

EC - LEARNER SUPPORT MATERIAL: CIVIL TECHNOLOGY

CONSTRUCTION: GRADE 11

CONTENT TO BE COVERED:

TOPICS:

1. MATERIALS (Generic)

Application and uses of the following:

- Timber: Hard wood, softwood and board products:
- Bricks and Blocks: Clay and cement
- Metal: Ferrous metals, Non-ferrous metals, Alloys, Glass:

Properties and uses of:

- Clear sheet glass, Translucent glass, Safety glass
 - Synthetic materials: Thermoplastics, Thermosetting plastics, Polythene, and Polypropylene
 - Polyvinyl chloride Classification according to use and quality and sketches of: Clay bricks: Clay blocks:
 - Concrete bricks: Concrete blocks:

Materials: (Specific)

Application and uses of:

- Solder and Ceramics

2. Equipment and Tools (Generic)

- Identification, proper use and care of the following basic site equipment:
Identification, proper use and care of the following: Brick cutting tools
- Identification, proper use and care of the following: Plastering tools,
- Identification, proper use and care of the following:
 - Woodworking tools

Equipment and Tools (Generic)

- Identification of parts, accessories and uses of the following construction machines:
- Identification and use of the following equipment:
 - depended scaffolding,
 - in-dependended scaffolding,
 - builder's trestle
 - tower scaffolding
 - putlog scaffold
 - mobile scaffold

Equipment and Tools (Subject Specific)

Identification, proper use and care of the following:

- Cutting tools:
 - Cold chisels
 - Tin snips (Bent, straight & universal)
 - Files (flat, round, square, triangular and half round)
 - Pipe threader (stocks and dies)
- Holding tools:
 - Pliers
 - Bench vice

Equipment and Tools (Subject Specific)

Fastening tools:

- Spanners (ring, open ended and combination)
- Pop rivet apparatus
- Snapper or riveting tool
- Groove or seaming tool

Sheet metal work machines:

- Guillotine
- Sheet bending machine
- Pan and box bending machine
- Rolling machine

3. JOINING (GENERIC)

Properties, use precautions and applications of the following:

- Contact glue
- PVC adhesives
- Silicone
- PVA-wood glue

JOINING (SPECIFIC)

Joining bricks to:

- Steel doors and windows
- Aluminum doors and windows
- Wooden doors and windows
- Cavity walls: Different types, materials and spacing of ties

4. INTRODUCTION OCCUPATIONAL HEALTH AND SAFETY ACT 85 of 1993 (OHS)

Application of the Occupational Health and Safety Act (OHSA) with regard to general health and safety in the workshop.

- Scaffolding
- Handling of material
- Floors and stairs with open sides
- Builders' hoists Ladders

EXAMPLE 1: QUESTION 1: SAFETY, MATERIALS, EQUIPMENT AND JOINING

1.1 Choose a description in COLUMN B that matches an item in COLUMN A. Write only the letter (A–M) next to the question number (1.1.1–1.1.10) for example 1.1.11 K.

COLUMN A		COLUMN B	
1.1.1	Hard hat	A	wear when working with a grinder
1.1.2	Overall	B	non-slip boots
1.1.3	Safety gloves	C	tools must be clearly marked when they are stored
1.1.4	Safety boots	D	causes troublesome behaviour
1.1.5	Mixing concrete manually	E	should be worn when working with heavy objects
1.1.6	Drowsiness	F	to protect your hands
1.1.7	Visible warning signs	G	used when practical work is done in a workshop to protect your body and clothing
1.1.8	Good housekeeping	H	used to prevent head injuries
1.1.9	Alcohol	I	symptoms of alcohol poisoning
1.1.10	Eye protection	J	placed on any building site
		K	higher productivity
		L	running shoes
		M	wear gumboots

(10 x 1) (10)

1.2 List THREE board products that are suitable for wall panelling. (3)

1.3 List THREE factors that should be considered when stacking materials. (3)

1.4 Distinguish between *ferrous* and *non-ferrous metals* in respect of their compositions. (2)

1.5 State TWO symptoms of alcohol poisoning. (2)

- 1.6 Give a reason why different types of hazardous material should be stored in a safe, separate room. (1)
- 1.7 Water is used to mix concrete. Name THREE other ingredients of concrete. (3)
- 1.8 Explain the purpose of water in a concrete mix. (2)
- 1.9 Describe one use of the following:
- 1.9.1 Screed (1)
- 1.9.2 Plywood (1)
- 1.9.3 Aluminium (1)
- 1.10 Explain ONE measure you can take so that you are not infected by the HIV. (1)

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ANSWER: EXAMPLE 1: QUESTION 1: SAFETY, MATERIALS, EQUIPMENT AND JOINING

- 1.1 1.1.1 H ✓
 1.1.2 G ✓ 1.1.3 F ✓
- 1.1.4 E ✓
- 1.1.5 M ✓
- 1.1.6 I ✓ 1.1.7 J ✓ 1.1.8 C ✓
 1.1.9 D ✓
 1.1.10 A ✓ (10)
- 1.2
- Plywood ✓
 - Block board ✓
 - Hardboard/Masonite ✓ (3)

- 1,3
- No stack should be higher than three times its width. ✓
 - Stacks should be linked or interlinked. ✓
 - Materials should only be stacked on firm, strong flooring. ✓
 - Position the stack that there are no protruding parts.
 - Stacks should not affect ventilation, lighting or the use of firefighting equipment
 - Any stack that appears unstable should immediately be restacked.

ANY THREE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (3)

- 1.4 Ferrous metals: Main ingredient is iron. ✓
 Non-ferrous metals: Contains no or little iron. ✓ (2)

- 1.5
- Loss of consciousness or semi-consciousness ✓
 - Slow respiratory levels ✓
 - Cold, clammy, pale or blue skin
 - Negligence
 - Lower productivity
 - Loss of interest in work
 - Troublesome behaviour
 - Interference with other workers on site

ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (2)

- 1.6 Hazardous material must be stored in a safe, separate room because it may ignite easily and chemicals may react with one another. ✓ (1)

- 1.7
- River sand ✓
 - Cement ✓
 - Stone/Coarse aggregates) ✓ (3)

- 1.8
- Reacts with the cement to start the hydration process (chemical reaction) ✓
 - Forms a paste so that it binds the aggregates and cement together ✓
 - Reacts with cement to give strength
 - Ratio of water to cement should be balanced – too much water will reduce strength and too little will make concrete unworkable
 - Cleans tools and equipment used for brickwork
 - Applied to concrete during the curing period (2)

- 1.9 1.9.1
- - Used to create a smooth, level surface on a concrete floor ✓
 - Used as a level layer of covering
 - Suitable for light-duty use if the floor is not covered

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)

- 1.9.2 • Used on the inside of formwork for a smooth finish of concrete ✓
• Used for bottoms of drawers
▪ Used for wall/door and cupboard panels

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)

- 1.9.3 • Window frames ✓
• Sliding doors
• Roof sheets
• Gutters
• Downpipes
• Door handles for doors

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)

- 1.10 • Abstain from intercourse ✓
• Have less risky sex
• Use condoms • Limit your sexual partners
• Get tested and treated
• Do not inject yourself with drugs

ANY ONE OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER (1)

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EXAMPLE 2: QUESTION 2: SAFETY AND MATERIALS (Generics).

- 2.1 Answer the following questions with regard to the safety equipment in **FIGURE 2.1**.



FIGURE 2.1

- 2.1.1 What is the safety equipment in **FIGURE 2.1** called? (1)
- 2.1.2 On which type of site is this type of safety equipment compulsory? (1)
- 2.2 Describe the safety measure which is applicable to each of the following factors:
- 2.2.1 Loose clothing (1)

- 2.2.2 Type of shoes in a workshop (1)
- 2.2.3 Carrying of sharp objects (1)
- 2.2.4 Dangerous moving parts of power tools (1)
- 2.2.5 Number of operators who operate a machine (1)
- 2.3 Who is responsible for the safety of visitors on a construction site? (1)
- 2.4 Name any FOUR safety measures which are applicable to the storage of flammable liquids. (4 x 1) (4)
- 2.5 Unreinforced concrete, reinforced concrete and precast concrete are used on construction sites.
Identify the type of concrete which will be used for the following work:
 - 2.5.1 Suspended concrete floors (1)
 - 2.5.2 Lintels above door openings (1)
 - 2.5.3 Foundations for single-storey buildings (1)
- 2.6 Name ONE use of screed. (1)
- 2.7 Name TWO reasons why lime can be added to a mortar mix. (2 x 1) (2)
- 2.8 Briefly motivate why pine wood is used for carpentry work on a construction site. (2)
- 2.9 Indicate whether the following statements are **TRUE** or **FALSE**. Write only the word 'true' or 'false'
 - 2.9.1 Board products are cheaper than solid wood products. (1)
 - 2.9.2 Stock bricks are manufactured from cement. (1)
 - 2.9.3 Face bricks must be plastered. (1)
 - 2.9.4 Cement blocks are cast with hollow cores to make them lighter. (1)
- 2.10 Briefly motivate why sinks are manufactured from stainless steel. (2)
- 2.11 Briefly describe what an alloy is. (3)
- 2.12 Name ONE use of thermosetting plastic. (1 x 1) (1)

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- 2.10 (1) High hygienic properties and (2) easy to clean (2)
- 2.11 (1) Two or more metals (2) are combined to (3) form a new metal / with better properties / other properties (3)
- 2.12 Any ONE use of thermosetting plastic.
- Sewerage pipes
 - Gutters
 - Cold- and hot water pipes (1 x 1) (1)
- [30]**

EXAMPLE 3: QUESTION 3: SAFETY AND MATERIALS (Generics).

- 3.1 Personal protective equipment (1)
- 3.2 Any TWO requirements of protective footwear on a building site: (2 x 1) (2)
- Sturdy
 - Non-slip
 - Metal reinforcements in the toes
- 3.3 Safety precautions for small plant equipment:
- 3.3.1 To ensure that the equipment is in a good, working condition. (1)
- 3.3.2 Less chance of inhaling the hazardous fumes of the engines. (1)
- 3.3.3 Avoiding any possible injuries. (1)
- 3.3.4 Insufficient training could lead to injuries and damaged equipment. (1)
- 3.3 Safe stacking of material:
- 3.4.1 Ladders or any similar answer. (1)
- 3.3.2 Any TWO factors that should not be affected: (2 x 1) (2)
- Ventilation
 - Lighting
 - Fire-fighting equipment
- 3.3.3 3 x 500 mm (1) = 1 500 mm of 1,5 m (2) (2)
- 3.3.4 Can easily hook onto or bump against protruding parts and that could cause the stack to fall over. (1)
- 3.4 Cement (1) and fine sand (2) (2)
- 3.5 Any ONE example of a fine aggregate: (1)
- Sand
 - Silt

- Clay

3.7 Any ONE purpose of lime:

- Increase the plasticity of the mixture
- Makes the mixture more workable
- Reduce wide cracks (1)

3.8 Any TWO board products for panelling work: (2 x 1) (2)

- Plywood
- Block board
- Hardboard / Masonite

3.9 Any TWO uses of stainless steel

- Sinks
- Wash tubs
- Water taps
- Water traps
- Extractor fans
- Any similar answers: (2 x 1) (2)

3.10 Iron (1)

3.11 Two or more metals, or metals and non-metals are combined (1) to form a new, permanent metal (2), with enhanced qualities. (3) (3)

3.12 Any TWO uses of safety glass: (2 x 1) (2)

- Sliding doors
- Exterior doors with glass panels
- Shower cubicle and doors
- Bath glass screens
- Balustrades of staircases

3.13 Any ONE use of a mastic sealant: (1)

- Adheres to almost any material (wood, glass, aluminium, concrete etc.)
- For filling cracks and sealing areas exposed to water
- Used in construction projects (roofing and brickwork)

3.14 Can be reshaped (1) when reheated (2). (2)

EXAMPLE 4: QUESTION 4: SAFETY AND MATERIALS (Generics).

- 4.1 What is the meaning of the abbreviation *PPE*? (1)
- 4.2 Name TWO requirements for protective footwear that is worn on a building site. (2 x 1) (2)
- 4.3 General safety for small plant equipment is important. Briefly motivate why the following safety rules must be adhered to.
- 4.3.1 Pre-operational checks should be conducted on equipment. (1)
- 4.3.2 Petrol engines should only be used outside. (1)
- 4.3.3 Driving and rotating parts should be covered. (1)
- 4.3.4 Operators should receive training with regards to equipment. (1)
- 4.4 Answer the following questions with regard to the safe stacking of materials.
- 4.4.1 What should workers use to climb up and down the stack? (1)
- 4.4.2 Name TWO factors that should not be affected by a stack. (2 x 1) (2)
- 4.4.3 Determine the maximum height of a stack if the material has a width of 500 mm and a thickness of 250 mm. (2)
- 4.4.4 Why should a stack have no protruding parts? (1)
- 4.5 Name the TWO main elements of screed. (2 x 1) (2)
- 4.6 Name ONE example of a fine aggregate. (1)
- 4.7 Name ONE purpose of lime in a building mixture. (1)
- 4.8 Name TWO board products that are suitable for wall panelling. (2 x 1) (2)
- 4.9 Name TWO uses of stainless steel. (2 x 1) (2)
- 4.10 What element of ferrous metals makes it prone to corrosion? (1)
- 4.11 Define the term *alloy*. (3)
- 4.12 Name TWO uses of safety glass. (2 x 1) (2)
- 4.13 Name ONE use of a mastic sealant. (1)
- 4.14 Define the term *thermoplastic*. (2)

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ANSWER: EXAMPLE 4: QUESTION 4: SAFETY AND MATERIALS (Generics).

4.1 Personal protective equipment (1)

4.2 Any TWO requirements of protective footwear on a building site: (2 x 1) (2)

- Sturdy
- Non-slip
- Metal reinforcements in the toes

4.3 Safety precautions for small plant equipment:

4.3.1 To ensure that the equipment is in a good, working condition. (1)

4.3.2 Less chance of inhaling the hazardous fumes of the engines. (1)

4.3.3 Avoiding any possible injuries. (1)

4.3.4 Insufficient training could lead to injuries and damaged equipment. (1)

4.4 Safe stacking of material:

4.4.1 Ladders or any similar answer. (1)

4.4.2 Any TWO factors that should not be affected: (2 x 1) (2)

- Ventilation
- Lighting
- Fire-fighting equipment

4.4.3 x 500 mm (1) = 1 500 mm of 1,5 m (2)

4.4.3 Can easily hook onto or bump against protruding parts and that could cause the stack to fall over. (1)

4.5 Cement (1) and fine sand (2) (2)

4.6 Any ONE example of a fine aggregate: (1)

- Sand
- Silt
- Clay

4.7 Any ONE purpose of lime:

- Increase the plasticity of the mixture
- Makes the mixture more workable
- Reduce wide cracks (1)

4.8 Any TWO board products for panelling work: (2 x 1) (2)

- Plywood
- Block board
- Hardboard / Masonite

- 4.9 Any TWO uses of stainless steel
- Sinks
 - Wash tubs
 - Water taps
 - Water traps
 - Extractor fans
 - Any similar answers: (2 x 1) (2)
- 4.10 Iron (1)
- 4.11 Two or more metals, or metals and non-metals are combined (1) to form a new, permanent metal (2), with enhanced qualities. (3) (3)
- 4.12 Any TWO uses of safety glass: (2 x 1) (2)
- Sliding doors
 - Exterior doors with glass panels
 - Shower cubicle and doors
 - Bath glass screens
 - Balustrades of staircases
- 4.13 Any ONE use of a mastic sealant: (1)
- Adheres to almost any material (wood, glass, aluminium, concrete etc.)
 - For filling cracks and sealing areas exposed to water
 - Used in construction projects (roofing and brickwork)
- 4.14 Can be reshaped (1) when reheated (2). (2)

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EXAMPLE 5: QUESTION 5: MATERIAL, TOOLS, GRAPHICS AND WINDOWS (SPECIFIC)

- 5.1 Name the two groups into which solid wood is divided. (2)
- 5.2 Choose the correct answer from those in brackets for the seasoning of timber and write only the question number with the correct answer
- 5.2.1 The compartment kiln method is (more expensive / cheaper) than natural seasoning. (1)
- 5.2.2 (Any type of wood / Only hardwood) can be dried artificially. (1)

5.2.3 A progressive kiln is only recommended for wood with a thickness of (150 mm / 50 mm). (1)

5.2.4 The moist content in wood can be reduced by up to (25% / 15%). (1)

5.3 Answer the questions on the following machine in **FIGURE 5.3**.

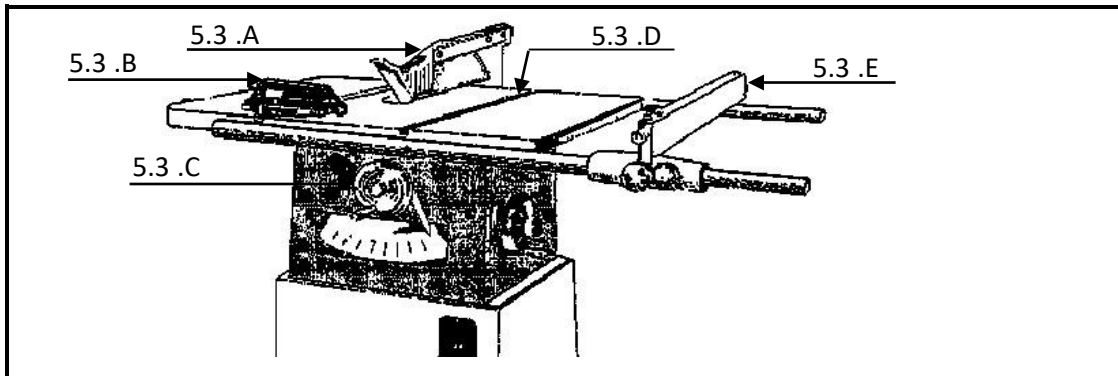


FIGURE 5.3

5.3.1 What is the name of the machine? (1)

5.3.2 Identify the parts 5.3.A to 5.3.E. (5)

5.4 List **ONE** use of each of the following portable woodworking machines:

5.4.1 Jig saw (1)

5.4.2 Orbital sander (1)

4.4.3 Router (1)

5.5 **FIGURE 5.5** shows the incomplete view of a building. Complete on a scale of 1:50, the SA-type roof truss with roof construction supported on the outside walls. The roof pitch is at 30° and overhang is 300mm. (12)



SA-type truss	1	
Tie beam	1	
Principal rafters	2	
King post	1	
Strut	2	
Position of support	1	
30° Pitch	1	
300 mm Overhang	1	
Scale	2	
TOTAL	12	

5.6 Identify the following mouldings: (3)

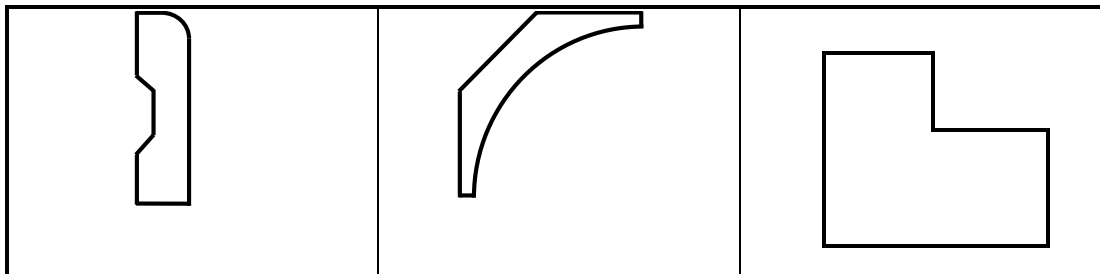


FIGURE 5.6.1

FIGURE 5.6.2

FIGURE 5.6.3

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ANSWER: EXAMPLE 5: QUESTION 5: MATERIAL, TOOLS, GRAPHICS AND WINDOWS (SPECIFIC)

5.1 Softwood and hardwood (2)

5.2 5.2.1 More expensive

5.2.2 Any type of wood

5.2.3 50 mm

5.2.4 25% (4)

5.3 5.3.1 Table saw / circular saw (1)

5.3.2 5.3. A – blade cover

5.3. B – mitre gauge

5.3. C – hand wheel for blade-height adjustment

5.3. D – mitre gauge slot

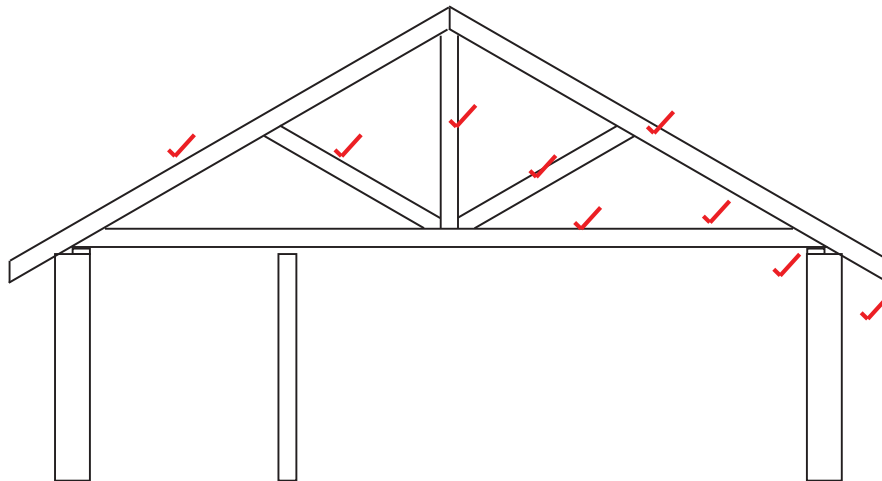
5.3.E – rip fence (5)

5.4 5.4.1 Cutting of curves and circles on large surfaces
 Cutting a wide range of materials such as hardboard, laminated boards, plastic and thin metal (Any 1) (1)

5.4.2 Sanding across as well as along the grain of wood
 Sanding surfaces before polishing (Any 1) (1)
 Sanding between layers of varnish

5.4.3 Shaping of surfaces and edging of wood
 Cutting of profiles to a straight or curved edge
 Cutting groves (Any 1) (1)
 Cutting dovetail joints

5.5 ROOF TRUSS (12)



SA-type roof truss	1	
Tie beam	1	
Principal rafter	2	
King post	1	
Strut	2	
Position of supports	1	
30 ° Pitch	1	
300 mm Overhang	1	
Scale	2	
TOTAL	12	

5.6 5.6.1 Skirting (1)

5.6.2 Cornice (1)

5.6.3 Rebate (1)