Cement hollow blocks (CHB) and Cement grills

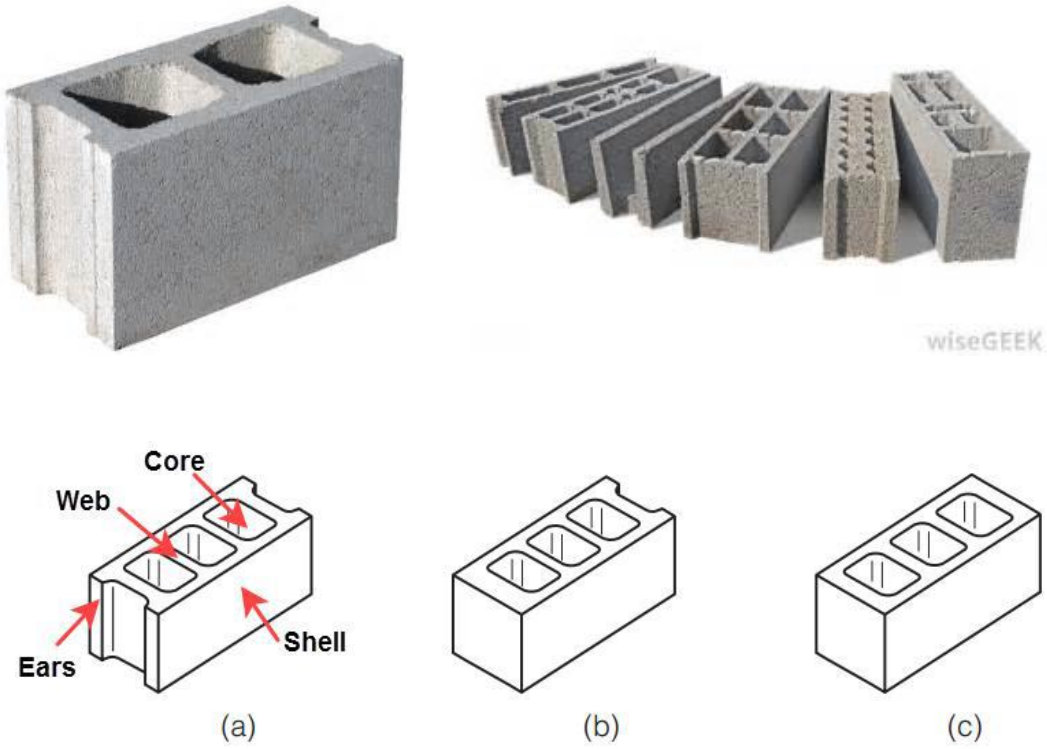
Introduction

A Concrete masonry unit (CMU) – also called cement block, concrete block, and foundation block – is a large rectangular brick used in construction. Concrete blocks are made from cast concrete, example: Portland cement and aggregate, usually sand and fine gravel for high-density blocks.

- Solid concrete units are commonly called concrete bricks, while hollow units are known as concrete or cement block(CHB).
- Cement hollow blocks are specified by their nominal dimensions. The nominal dimension is greater than its specified dimension by the thickness of the mortar joint, usually 10 mm. For example

✓ A 200 x 200 x 400 block has an actual width of 190 mm, height of 190 mm, and length of 390 mm.

✓ Load-bearing cement blocks are available in nominal widths of 100 mm, 150 mm, 200 mm, 250 mm, and 300 mm, heights of 100 mm and 200 mm, and lengths of 300 mm, 400 mm, and 600 mm.



Figure(1):-Concrete masonry units: (a) stretcher, (b) single-corner, and (c) double-corner.

Grades of CMU Block:

1) Grade "N" - Suitable for use above or below ground and exposed to weather.

2) Grade "S" - Only for above ground, not exposed to weather.

Advantages:

- High durability
- Different surfaces with different color shades
- Self-contained - CMU building materials can act as the structure, walls, foundation and other components of the building.
- High Fire resistance

- Local Labor - Practically any contractor is capable of building with CMU.
- Low maintenance

Disadvantages:

- High weight (Heavy) -Masonry buildings weigh more than comparable steel-framed and wood-framed buildings.
- Lower thermal resistance
- Demanding – labor consumption
- Absorbent - CMU, like any other cementitious material is absorbent to water penetration and must be weather-proofed.
- Difficult to insulate - walls must be insulated by adding width to them.

- CHB walls are very weak against lateral loads (pushing or pulling forces from typhoon or earthquake). Adding steel reinforcing bars vertically and horizontally inside the CHBs can increase their resistance to lateral loads.

Manufacturing of concrete masonry units

Manufacturing process of concrete blocks consists of four basic processes: (a) mixing, (b) molding, (c) curing, and (d) cubing as shown in Figure 2.

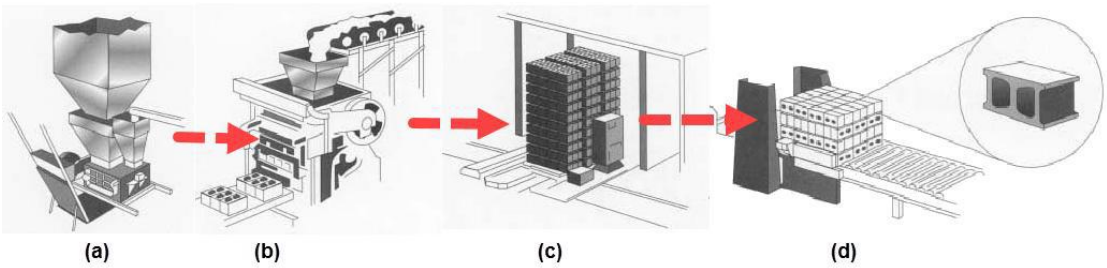


Figure (2). Four basic processes of the manufacturing process of concrete blocks: (a) mixing, (b) molding, (c) curing, and (d) cubing.

Properties of concrete masonry units

Concrete masonry units are manufactured in three classes, based on their density: lightweight units, medium-weight units, and normal-weight units, with dry unit weights as shown in Table 1. Well graded sand, gravel, and crushed stone are used to manufacture normal-weight units. Lightweight aggregates such as pumice, scoria, cinders, expanded clay, and expanded shale are used to manufacture lightweight units.

Table (1): Weight classifications and allowable maximum water absorption of concrete masonry units

Weight Classification	Unit Weight	Maximum Water Absorption (Average of 3 units)
	kg/m³	kg/m³
Lightweight	Less than 1680	288
Medium Weight	1680 –2000	240
Normal Weight	2000 or more	208

Table (1) shows the allowable maximum water absorption for load-bearing concrete masonry units.

The amount of water absorption of concrete masonry units is controlled to reduce the effect of weathering and to limit the amount of shrinkage due to moisture loss after construction.

Concrete masonry units can be classified as load bearing and non–load bearing. Load-bearing units must satisfy a higher minimum compressive strength requirement than non–load-bearing units, as shown in Table (2).

Table (2): Strength requirements of load bearing and non–load bearing concrete masonry units

Type	Minimum Compressive Strength Based on Net Area [MPa]	
	Average of Three Units	Individual Units
Load bearing	13.1	11.7
Non-load bearing	4.1	3.5

Applications of concrete masonry units

The typical uses for concrete block include:

- ✓ Foundation walls
- ✓ Basement walls.
- ✓ Partition walls
- ✓ Exterior walls
- ✓ Coatings are often are applied to concrete block in order to prevent water penetration.
- ✓ Lightweight units have higher thermal and fire resistance properties and lower sound resistance than normal weight units.