper left/right hand corner. Cuts against the wall or at the end should be measured by flipping the tile over, back facing up and mark the tile for cutting allowing for room to grout. The tile should be cut so that it is flush against the wall.

CALCULATE QUANTITIES OF MATERIALS FOR CONCRETE

Quantities of materials for the production of required quantity of concrete of given mix proportions can be calculated by absolute volume method. This method is based on the principle that the volume of fully compacted concrete is equal to the absolute volume of all the materials of concrete, i.e. cement, sand, coarse aggregates and water.

A Concrete structure may consists of beams, slabs, columns and foundations etc. based on type of structure. The volume of concrete required for concrete structure can be calculated by summing up the volumes of each structural member or each parts of members. The volume of a rectangular cross sectional member can be calculated as length x width x height (or depth or thickness). Suitable formula shall be used for different cross-sectional shapes of members.

The formula for calculation of materials for required volume of concrete is given by:

Where, Vc = Absolute volume of fully compacted fresh concrete
W =Mass of water
C = Mass of cement
Fa = Mass of fine aggregates
Ca = Mass of coarse aggregates

Sc, Sfa and Sca are the specific gravities of cement, fine aggregates and coarse aggregates respectively.

The air content has been ignored in this calculation.
This method of calculation for quantities of materials for concrete takes into account the mix proportions from design mix or nominal mixes for structural strength and durability requirement.
Calculating Quantities of Materials for per cubic meter or cubic feet or cubic yards concrete
Consider concrete with mix proportion of 1:1.5:3 where, 1 is part of cement, 1.5 is part of fine aggregates and 3 is part of coarse aggregates of maximum size of 20mm. The water cement ratio required for mixing of concrete is taken as 0.45.
Assuming bulk densities of materials per cubic meter, cubic feet and cubic yards as follows:

Cement = 1500 kg/m3 = 93.642 lb/ft3 = 3.4682 lb/cubic yards
Sand = 1700 kg/m3 = 105 lb/ft3 = 3.89 lb/cubic yards
Coarse aggregates = 1650 kg/m3 = 105 lb/ft3 = 3.89 lb/cubic yards

Specific gravities of concrete materials are as follows:

Cement = 3.15
Sand = 2.6
Coarse aggregates = 2.6.

The percentage of entrained air assumed is 2%.

The mix proportion of 1:1.5:3 by dry volume of materials can be expressed in terms of masses as:

Cement = 1 x 1500 = 1500
Sand = 1.5 x 1700 = 2550
Coarse aggregate = 3 x 1650 = 4950.

Therefore, the ratio of masses of these materials w.r.t. cement will as follows = 1 : 1.7 : 3.3
The water cement ratio = 0.45
Now we will calculate the volume of concrete that can be produced with one bag of cement (i.e. 50 kg cement) for the mass proportions of concrete materials.
Thus, the absolute volume of concrete for 50 kg of cement =
Thus, for the proportion of mix considered, with one bag of cement of 50 kg, 0.1345 m3 of concrete can be produced.
We have considered an entrained air of 2%. Thus the actual volume of concrete for 1 cubic meter of compacted concrete construction will be = 1 -0.02 = 0.98 m3.

Thus, the quantity of cement required for 1 cubic meter of concrete = 0.98/0.1345 = 7.29 bags of cement.
The quantities of materials for 1 m3 of concrete production can be calculated as follows:
The weight of cement required = 7.29 x 50 = 364.5 kg.
Weight of fine aggregate (sand) = 1.5 x 364.5 = 546.75 kg.
Weight of coarse aggregate = 3 x 364.5 = 1093.5 kg.

ACTIVITY

1. The absolute volume of concrete produced by a 50kg of cement is 0.1345m³ with entrained air of 2% resulted in the actual volume of 0.98m³.

With the mix proportion of 1:1.5:3, calculate the weight of the cement.

_____
_____
_____
_____
_____
_____

(c) Discuss Glass and Metal in terms of their compositions and properties.

_____
_____
_____
_____
_____

(d) State one practice used for storing and handling plywood.

_____
_____
_____
_____

LESSON PLAN

Subject: Applied Technology		**Year/Level:** 13
Week: 5	**Lesson 4**	**Date:**
Topic: APPLIED ENGINEERING		

Previous Knowledge
Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

Learning Outcomes

How to Measure for Building Materials

The Quick Read

- Reducing wastage and unnecessary ordering of excess materials is a smart way to save money on extension, renovation and self-build projects.
- Measuring well is the best way to achieve these savings and understanding simple quantity management is key.
- There are simple, basic rules for the volume of concrete required for foundation runs, the number of bricks and blocks required for a wall, etc The good news is that over-ordering can easily be avoided by accurately measuring the working drawings prior to placing any orders.

All that is required is the Building Regulations-approved plan, a scale rule and a calculator. So what do you need to order? Well, the list should look something like the one below. Once you've got the list established, you can begin to measure.

An ordering list

Concrete for Foundations

Assuming that the plans show the standard 600x225mm concrete strip foundations, measuring this is quite simple. Approximately 1m³ of concrete will lay a 7m run of foundations. To arrive at the m³ quantity required, simply measure the full length of the foundation trench and divide this figure by seven.

Foundation Walls up to Damp-Proof Course (DPC)

The walls up to the DPC can be either cavity work in dense concrete block, engineering bricks or maybe trench blocks..

Over site Concrete Floor

Measuring the over site floor area is simple: multiply the width by the length to get the area, and then multiply this figure by the depth for the concrete and sub-base volume.

Cavity Walls

The cavity walls from DPC to the roof are also quite easy to measure, simply by multiplying the length by the height (less any openings for windows and doors). To make things easier, it is best to measure from the ground floor to the first floor joists (if it‘s a two story building) and then from the joints to the roof.

Roof Timbers

Timber for the roof comes pressure treated and in standard lengths of 1.80m to 6.30m at 300mm intervals (e.g. 2.10m, 2.40m, etc.) Structural timber also comes in different grades: C14, C16, C18, C22, C24, TR26, C27. The plans should show which grade is required.

Roof Covering

The number of roof tiles required will vary according to t need approximately 60/m². If the roof is covered with concrete interlocking tiles, check with the tile manufacturer‘s catalogued pertom², not find forgetting outtoadd10 how percent to many the a tile order for breakages.

Placing the Orders

Try and get at least three quotes before placing any orders. Order materials as they are needed; it‘s week before they are going to be used.

LESSON PLAN

Subject: Applied Technology		**Year/Level:** 13
Week: 5	**Lesson 5**	**Date:**
Topic: APPLIED ENGINEERING		

Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

Learning Outcomes

BUILDING MATERIALS.

Building material is any material which is used for construction purposes. Many naturally occurring substances, such as clay, rocks, sand, and wood, even twigs and leaves, have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as carpentry, insulation, plumbing, and roofing work. They provide the make-up of habitats and structures including homes.

Economic costs

The initial economic cost of building materials is the purchase price. This is often what governs decision making about what materials to use. Sometimes people take into consideration the energy savings or durability of the materials and see the value of paying a higher initial cost in return for a lower lifetime cost.

Ecological costs

Pollution costs can be macro and micro. The macro, environmental pollution of extraction industries building materials rely on such as mining, petroleum, and logging produce environmental damage at their source and in transportation of the raw materials, manufacturing, transportation of the products, retailing, and installation. An example of the micro aspect of pollution is the off-gassing of the building materials in the building or.

Energy costs

Initial energy costs include the amount of energy consumed to produce, deliver and install the material

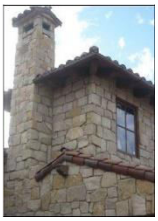
Social costs

Social costs are injury and health of the people producing and transporting the materials and potential health problems of the building occupants if there are problems with the building biology.

Brush

An extension on the brush building idea is the wattle and daub process in which clay soils or dung, usually cow, are used to fill in and cover a woven brush structure

Mud and clay



Clay based buildings usually come in two distinct types. One being when the walls are made directly with the mud mixture, and the other being walls built by stacking air-dried building blocks called mud bricks.

Structural clay blocks and bricks

Mud-bricks, also known by their Spanish name adobe are ancient building materials with evidence dating back thousands of years BC.

Sand

Sand is used with cement, and sometimes lime, to make mortar for masonry work and plaster. Sand is also used as a part of the concrete mix

Stone or rock

Rock structures have existed for as long as history can recall. It is the longest lasting building material available, and is usually readily availab

Wood and timber

Wood has been used as a building material for thousands of years in its natural state. Today, engineered wood is becoming very common in industrialized countries.

Man-made substances

Fired bricks and clay blocks

Bricks are made in a similar way to mud-bricks except without the fibrous binder such as straw and are *fired* ("burned" in a brick clamp or kiln) after they have air-dried to permanently harden them. Kiln fired claybricksareaceramicmaterial.

Concrete

Concrete is a composite building material made from the combination of aggregate and a binder such as cement. The most common form of concrete is Portland cement concrete, which consists of mineral aggregate (generally gravel and sand), portland cement and water.

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Fabric

Recently, synthetic polystyrene or polyurethane foam has been used in combination with structural materials, such as concrete. It is lightweight, easily shaped, and an excellent insulator. Foam is usually used as part of a structural Insulated panel, wherein the foam is sandwiched between wood or cement or insulating concrete forms.

Glass

Clear windows have been used since the invention of glass to cover small openings in a building. Glass panes provided humans with the ability to both let light into rooms while at the same time keeping inclement weather outside.

Glass is generally made from mixtures of sand and silicates, in a very hot fire stove called a kiln, and is very brittle.

Metal

Metal is used as structural framework for larger buildings such as skyscrapers, or as an external surface covering. There are many types of metals used for building Steel is a metal alloy whose major component is iron, and is the usual choice for metal structural building materials. It is strong, flexible, and if refined well and/or treated lasts a long time.

- The lower density and better corrosion resistance of aluminum alloys and tin sometimes overcome their greater cost.

- Copper is a valued building material because of its advantageous properties (see: Copper in architecture). These include corrosion resistance, durability, low thermal movement, light weight, radio frequency shielding, lightning protection, sustainability, recyclability, and a wide range of finishes. Copper is incorporated into roofing, flashing, gutters, downspouts, domes, spires, vaults, wall cladding, building expansion joints, and indoor design elements.
- Other metals used include chrome, gold, silver, and titanium. Titanium can be used for structural purposes, but it is much more expensive than steel. Chrome, gold, and silver are used as decoration, because these materials are expensive and lack structural qualities such as tensile strength or hardness.

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Plastics

The term "plastics" covers a range of synthetic or semi-synthetic organic condensation or polymerization products that can be molded or extruded into objects, films, or fibers. Their name is derived from the fact that in their semi-liquid state they are malleable, or have the property of plasticity. Plastics vary immensely in heat tolerance, hardness, and resiliency. Combined with this adaptability, the general uniformity of composition and lightness of plastics ensures their use in almost all industrial applications today.

REVIEW QUESTIONS

1. Name three building materials used in the modern technology and explain each materials.
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   _____
   _____
2. Name three building materials used in the traditional technology and explain each materials.
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   _____
   _____
   _____
3. What is the difference between clay blocks and bricks?
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   _____
   _____
4. Name a man-made material that can be used as building materials?
   _____
   _____
   _____
5. Differentiate between Fabric and Foam as materials used in building?
   _____
   _____
   _____
6. Plastic is also one of the building materials. Discuss what is plastic?
   _____
   _____
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