

# **INDUSTRIAL ARTS: MASONRY (PREPARE MASONRY MATERIALS)**

Learner's Material

This instructional material was collaboratively developed and reviewed by educators from public and private schools, colleges, and/or universities. We encourage teachers and other education stakeholders to email their feedback, comments, and recommendations to the Department of Education at [action@deped.gov.ph](mailto:action@deped.gov.ph).

**We value your feedback and recommendations.**

**Department of Education  
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**Technology & Livelihood Education – Grade 9**  
**Industrial Arts: Masonry - (Prepare masonry materials)**  
**Learner’s Material**  
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# PREPARE MASONRY MATERIALS

<b>Content Standard</b>	<b>Performance Standard</b>
The learner demonstrates understanding of the underlying principles in preparing masonry materials	The learner independently prepares masonry materials according to workplace practices

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## INTRODUCTION

This module contains information and suggested learning activities on **Masonry I**. It includes instructions and procedure on how **to mix concrete**.

This module consists of **3** learning outcomes. Each learning outcome contains learning activities supported by information sheets. Before you perform the instructions, read the information sheets and answer the SELF CHECK and activities provided to ascertain to yourself and your instructor that you have acquired the knowledge necessary to perform the skill portion of the particular learning outcome.

Upon completing this module, report to your teacher for assessment to check your achievement of knowledge and skills requirements of this module. If you pass the assessment, you will be given a certificate of completion.

Completion of this module will help you better understand the succeeding module on **Perform Basic Rebars**.

## SELECT TOOLS, EQUIPMENT AND MATERIALS NEEDED IN HAULING AND MIXING

- Identify tools, materials, and equipment used in hauling according to work requirements
- Identify tools, materials and equipment used in mixing according to work requirement
- Determine quantity and quality of material to be hauled according to job requirement
- Inspect the materials to be used
- Identify tools, materials, and equipment used in accordance with the job requirement

## PRE/DIAGNOSTIC ASSESSMENT

A. **Directions:** Complete the following sentences with the appropriate words or group of words. Write your answers on another piece of paper.

1. \_\_\_\_\_ is a material formed through the combination of calcium silicate and aluminate.
2. \_\_\_\_\_ are bricks made from clay materials used on exposed exterior and interior masonry walls and other architectural application where the size, color and texture are especially important.
3. \_\_\_\_\_ are inert materials such as sand and gravel.
4. \_\_\_\_\_ are the most commonly used materials for wall and partitions.
5. \_\_\_\_\_ are made from clay and other materials.

### INFORMATION SHEET 1.1 Materials Used in Masonry

**Concrete Building Materials includes the following:**

#### 1. Concrete Hollow Blocks (CHB)

Concrete hollow blocks are the most widely used masonry materials for all types of construction such as walls, partition and fences. Concrete blocks are building modules resembling large bricks molded from concrete (see fig.1). Commercial sizes of CHB are as follows:

4" x 8" x 16",

5" x 8" x 16", and

6" x 8" x 16",

#### 2. Bricks

Bricks are manufactured from clay and other minerals processed into a workable consistency, molded to sizes and fired in kiln for stronger, more attractive products (fig.1)

##### **Kinds of Bricks**

- a. **Common Bricks** are bricks made from clay such as the ordinary commercial bricks.
- b. **Face Bricks** are bricks made from clay materials used on exposed exterior and interior masonry walls and other architectural application where the size, color and texture are especially important.

- c. **Calcium Silicate Bricks** are bricks made from clay or non-clay materials used in furnace construction where resistance to temperature as high as 178° C is required.

### **3. Cement**

Cement is a combination of calcium silicate and aluminate. The most extensively used for common masonry works is the Portland cement. It is a very strong material used for small and large construction, including roads and highways.

#### **Different types of Cement Used in Construction**

- a) The ordinary portland cement
- b) The rapid hardening portland cement which is preferred when high early strength is desired
- c) The blast furnace or sulphate cement which is used on structures designed to resist chemical attacks
- d) The portland pozzolan cement with a low hardening characteristic concrete
- e) The low heat portland cement used for massive section designed to reduce the heat of hydration
- f) The high alumina cement also called aluminous cement or cement fundu having predominant alumina oxide of at least 32% by weight

#### **Types of Cement**

- a. TYPE I – a normal cement which is commonly used for general construction
- b. TYPE IA – this is a normal air entraining cement
- c. TYPE II – a modified cement for use in concrete in contact with soil or water containing sulfates
- d. TYPE IIA - this is a moderate sulfate resistant and air entraining cement
- e. TYPE III – a high early strength cement
- f. TYPE IIIA – high early strength air entraining cement
- g. TYPE IV – low heat of hydration cement, developed for use in massive structures such as dams
- h. TYPE V – a special high sulfate resistant cement for use in structures exposed to fluids containing sulfates such as sea water.

### **4. Angular and Round Aggregates**

These are inert materials such as sand and gravel. There are fine and coarse aggregates. Aggregates smaller than 10 millimeter in diameter are classified as fine, while aggregates bigger than 10 millimeters in diameter are coarse.

### **5. Water**

Water intended for mixing should be clean and free from oil, acid, alkali, salts or other organic materials.



**Figure1.** Concrete block is a modular material and half-units are offered to complete a project.



**Figure2.** Concrete products typically come in dry, ready-to-mix versions



## SELF-CHECK 1.1

**Direction.** Box the words/the different masonry materials which you can find in the word puzzle.

C	R	F	A	C	E	B	R	I	C	K	S	A	X
E	E	A	G	G	R	I	G	A	T	E	S	F	O
W	F	M	K	A	H	K	R	L	U	W	Q	A	Z
A	T	K	E	I	S	C	A	E	C	R	O	M	F
T	D	U	Q	N	P	I	V	H	T	U	G	E	O
A	N	U	A	H	T	R	E	O	N	A	K	Y	U
H	O	L	L	O	W	B	L	O	C	K	W	A	X
C	S	C	O	M	M	O	N	B	R	I	C	K	S

## INFORMATION SHEET 1.2

### Masonry Anchors, Ties and Reinforcements

**Steel Reinforcement** is the most widely used reinforcing material in most constructions. It is an excellent partner of concrete in resisting both tension and compression stresses. Comparatively, steel is ten times stronger than concrete in resisting compression load hundred times stronger in tensile stresses.

#### Types of Reinforcement

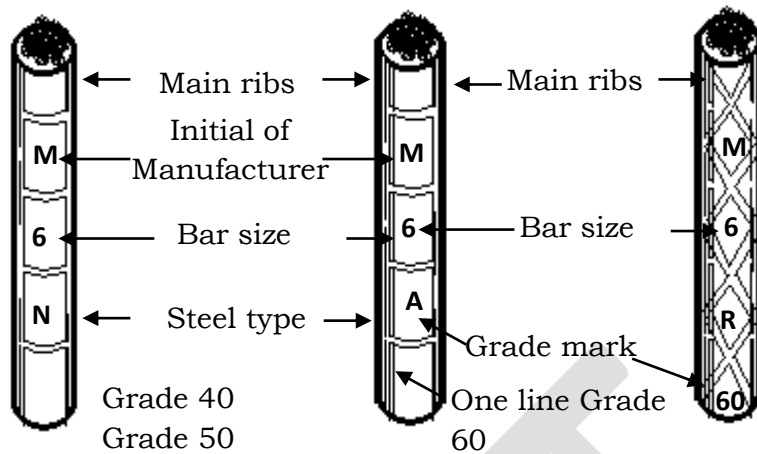
- a) **Square or round bars** – Plain
- b) **Deformed bars** – Uneven surface

#### Identification of Steel Bar

Distinguishing the different shapes and sizes of bar is a problem. One might accidentally use a lower strength or smaller size of steel bars from what is being required. All deformed bars are provided with descriptive marking, identifying the manufacturer usually by an initial and the bar size number from 3 to 18 including the type of steel such as;

- N – for billet
- A – for axis
- Rail sign – for rail steel

Additional marking for identifying high strength steel bars:



**Figure 2 Marking System**

**Table of Standard Weights**

<b>STANDARD WEIGHT OF DEFORMED ROUND STEEL BARS</b>						
Bar Diameter Ømm	Unit Weight Kg/m	Bar Commercial Length				
		6.0 m	7.5 m	9.0 m	10.5 m	12.0 m
10	0.616	3.696	4.620	5.544	6.468	7.392
12	0.888	5.328	6.660	7.992	9.324	10.656
16	1.578	9.468	11.835	14.202	16.569	18.936
20	2.466	14.796	18.495	22.194	25.893	29.592
25	3.853	23.118	28.898	34.677	40.457	46.236
28	4.834	29.004	36.255	43.506	50.757	58.008
32	6.313	37.878	47.348	56.817	66.287	75.756
36	7.990	47.940	59.925	71.910	83.895	95.880

## Tie Wire for Steel Reinforcement

*Tie wire* refers to gauge no.16 galvanized iron wire popularly called G.I. tie wire. Tie wire is used to secure the steel bars in its designed position before accepting fresh concrete.

Ordering tie wire is not by foot or meter or on its desired length but by kilogram or roll. One roll is equivalent to 40 to 45 kilograms or approximately 2,285 meters at 53 meters per kilogram.

The length of each tie wire depends upon the size of the bars to be tied on. The most common size of steel reinforcement specified for concrete hollow blocks is either 10 mm, 12 mm depending on the plan and specification. However, tie wire is cut into length ranging from 20 to 40 centimeters, long folded at the center is accepted.

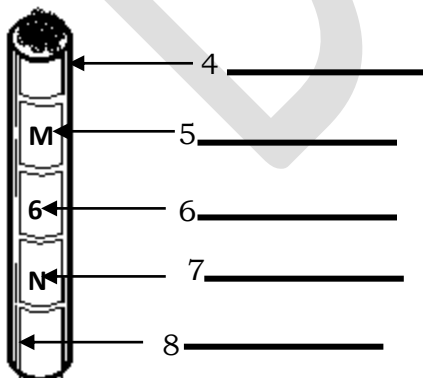
### SELF CHECK 1.2

**Direction:** Identify what is asked for. Use another sheet of paper for your answers.

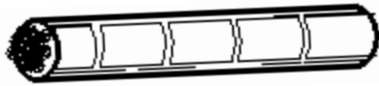
#### Types of steel bars

1. N \_\_\_\_\_
2. A \_\_\_\_\_
3. RS \_\_\_\_\_

#### Marking system



### Kinds of steel bar



9. \_\_\_\_\_



10. \_\_\_\_\_

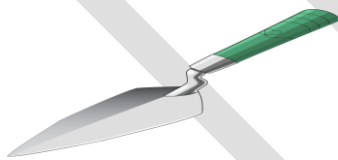
11. Tie wire Gauge No. \_\_\_\_\_
12. Weight \_\_\_\_\_
13. Length of one roll \_\_\_\_\_
14. Length of each tie wire \_\_\_\_\_
15. Length per kilo \_\_\_\_\_

### INFORMATION SHEET 1.3

#### Types and uses of hauling tools equipment and Personal Protective Equipment (PPE)

##### Tools and Equipment used in Hauling Materials for Masonry Work

1. **Spade** or **shovel** is a tool for digging, lifting, and moving bulk materials, such as soil, coal, gravel, snow, sand, or ore. Shovels are common tools that are used extensively in agriculture, construction, and gardening.



2. **Trowel** – A flat-bladed hand tool for leveling, spreading, or shaping substances such as cement or mortar.

3. **Water container** is a container suitable for hauling the water needed for the mixture of concrete.



4. **Wheel barrow** a cart with two handles, a large bowl, and usually one wheel that is used for carrying heavy loads of dirt, rocks, and is used for transporting the aggregates and cement.



5. **Buggy** is a light carriage for transporting and carrying construction materials especially for big jobs.

6. **Measuring Box** is the most commonly used and the easiest way in proportioning the volume of concrete; sand and gravel



### SELF CHECK 1.3

**Direction:** Identify what is asked for. Use another sheet of paper for your answers.

1. \_\_\_\_\_ is a light carriage for transporting and carrying construction materials especially for big jobs.
2. \_\_\_\_\_ is a container suitable for hauling the water needed for the mixture of concrete.
3. \_\_\_\_\_ is a tool for digging, lifting, and moving bulk materials, such as soil, coal, gravel, snow, sand, or ore. They are common tools that are used extensively in agriculture, construction, and gardening.
4. \_\_\_\_\_ is a flat-bladed hand tool for leveling, spreading, or shaping substances such as cement or mortar.
5. \_\_\_\_\_ is the most commonly used and the easiest way in proportioning the volume of concrete sand and gravel.

### ACTIVITY SHEET 1.1

#### Identifying Types and Uses of Tools, Equipment and PPE

● **Tools and Equipment:**

- Helmet
- Safety shoes
- Proper uniform
- Gloves
- Dust masks
- Safety goggles
- Buggy
- Wheel barrow
- Pallet

- Pallet track
- Pail
- Measuring box
- Shovel

● **Procedure:**

A. Identifying tools and equipment

1. Borrow the following tools and equipment and PPE from the tool room and state the uses.
  - a. Helmet
  - b. Safety shoes
  - c. Proper uniform
  - d. Gloves
  - e. Dust masks
  - f. Safety glasses
  - g. Buggy
  - h. Wheel barrow
  - i. Pallet
  - j. Pallet track
  - k. Pail
  - l. Measuring box
  - m. Shovel

**HAUL MATERIALS**

- Check availability of hauling equipment
- Haul construction materials

**PRE/DIAGNOSTIC ASSESSMENT**

**A. Direction:** Write true if the statement is correct and false if the statement is wrong.

1. Listen to the instruction and take note of the precautionary tips given by the teacher.
2. While working, do not engage in house play.
3. Use only tools and equipment that are in good condition.
4. Do not report any accident to the teacher, you might be scolded.
5. Do not bend your knees and do not keep your back upright when lifting heavy objects. Do not bend from the waist.

## INFORMATION SHEET 2.1

### Safety Practices in Masonry

1. Listen to the instruction and take note of the precautionary tips given by the teacher.

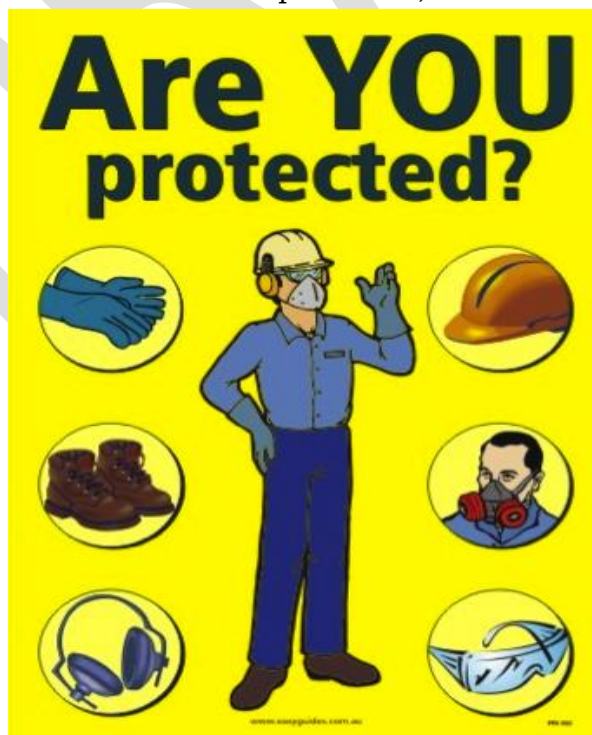


2. While working, do not engage in house play.
3. Use only tools and equipment that are in good condition.
4. Report any accident to the teacher, no matter how minor it is.
5. Bend your knees and keep your back upright when lifting heavy objects. Do not bend from the waist.

## INFORMATION SHEET 2.2

### Types of Personal Protective Equipment (PPE)

The PPE regulation covers all private and public sector workers in general industry who are exposed to hazardous processes, conditions and toxic substances.



Here are what Occupational Safety and Health Administration (OSHA) requires for specific types of PPE.



### A. Eye and Face Protection

Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing or when working with concrete and/or harmful chemicals or when exposed to flying particles, or any electrical hazards, including working on energized electrical systems.



Eye and face protectors are selected based on anticipated hazards.

### B. Head Protection



Hard Hat is a light weight protective helmet made of plastic or metal worn by construction workers.

Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects, or of accidental head contact with electrical hazards.

Routinely inspect them for dents, cracks or deterioration; replace after a heavy blow or electrical shock; maintain in good condition.

### C. Hand Protection

Gloves are required to protect workers from cuts, scrapes, punctures, burns, chemical absorption, or extreme temperatures.

Gloves should fit snugly. Workers should wear the right gloves for the job (examples: heavy-duty





rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).

**D. Hearing Protection**



Earplugs/earmuffs are plugs of cotton or rubber that is fitted to the air canal for protection against the entry of loud noise.

Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.

**ACTIVITY SHEET 2.1**

**Procedure in Hauling of Construction Materials**

**• Tools and Equipment:**

- a. Helmet
- b. Safety shoes
- c. Proper uniform
- d. Gloves
- e. Dust masks
- f. Safety glasses
- g. Buggy
- h. Wheel barrow
- i. Pallet
- j. Pallet track
- k. Pail
- l. Measuring box
- m. Shovel

**Procedure:**

1. Prepare tools and equipment for hauling masonry materials
  - a. Shovel
  - b. Buggy
  - c. Wheel barrow
2. Check work schedule on the jobsite and see to it that the quantity and types of the materials are appropriate to the job required.
3. Use the proper tools and equipment in hauling of materials.
4. Haul the materials to the work location according to the instruction of your teacher.

Qty	Unit	Material Description
5	Bags	Cement
0.5	cu.m	Sand
0.5	cu.m	Gravel

**Note:** Observance of safety measure at work prevents accidents.

### Rubrics for Assessment

1. Observance of correct procedure	30%
2. Speed of work	10%
3. Correct Materials are hauled	25%
4. Proper handling of tools.	20%
5. Safety Work habits	<u>15%</u>
	100%

### SUMMATIVE ASSESSMENT

**I. Direction:** Fill in the blank with the word or group of words to complete the statement.

1. The bricks made of clay used in exposed exterior and interior masonry walls and other architectural applications where the size, color, and texture are important are called \_\_\_\_\_.
2. A type of cement commonly used in small and large construction such as roads and buildings and other concrete works is \_\_\_\_\_.
3. A type of cement used in structures designed to resist chemical attacks \_\_\_\_\_.
4. Aggregates smaller than 10 mm in diameter are classified as fine, while aggregates bigger than 10 mm in diameter are \_\_\_\_\_.
5. The brick made of clay such as the ordinary and commercial bricks are called \_\_\_\_\_.
6. An important material intended for mixing aggregates and must be free from oil, acid, alkali, salts and other organic materials is \_\_\_\_\_.
7. \_\_\_\_\_ is considered the most common and widely used material for concrete reinforcement.
8. A galvanized iron, usually gauge 16, used to hold reinforcement materials in place is \_\_\_\_\_.

9. The most common sizes of rebars used in concrete hollow blocks laying are either \_\_\_\_\_ or \_\_\_\_\_.
10. Tie wire is cut into length ranging from \_\_\_\_\_ cm to \_\_\_\_\_ cm long folded at the center.
11. The most appropriate tool used in digging, lifting and moving bulk materials such as soil, coal, gravel and sand is \_\_\_\_\_.
12. \_\_\_\_\_ is a tool for leveling, spreading, or shaping substances such as cement or mortar.
13. \_\_\_\_\_ is commonly seen on the job site used for transporting the aggregates and cement.
14. A job site is not complete without this tool used to measure the proportion of sand and gravel to that of the cement. \_\_\_\_\_
15. \_\_\_\_\_ is suitable for hauling water needed for the mixture of concrete.

**II.** Complete the table with the needed information.

<b>COMMON AREAS FOR PROTECTION</b>	<b>TYPE OF PPE</b>	<b>USES</b>
Eye and Face Protection	1.	2.
3.	Hard Hat	4.
5.	6.	Protection from cuts, burns, chemical absorption or extreme temperature
Hearing Protection	7.	8.

**III.** Enumerate/list the procedure in Hauling.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_