



Carpentry Level I I

Learning Guide-72

**Unit of Competence: Repair and
Rectify Concrete structures**

**Module Title: Repairing and
Rectifying Concrete structures**

LG Code: EIS CRP2 M16 LO1-LG-72

TTLM Code: EIS CRP2 M16 TTLM 0919v1

**LO 1: Plan and prepare for repair
work**

**Instruction Sheet****Learning Guide #72**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Obtaining and confirming work instructions
- Identifying and applying *Safety* requirements
- Identifying and implementing Signage/barricade requirements
- Selecting Tools and equipment
- Calculating material quantity requirements
- Identifying and using appropriate materials
- Identifying and applying environmental protection requirements

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Obtain, confirm and apply Work instructions, including plans, specifications, quality requirements and operational details.
- follow Safety requirements in accordance with safety plans and policies including implementation of signage/barricade
- rectify and report prior to commencement select tools and equipment to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults
- calculate Material quantity requirements in accordance with plans and/or specifications
- identify, obtain and prepare, use appropriate Materials to the work application safely handled and made ready
- identify Environmental protection requirements for the project in accordance with environmental plans and regulatory obligations

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below 3 to 5
2. Read the information written in the information
3. Accomplish the “Self-check 1, Self-check, 2,Self-check 3” ,Self-check 4,Self-check 5 ,Self-check 6,Self-check 7, ,in page 4, 11, 15, 24, 29, 35,and38 respectively.
4. If you earned a satisfactory evaluation from the “Self-check proceed to operation sheet,40
5. Do the “LAP test” 41



Information Sheet-1

Obtaining and confirming work instructions

1.1. Applying Work instruction

Instructions are directions or orders that you receive either verbally or in written form. Depending on your role on a construction site, you'll receive instructions from different people. A builder or site manager will communicate directly with the architect or the client, whereas a tradesperson may receive instructions from an employer, foreperson or supervisor. You need clear and complete instructions to establish the task you're going to be doing before you start planning, so it's important to pay attention, develop good listening skills and ask as many questions as necessary, to make sure you have all the information you need and that you understand what you've been told

Work Instructions are documents that clearly and precisely describe the correct way to perform certain tasks that may cause inconvenience or damage if not done in the established manner. That is, describe, dictate or stipulate the steps that must be followed to correctly perform any specific activity or work. A document describing specific activities and tasks within the organization. It contains the greatest amount of detail.

As a component of a process, "defines how one or more activities in a procedure should be executed in detail, using technology or other resources.

Here are some examples of documented work instructions which may be found on a typical construction site:

- ✓ Working Drawings issued for construction such as Plans, elevations, sections etc.
- ✓ Specifications/Contract specifications
- ✓ Construction method statements
- ✓ Quality requirements
- ✓ Operational details
- ✓ Maintenance manuals



1.2. Plans and specifications

Plans and specifications are the written documents used to communicate the design and technical details of a construction project to the builder and the tradespeople involved. Plans are the drawings created by a specialist like an architect, designer or Engineer sometimes in consultation with the client. There are many types of plans including site plans, electrical plans, elevations and floor plans.

Specifications are documents that outline specific information that can't be shown or described in detail on the plans or drawings. The following are examples of the type of information you might find in a specification:

- paint color
- floor and wall tile type, size and color
- electrical fittings
- fixtures such as basins and toilets
- Fittings such as taps and mixers.

When you plan a task, you use the information provided on the plans and specifications to identify what you're building, the dimensions of the various elements, where the building will be built and the materials you must use. This information is essential for scheduling tasks, obtaining or preparing tools and equipment, and ordering materials

1.3. Clarifying and confirming understanding

When you receive instructions, you must make sure you've interpreted them correctly. There are serious and costly consequences when misunderstandings occur in the construction industry.

Clarifying means literally 'to make clear' and when you clarify information, you're attempting to obtain the complete meaning of that information. If you're asked to paint a room, you would need to clarify which parts of the room you're meant to paint – the walls, ceiling, skirting boards or cup boards. You can clarify your understanding of what you're meant to do on a construction task by using some or all of the following techniques:

- asking for more information
- asking the speaker to repeat what they said
- reading plans, specifications and instructions, and making notes
- researching in trade publications or on the internet



- asking a more experienced workmate checking documentation like legislation, standards, policies and procedures and manufacturers' specification

Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. what is Work Instructions?(3point)
2. what is Specifications.(5 points)

Note: Satisfactory above – 4 out of 8 points Unsatisfactory - below 4 out of 8 point



Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Short Answer Questions

1. _____

2. _____



Information Sheet-2

Identifying and applying Safety requirements

2.1. Occupational Health and Safety (OHS) requirements

2.1.1. Protective clothing and equipment

Personal protective equipment (PPE) is protective clothing, helmets, goggles, or other construction or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter

2.1.2. Use of tools and equipment

Hard hat:-Protects head of the worker from any falling objects dropping from high level during construction.



Fig2.1 Hard hat

Overall:-Protects the normal clothes from dust, grease and other spilling materials.

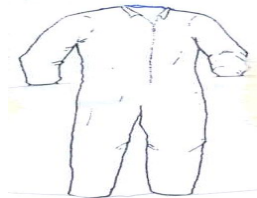


Fig2.2 Overall cloths

Safety shoe (boot):-Protects the worker from nail, sharp objects
hard-rolled leather shoes with metal toe caps.



Fig2.3 Non-slip oil resistant shoe

Rubber boot:- Protects the workers feet from colds, chemical, and mud in the working area.



Fig2.4 Rubber boot

Mask: - Protects eyes of the worker from other endangering object and dust during construction.



Fig2.5 Mask

Goggle: - Protects eyes of the workers during welding of metal works and when placing reinforcement in the form work.



Fig2.6 Goggles with safety glass or plastic lenses, heavy duty

Glove:-Protects the workers from oils, chemicals, and dust and other dangerous material that affect the skin.





Fig2.7Gloves

Safety Belt:- Secures laborers working in a plane where the construction is done at high level.

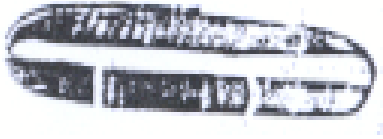


Fig2.8 Safety Belt

2.1.3. Workplace environment and safety

Organizations are legally responsible for establishing and maintaining a working environment where employees are able to work safely, without risk to their physical and psychological health and welfare.

Likewise, employees are obliged to: comply with any legislative requirements and organizational policies and procedures; work in accordance with agreed safe work practices; and use all means provided to protect their health and safety.

Employer and employee health and safety responsibilities are often prescribed in legislation and supported by regulations, codes of practice and standards. These provide a foundation for guidelines on workplace safety, compensation and rehabilitation.

2.1.4. Handling of materials

Material handling is the movement, protection, storage and control of materials and products throughout manufacturing, warehousing, distribution, consumption and disposal.

. The focus is on the methods, mechanical equipment, systems and related controls used to achieve these functions.

2.1.5. Use of firefighting equipment

Anyone who is likely to have to use firefighting equipment should be trained in its use and in basic fire-fighting techniques. It is also essential that the right type of extinguisher is used for the fire. ... Some water sprays and water mist extinguishers are approved for use on electrical equipment.

2.1.6. Organizational first aid

First aid is medical attention that is typically administered immediately after an injury or illness occurs. It usually consists of one-time, short-term treatment, such as cleaning minor cuts, treating minor burns, applying bandages, and using non-prescription medicine.

A building site should have a first aid kit which as minimum containers:-

- Plaster



- Bandage
- Ointment
- Disinfectant
- Someone on the site should be in charge of
 - the kit and know how to deal with broken
 - Bones, bowls and effective strikes.
- First aid kit should be placed at convenient location
- At the site so that worker can pick it up early

2.1.7. Hazard control and hazardous materials and substances

A hazard control program consists of all steps necessary to protect workers from exposure to a substance or system, the training and the procedures required to monitor worker exposure and their health to hazards such as chemicals, materials or substance, or other types of hazards such as noise and vibration

2.1.8. Emergency procedures such as:

- shutting-down and stopping
- extinguishing fires
- organizational first aid requirements and evacuation

2.1.9. Environmental requirements such as:

- Waste management
 - noise
 - dust
 - vibration
 - clean-up management

2.1.10. Safe operating procedures such as:

- conduct of operational risk assessment and treatments associated with hazards
- working with dangerous materials
- restricted access barriers
- traffic control
- working at heights
- working in proximity to others

2.2. Safety plans and policies

A Safety Plan is a written document that describes the process for identifying the physical and health hazards that could harm workers, procedures to prevent accidents, and steps to



take when accidents occur. ... Many organizations compile their activity-specific safety plans into a single safety manual.

Workplace safety rules and general safety policies are necessary parts of a comprehensive safety program. In addition to general safety rules, job specific safety rules are needed to ensure task safety training addresses all hazards for each job.

- **Hazard Reporting**

Identification and reporting of potentially unsafe or unhealthful working conditions is the responsibility of all employees. Employees should be encouraged to report unsafe or unhealthful working conditions to their immediate supervisor to promptly investigate the situation and take appropriate corrective actions. .

- **Signs and Tags**

Signs and tags are not intended as substitutes for preferred abatement methods such as engineering controls, substitution, isolation, or safe work practices. Rather, they are additional safety guidance and increase the employee's awareness of potentially hazardous situations.

Tags are temporary means of warning all concerned of hazardous conditions, defective equipment, etc.

- **Planned Work**

Work shall be planned and supervised to prevent injuries in the handling of materials and in working together with equipment. Employees shall not enter manholes, underground vaults, chambers, tanks, silos, or other similar places that receive little ventilation unless it has been determined that it is safe to enter. Confined spaces can be quite hazardous from toxic fumes, gas, and other hazards can gather in the spaces creating a dangerous hazard. Machine guards and other protective devices must be in their proper place before machinery and equipment is used and employees must report any deficiencies or hazards to the supervisor when they are detected. If the equipment is unsafe to operate, do not operate the equipment until it has been replaced or repaired.

- **Hazard Safety Control**

Substitution The risk of injury or illness may be reduced by replacement of an existing process, material, or equipment with a similar item having more limited hazard potential Some examples include: brush painting instead of spray painting to reduce inhalation hazards, welding instead of riveting to reduce noise levels, use of safety cans instead of bottles to store flammable liquids,



Isolation Hazards are controlled by isolation whenever an appropriate barrier or limiter is placed between the hazard and an individual who may be affected by the hazard.

Ventilation The control of a potentially hazardous airborne substance by ventilation can be accomplished by one or two methods: diluting the concentration of the substance by mixing with uncontaminated air or capturing and removing the substance at its source or point of generation.

Self-Check -2	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. _____ is the movement, protection, storage and control of materials (1point)

- A. Specifications
- B. plans
- C. Material handling
- D. all

2. _____ is medical attention that is typically administered immediately after an injury or illness occurs (1point)

- A. Safety
- B. First aid
- C. Hazard
- D. all

Note: Satisfactory above – 3.5 out of 7 points
of 7point

Unsatisfactory - below 3.out



Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

1. _____

2. _____



Information Sheet-3	Identifying and implementing Sign/barricade requirements
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3.1 implemented and Sign/Barricading Requirements

Barricading controls shall be implemented and authorized as part of the safe work system to protect persons from hazards such as:

- being struck by falling objects;
- being struck by moving plant;
- Fall from height, including falling into open excavations, penetrations, and falls from unprotected edges such as removed flooring, walkways, stairs and / or hand railings.
- exposure to hazardous chemicals;
- unauthorized entry into a confined space or work area; and
- Any potentially hazardous work processes, for example, hot works, scaffolding, radiation work and work involving asbestos.

Barricading controls shall also be implemented and authorized as part of the incident management and emergency response procedures.

3.2. Selection of Barricade

When selecting the type of barricade (soft or hard) the following factors are to be considered as part of a risk assessment:

- risk associated with the hazard;
- visibility of the hazard;
- required strength of the barrier, for example, impact potential; and
- The amount of clearance provided from the hazard by the barricade.

In addition it shall be ensured that hard/solid barricading is used for:

- a fall from height risk greater than two meters; and
- excavations greater than 1.5 meters deep.

3.3. Erection and Use of Barricade

The barricade shall encompass the entire potentially affected area of the hazard and take into account factors such as:



- possible deflection of an object if it falls;
- slag or sparks created from hot work activities;
- distance from the hazard; and
- Creating an additional hazard, for example, access and egress. Sites shall make sure that barricades are erected so that all sides of the hazard are protected from unauthorized access. All barricades shall be accompanied by an appropriate sign, which is to be placed on all access points

. Refer to Appendix C – Appropriate Signage for Barricading. Signage is linked to the Safe Work System used on site; therefore signage may differ across sites. Signage will be standardized across sites when the consolidated Safe Work System is implemented.

Signs or tags shall clearly display the following information:

- the name of the person in charge of the barricaded area;
- the hazards that are within the barricaded area;
- the date; and
- the contact details of the person in charge of the area

3.4. Safety Sign Requirements

It shall be ensured that safety signs are erected to warn workers of specific hazards and to communicate necessary precautionary measures and emergency actions.

As a minimum, it shall be ensured that safety signs are erected in accordance with

Queensland Work Health and Safety Regulation 2011 including, but not limited to:

- confined spaces;
- specific personal protective equipment (PPE) requirements;
- hazardous chemicals;
- asbestos;
- lead;
- fire protection equipment;
- hazardous areas;
- emergency and first aid information;
- emergency eyewash and shower; and
- Traffic management and pedestrian control.



Fig3.1 safety sign

Self-Check -3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is barricading controls? (3point)
- 2 list types of Safety Sign regulation (4point)

Note: Satisfactory above – 3.5 out of 7 points

Unsatisfactory - below 3.out of 7point



Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

1. _____



4.1. Construction Tools and equipment Pouring Cement concrete cast

1. Trowels

Trowels also help smooth concrete surfaces for their finish coats before being left to dry. Hand-troweling is common for smaller slabs, or power trowels are often preferred for large slabs. There are varying types of trowels for specific concrete work.



Fig 4.1 Trowels

2.Float Blades and Troweling Blades

A variety of blade types is available for floats and power trowels, each designed to accomplish different finishes. Some care must be taken during the troweling stage not to burnish the surface and prolong drying time.



Fig 4.2 Float Blades

3. Groove Cutter/Jointer Tool

For certain job types; grooving the surface also helps prevent cracking or excess damage from shrinkage as the concrete dries or during use.



Fig4.3 Float Blades

4 Brooms

A traditional finish for a concrete slab is a broom finish – drawing a broom across the surface of the almost-dried concrete slab for a slip-resistant surface. The finished look can be a smooth draw or a more artistic pattern.



Fig4.4 Brooms

5. Polishers

after the slab has dried sufficiently, polishers can be used to produce a surface finish effect, from a gentle smoothing of the surface for traction and safety to a mirror-like shine for an aesthetic finish.





Fig4.5 Polishers

6. Mixers

Concrete mixers are available in from of different capacities. Small mixers can produce 250Lit of mortar or concrete and the big ones produces more and more, up to 6000Lit.; widely used, small mixers up to a capacity of 1000Lit. Mixers are driven with diesel, benzene engine or electrical power.



Fig4.6Mixer

7. Wheelbarrows

Ideal for transporting (or even mixing) small batches of concrete or tools on the job site.



Fig4.7Wheelbarrows

8. Rubber Boots or Work Boots

Concrete is stiff stuff, and wearing waterproof boots is the best way to get through it and



prevent contact with your skin. It's also easy to rinse your footwear after the concrete is down.

9. Gloves

Many concrete mixes contain potentially caustic admixtures that can cause serious burns from extended contact with bare skin. Gloves prevent overexposure to these components (and save a few occasional blisters, too).



Fig4.8Gloves

10. Safety Glasses

Standard on most job sites, wearing safety glasses is an important safety measure when drilling, grinding, power troweling or sawing concrete.

11. Levels

Both the sub-base and slab surface must be level. A standard long-line level, or a laser level, will let you verify that the slab is completely according to spec before pouring and after.



Fig4.9Levels

12. Tape Measures

Concrete forms and slab depth need the same “measure twice, pour once” verification as any other material on the job site. They are also useful for testing placement and mapping.

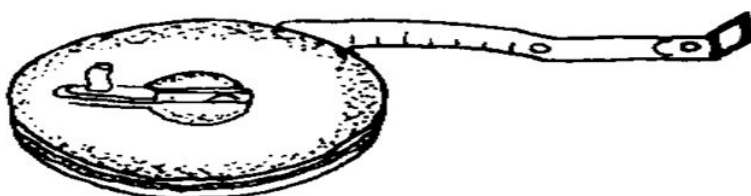




Fig4. 10Tape Measures.

13. Shovels

Shovels help distribute concrete around the job site to fill in gaps left during the pouring process or for smaller applications. Square-ended shovels generally work better for concrete; rounded ones spread concrete unevenly.



Fig4.11 Shovels

14. Rakes and Come-Along Rakes

using a rake is the quickest way to begin getting the freshly-poured concrete spread more uniformly into place. Garden rakes work but concrete rakes, also called come-along rakes, have a more scooped blade for more easily pre-leveling new concrete. Concrete rakes also have a tine on the back of the blade to help lift rebar or mesh into position before the concrete begins to harden.



Fig4.12Rakes

15 Screeds

Screeds come in a variety of sizes and can be a specific tool (also called straight edges or bump cutters), or can be simple flat pieces of dimensional lumber. The purpose of a screed is to smooth concrete after it has been moved into place by scraping away any excess from the slab surface.



Fig4.13 Screed

16. Angel grinder

Grinders are available as one hand and two hands. They are operating with high speed rotary cutting discs. The protecting hood must not be removed by all means. A grinder is very useful for cutting hard material like concrete, steel, natural stones or tiles. It is effective to cut blocks or bricks perfectly than cutting with hands.



Fig4.14 Angle grinder

17. Drilling machine

It is used to make or drill holes in concrete, stones and other building elements or material. Drilling holes is depending up on the size and materials to be drilled, i.e, the drill bits are of different size and types. Types of drill bit can be classified as bits for metal, wood and stone or concrete).





Fig4.15Electrical drilling ma

18 .Chisel

Used to cut concrete blocks, bricks, plaster surface and to remove mortar projections etc. Cold chisels are available in different sizes and shapes. The operation is done together with a club hammer.



Fig 4.16Flat chisel



fig 4.17 pointed chisel

19 Mortar barrel/ drum

This is used by mason, plasterer, tiller, etc, and serves to prepare small amount of mortar right at the working place. It is also used as temporary mortar storage, supplied from mixing station, and to control water ratio of the mix when it gets dry. Always, keep it workable and clean.



Fig 4 .18Mortar barrel/ drum



Self-Check -4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List the construction tools and equipment.(5 points)
2. What is the use of Wheelbarrows? (3point)

**Note: Satisfactory above_4 out of 8 points
point**

Unsatisfactory - below 4out of 8



Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

1. _____

2. _____



5.1. Calculating material quantity requirements

Note that the system does not take the unit of measure of referred values into account. Percentages, for example, are treated like absolute values during the calculation.

- To insert the operators of the basic arithmetical operations or a bracket in the formula, choose the corresponding button in the *Formula definition* section or use the keyboard to enter the sign.
- Use the keyboard to enter all other operators or functions
- Depending on the values for which you have entered a formula, start the calculation as follows:
- If you want to recalculate component, operation, phase, or scrap quantities, choose
- If you want to recalculate the product or order quantity, choose *Calculate product qty*.

The system calculates the product quantity and subsequently updates all component, operation, phase, and scrap quantities for which formulas have been maintained.

5.5.1. Calculating Quantity of Materials

An estimate is probable cost of a building before construction. This estimate should not be far away from the actual cost of the building after completion of the project. It is done by mathematical calculation based on working trainings. First of all the quantity of the work is calculated based on standard unit of measurement for each work. This unit of measurement can be pieces (No), meter linear, meter square and meter cube.

The unit of measurement for concrete is meter cube for thick surfaces such as ground floor slab. The data given below can be used to calculate materials required for making concrete, the materials needed depends on the grade of concrete as given on the data

General formula for calculating material list of concrete

Basic data

Density of cement - - - - 1400 kg/m³



Density of Sand - - - - 1840 kg./m³

Density of Stone Aggregate - - - - 2250 kg/m³

Density of Lime - - - - 1900 kg/m³

Density of Cement Mortar - - - - 2300 kg/m³

Density of Compo Mortar - - - - 1200 kg/m³

Density of Tracheae - - - - 2600 kg/m³

Assume 30% Shrinkage and 5% wastage.

1) Concrete Mix = 1:3:6

Let volume of concrete = Zm³

$$\begin{aligned} \text{then a) Cement} &= \frac{1}{10} \times Zm^3 \times 1400 \text{ kg / m}^3 \times 1.30 \text{ shrinkage} \times 1.05 \text{ wastage} \\ &= 191 \text{ kg Z} \\ &= 0.41 \text{ m}^3 \text{ Z} \end{aligned}$$

$$\begin{aligned} \text{b) Sand} &= \frac{3}{10} \times Zm^3 \times 1840 \text{ kg / m}^3 \times 1.30 \text{ shrinkage} \times 1.05 \text{ Wastage} \\ &= 754 \text{ kg Z} \\ &= 0.41 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{c) Aggregate} &= \frac{6}{10} \times Zm^3 \times 2250 \text{ kg / m}^3 \times 1.30 \text{ Shrinkage} \times 1.05 \text{ Wastage} \\ &= 1843 \text{ kg} \times Zm^3 \\ &= 0.82 \times Zm^3 \end{aligned}$$

C/ Material list Calculation

I Concrete

Assuming 30% Shrinkage

5% Wastage

For: Mechanical mix Water = 0.4-0.5
Cement



Hand mix Water = 0.4-0.65
Cement

5.1.2 Concrete mix quantities calculation

Let us consider M20 concrete mix - 1:1.5:3

Total Volume = $1+1.5+3 = 5.5$

Consider, Wet volume = 1m^3

Dry Volume = $1.54 \times 1 = 1.54 \text{ m}^3$ (54% increases)

Cement:

Quantity of cement In Cubic meters = $1 \times 1.54 / 5.5 = 0.28 \text{m}^3$

Quantity of cement in kg = $1 \times 1.54 / 5.5 \times 1440 = 403.2 \text{ kg}$ (Density of cement = 1440 kg/m^3)

Total no. of cement bags required = $403.2 / 50 = 8.064$ bags

Sand:

Quantity of sand in Cubic meter = $1.5 \times 1.54 / 5.5 = 0.42 \text{ m}^3$

Quantity of sand in kg = $1.5 \times 1.54 / 5.5 \times 1500 = 630 \text{ kg}$ (Density of sand = 1500 kg/m^3)

Quantity of sand in Cubic feet = $1.5 \times 1.54 / 5.5 \times 35.3147 = 14.83 \text{ cu.ft}$

Aggregates:

Quantity of aggregate in Cubic meter = $3 \times 1.54 / 5.5 = 0.84 \text{ m}^3$

Quantity of aggregate in kg = $3 \times 1.54 / 5.5 \times 1450 = 1218 \text{ kg}$ (Density of aggregate = 1450 kg/m^3)

Quantity of aggregate in cubic feet = $3 \times 1.54 / 5.5 \times 35.3147 = 29.66 \text{ cuff}$

Water:

For M20, 30 liters of water per 50kg cement should be used.

Total amount of water required = $30 \times 403.2 / 50 = 241.92$ liters.



For any construction request or queries please visit Brick Bolt packages or call us at 73488 49691.

Self-Check -5	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. calculate the amount of concrete materials to required produce 3 m^3 concrete with mix ratio 1:2:4. Assume the density of cement 1400 kg/m^3 , density of aggregate 2250 kg/m^3 , density of sand 1840 kg/m^3 and wastage and shrinkage factors 5% and 30% respectively (8point)

A, 1.17,, 2.34,,,2.34 m^3

B, 0.585, 1.17,, 2.34 m^3

C, 1.23,2.15,,4.8 m^3

D, 1.2 1,6. 12,, 4.8 m^3



**Note: Satisfactory above_4 out of 8 points
point**

Unsatisfactory - below 4out of 8

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

1



Information Sheet-6	Identifying, obtaining, appropriate Materials
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6.1. What Is Concrete?

Concrete is a composite material, which is made from a mixture of cement, aggregate (sand or gravel), water and sometimes admixtures in required proportions. It is one of the most important and useful materials for construction work.

When all the ingredients (cement, aggregate, water) are mixed in the required proportions, the cement and water start a reaction with each other to bind themselves into a hardens mass. This hardens rock-like mass is known as concrete.

Advantages of Concrete:

1. Concrete is economical than other building materials.
2. The compressive strength of concrete is very high.
3. The corrosive and weathering effects of concrete are minimal.
4. Concrete can be cast in any required shape and can also cast in the construction site.
5. It is strong in compression and has unlimited applications in combination with steel reinforcement.
6. Concrete can be pumped and sprayed in Different positions.
7. Concrete is durable, fire resistant and have a little maintenance cost which can be ignored.

6.2. Concrete Materials

➤ Cement

The job to be done will determine the type of cement to select.

Cement binds the concrete mix together. There are a number of types of cement. The most common, used for general construction, is called Type I Normal Portland cement.

Another variation used in construction is white Portland cement. It is light-colored and used chiefly for architectural effects. White Portland cement is made from carefully selected raw materials and develops the same strength as the normal gray colored Portland cement.

➤ Aggregates

Aggregates used in concrete are obtained from either natural gravel deposits or are manufactured by crushing quarried rock. Natural deposits of sand and gravel may contain large amounts of deleterious aggregates such as shale and iron oxides. Therefore, some of these deposits do not meet concrete aggregate specifications. Beneficiating equipment can



sometimes remove these undesirable materials during production. During processing, oversized material is either eliminated or reduced to

Usable size by crushing. Crushed rock is generally obtained from quarried granite, quartzite, limestone, or trap rock.

- **Aggregate size**

Aggregates are divided into two general group sizes, fine and coarse. In many instances more than two actual sizes of material are used, due to a further subdivision by size of material within one or both of the groups.

A. Fine aggregate is normally considered material that will pass through a sieve having 4.75 mm (No.4) mesh. Specifications require washed, natural sand, unless otherwise provided by the Special Provisions. In some instances, fine aggregate of two or three different sizes or from more than one deposit are used.

B. Coarse Aggregates coarse aggregate is considered the material that is retained on a 4.75 mm (No.4) sieve. Two sizes of coarse aggregate are required whenever the maximum size of the aggregate is 25 mm (1 in.) or larger.

➤ **WATER**

In a correctly proportioned concrete mix, only about half of the mixing water is needed to hydrate the cement. The remainder acts as a lubricant to produce workability. When more water than is actually needed for workability is added, the concrete is diluted, its density is reduced, and it is weakened. If the water is fit to drink, it is satisfactory to use in concrete. This is not to say that water to be used in concrete must be completely pure. Impurities in water may cause efflorescence, surface discolorations, corrosion of steel as well as affecting setting time and strength.

6.3. Retardants, bonding agents

Chemical Additives (Admixtures)

Sometimes a fourth ingredient is used in addition to three basic ingredients (i.e. cement, aggregate, and water) to improve upon certain characteristic of concrete. This additional ingredient is called admixtures (also called additive). The admixtures are added to concrete mix immediately before or during mixing operation to modify certain specific characteristic of concrete in fresh or hardened state.



The purposes for which admixtures are commonly used in concrete are:

- To improve workability of fresh concrete.
- To accelerate setting and/or hardening
- To retard setting and/or hardening.
- To reduce the heat evolution.
- To improve durability of hardened concrete.
- To import water proofing properties of concrete.
- To reduce shrinkage during setting, etc.

6.4. Concrete Curing Compound?

Curing is essential for the hydration of cement in concrete making. So, to maintain required moisture content, some precautions are applied. Concrete curing compound is a compound which helps to prevent the loss of moisture content from the concrete. So, concrete is properly cured which results in the full development of strength of concrete.

6.5. Types of Concrete Curing Compounds

- Synthetic resin compound
 - Acrylic compound
 - Wax compound
 - Chlorinated rubber compound
- ✓ **Synthetic Resin Concrete Curing Compound**

Synthetic resins will seal the concrete by forming a membrane. If we want to provide plastering, the membrane can be removed by washing it with hot water.

✓ **Acrylic Concrete Curing Compound**

Acrylic is made of polymers of acrylic acid. It also seals the concrete in a good manner. It is having property of adhesion to the subsequent plaster. No need to wash the surface of acrylic with hot water if we want to provide plastering.

✓ **Wax Concrete Curing Compound**

Wax compound has similar properties like resin compound. The wax membrane will lose its efficiency with time increment.

✓ **Chlorinated Rubber Curing compound**



Chlorinated rubber type curing compound will form thick layer when we applied. It seals the concrete tightly and also fills the minute pores present in the concrete. But the film cannot stay for longer period. It is worn out in the long run.



Fig6.1 Chlorinated Rubber curing compound

6.6. Properties of Concrete Curing Compound

There are 5 properties to decide the quality of concrete curing compound namely

- Water retention
- Reflectance
- Drying period
- Long term setting
- Non-volatile matter

6.7. Process of Applying Concrete Curing Compound

Concrete curing compounds formed a membrane when we applied to fresh concrete. This member does not allow the inside moisture to come out of concrete hence, curing occurs.

These curing compounds possess waxes, natural resins, synthetic resins and solvents of high volatility. Generally white or gray colors are appeared when we apply curing compound on fresh concrete. These pigments are provided heat reflectance and also useful to check the area of curing completed.



Fig6. 2natural resins

Self-Check 6	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List Types of Concrete Curing Compounds. (5 points)
2. What is the concrete material? (3point)

Note: Satisfactory above_4 out of 8 points point

Unsatisfactory - below 4out of 8



Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

1. _____

2. _____



7.1 Environmental protection requirements

It is a necessary effort for all contractors to develop an environmental policy. Depending on the project, environmental protection can translate into time, money or both—as well as failure—to uphold a moral obligation to the community.

Failure to conduct an environmental review during the pre-construction phase of a project can lead to severe delays and work stop pages.

The environmental policy should contain a basic commitment to the environment and to environmental compliance.

Organizational tool a company can use to manage environmental responsibilities throughout the company or on a jobsite.

Even if an environmental review has been completed, project changes can affect environmental compliance. No matter how rigorous the planning and monitoring, it is likely that something will not occur as planned. Foresight into the following common changes can improve outcomes:

1. site conditions other than expected (e.g., soils are found to be more erosive or have a higher silt content than described in the technical studies);
2. discoveries of hazardous materials, or other features that cause a change in construction plans;
3. safety compromised due to environmental compliance (e.g., the permitted storm water conveyance system causes inadvertent flooding of the roadway);
4. access (e.g., the need to get equipment into a sensitive area due to restricted space);
5. changes in construction activities, location or sequencing (e.g., cannot complete in-water work by close of work window, need to change location of permanent or temporary storm water facility, etc.); and
6. Environmental commitments shown to be inappropriate or impractical.



Self-Check -7	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is Environmental protection? (5 points)



Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

1. _____



Operation Sheet 1	Obtaining, confirming and applying Work instructions
--------------------------	---

Obtaining, confirming and applying Work instructions

Step 1- Interpreting Plans, drawings and specifications

Step 2 _ Applying workplace and equipment safety, and Quality requirements

Step 3- list out specific resources and tasks (material, equipment, man power, resources)

Step 4- Submit your report to your teacher/ instructor after the data is complete

Operation Sheet 2	Calculating material quantity requirements
--------------------------	---

Calculating material quantity requirements procedure

Step 1_ interpret plan drawings and specifications

Step 2- Calculate material requirements

Step 3- Find the total amount materials

Step 4_ evaluate own actions and make judgments

Step 5- Submit your report to your teacher/ instructor after the data is complete



LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour.

Task1. How Obtaining, confirming and applying Work instructions?

Task2 how to Calculating material quantity requirements

List of Reference Materials

1. <https://www.google.com> Organizational first aid
2. <https://www.google.com/search?q=Handling+of+materials+&ie=utf-8&oe=utf-8>
3. <https://theconstructor.org/concrete/concrete-curing-compound-types/13478/>
4. <https://www.safetyinfo.com/rules-policies-safety-index/>
- 5 <https://www.wagnermeters.com/concrete-moisture-test/concrete-info/30-top-tools-concrete-construction-site/>
- 6 <tps://theconstructor.org/concrete/13-types-of-cement-uses/5974/>
- 7 <http://civilrnd.com/calculate-cement-sand-and-aggregate-for-nominal-mix-concrete/>
- 8 <http://www.greenspec.co.uk/building-design/aggregates-for-concrete/>
- 9 <http://constructionexec.com/article/what-does-environmental-protection-mean-to-the-construction->



Annex I

Answer keys for learning guide -72

Answer key

Self-check

Information Sheet-1

1, Instructions are directions or orders that you receive either verbally or in written form. Depending on your role on a construction site,

2. Specifications are documents that outline specific information that can't be shown or described in detail on the plans or drawings.

Information Sheet-2

1, C 2, B

Information Sheet-3

1, Barricading controls shall be implemented and authorized as part of the safe work system to protect persons from hazards

- 2. confined spaces;
- specific personal protective equipment (PPE) requirements;
- hazardous chemicals;
- asbestos;
- lead;

Information Sheet-4

1. **Trowels, Shovels, saw, mixer**

2. Ideal for transporting (or even mixing) small batches of concrete or tools on the job site

Information Sheet-5

1. B

Information Sheet-6

1. Synthetic resin compound,,Acrylic compound, Wax compound Chlorinated rubber compound
2. Cement, sand, aggregate

Information Sheet-7

1.It is a necessary effort for all contractors to develop an environmental policy



The trainers prepare TTLM

No	Name	Region	Qualification level	TVET College	Phone number
Zeyede Tekle	B	Dire dawa	DDPTC	0921153259	zedjesus22@gmail.com
Yibeltal Shitie	B	Amhara	MOTTA PTC	0912455288	yibecon2019@gmail.com
Mihiretu Hambisa	B	Oromia	NEKEMTIE PTC	0910195546	mihambi@gmail.com
Tariku W/Agegne	A	SNNP	DILAPTC	0916512167	mamush572@gmail.com
Fikrie Shiferaw	A	Somale	JIJIGA PTC	0913294412	

Facilitator

No	Name	Region	TVET Bureau	Email & phone number	Phone no
1	Tilahun Tesfaye	Amhara	Amhara TVED Bureau	Tilahun tesfaye eewnetu@gmail.com	0940651823
2	Abere Dagnaw	Amhara	Amhara TVED Bureau	Aberedagnaw10@gmail.com	09 18 1 41 11
3	Abdulahi Muktare	Somale	Somalia TVET Bureau		0935635068



