**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
 |
| 1. **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-depended 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
 |
| 1. **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
 |

1. **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  1.1.2  1.1.3  1.1.4  1.1.5   1.1.6  1.1.7  1.1.8  1.1.9  1.1.10  | Hard hat  Overall  Safety gloves  Safety boots  Mixing concrete manually  Drowsiness  Visible warning signs  Good housekeeping  Alcohol  Eye protection  | A  B  C   D  E   F  G    H  I  J  K  L  M  | wear when working with a grinder  non-slip boots  tools must be clearly marked when they are stored  causes troublesome behaviour  should be worn when working with heavy objects  to protect your hands  used when practical work is done in a workshop to protect your body and clothing  used to prevent head injuries  symptoms of alcohol poisoning  placed on any building site  higher productivity  running shoes  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)

 **[30]**

**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) [30]

**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)

 **[30]**

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

2.1 2.1.1 Hard hat / Safety hat (1)

 2.1.2 All building sites / construction sites (1)

2.2 2.2.1 Loose clothing – Button up / Remove (1)

 2.2.2 Type of shoes in a workshop – Non-slip / Metal point (1)

 2.2.3 When sharp object is carried – Point downwards (1)

 2.2.4 Dangerous moving parts of power tools – Covered by guards (1)

 2.2.5 Number of operators who operates a machine – Only one (1)

2.3 Contractor (1)

2.4 Any FOUR safety measures which are applicable to the storage of

 flammable liquids.

* Room must be well ventilated
* Door must have a threshold
* No material that may cause a spark
* Liquids that may interact chemically not to be stored in close proximity
* Containers sealed properly (4 x 1) (4)

* 1. 2.5.1 Suspended concrete floors – Reinforced concrete (1)

2.5.2 Lintels above door openings – Precast concrete (1)

* + 1. Foundations for single-storey buildings – Unreinforced concrete (1)

2.6 Any ONE use of screed.

* A finish for floors and walls
* Facing material
* Surfacing of suspended floors
* Insulated roof screed (1)

2.7 Any TWO reasons why lime can be added to a mortar mix

* Increases plasticity
* Makes mortar more workable (2 x 1) (2)

* 1. (1) Cheap (2) easy workable (2)

* 1. 2.9.1 True (1)

 2.9.2 False (1)

 2.9.3 False (1)

 2.9.4 True (1)

* 1. (1) High hygienic properties and (2) easy to clean (2)

* 1. (1) Two or more metals (2) are combined to (3) form a new metal / with

 better properties / other properties (3)

* 1. 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 footgear on a building site: (2 x 1) (2)

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

* 1. 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)

* 1. Safe stacking of material:

3.4.1 Ladders or any similar answer. (1)

* + 1. Any TWO factors that should not be affected: (2 x 1) (2)
* Ventilation
* Lighting
* Fire-fighting equipment

* + 1. 3 x 500 mm (1) = 1 500 mm of 1,5 m (2) (2)

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

* 1. Cement (1) and fine sand (2) (2)

* 1. 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)

* 1. Iron (1)

* 1. Two or more metals, or metals and non-metals are combined (1) to form a

 new, permanent metal (2), with enhanced qualities. (3) (3)

* 1. 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)

#  [30]

**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 footgear 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)

 **[30]**

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

4.1 Personal protective equipment (1)

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

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

* 1. Safety precautions for small plant equipment:

* + 1. To ensure that the equipment is in a good, working condition. (1)
		2. Less chance of inhaling the hazardous fumes of the engines. (1)
		3. Avoiding any possible injuries. (1)
		4. Insufficient training could lead to injuries and damaged equipment. (1)

* 1. Safe stacking of material:

4.4.1 Ladders or any similar answer. (1)

* + 1. 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) (2)

* + 1. Can easily hook onto or bump against protruding parts and that could

 cause the stack to fall over. (1)

* 1. Cement (1) and fine sand (2) (2)

* 1. 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)

* 1. Iron (1)

* 1. Two or more metals, or metals and non-metals are combined (1) to form a

 new, permanent metal (2), with enhanced qualities. (3) (3)

* 1. 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)

#  [30]