



7TH LECTURE (CONCRETE)

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WHAT ARE MATERIALS FOR MAKING CONCRETE

1- cement

- Cements in a general term are **adhesive**(لاصق) and **cohesive**(متماسك) materials which are capable of **bonding** together particles of solid matter into a compact durable mass.
- Its primary function being to bind the fine (sand) and coarse aggregate particles together.
- Cements used in construction industry may be classified as **hydraulic and non hydraulic**. non-hydraulic lime are unstable in water, e g. Plaster of Paris.
- The hydraulic cement set and harden in water and give a product which is stable. Portland cement is one of it.

- Cement can be manufactured either from natural cement stones or artificially by using calcareous and argillaceous materials. The examples of natural cements are Roman cement, Puzzolana cement and Medina cement and those of artificial cement are Portland cement and special cements.



2- Aggregate

Aggregates are the materials basically used as filler with binding material in the production of mortar and concrete. They are derived from igneous, sedimentary and metamorphic rocks or manufactured from blast furnace slag, etc.

To increase the bulk density of concrete aggregates are used in two markedly different sizes—the bigger ones known to be **coarse aggregate (grit)** and the smaller ones **fine aggregate (sand)**. The coarse aggregate form the main matrix of concrete and the fine aggregate from the filler matrix between the coarse aggregate.



According to geological origin

- Natural aggregate
- Artificial aggregate

According to size

- Fine aggregate
- Coarse aggregate
- All-in-aggregate
- Single-size-aggregate

According to shape

- Rounded aggregate
- Irregular aggregates
- Angular aggregate
- Flaky and elongated aggregate

Based on unit weight

- Normal-weight aggregate
- Heavy-weight or high-density aggregate
- Light-weight aggregate

Classification Of Aggregate Origin

1- According to geological origin

The aggregates may be classified into **natural aggregates** and **artificial aggregates**

A) These are obtained by crushing from quarries of igneous, sedimentary metamorphic rocks. Gravels and sand reduced to their present size by the natural agencies also fall in this category. Aggregates obtained from pits or dredged from river, creek or sea are most often not clean enough or well graded to suit the quality requirement.

B) Broken bricks and synthetic aggregates are artificial aggregates.



Natural aggregate



Artificial aggregate

3- Water

The amount of water in concrete controls many fresh and hardened properties in concrete including **workability, compressive strengths, permeability and water tightness, durability and weathering, drying shrinkage and potential for cracking**. For these reasons, limiting and controlling the amount of water in concrete is important for both constructability and service life

4- Lime

Until the invention of Portland cement, lime was used as the chief cementing material in the building construction both for mortar and plasters. Most of the ancient palaces, forts, temples, monuments, etc., have been built with lime. Though Portland cement has almost replaced lime, but still at places, where lime is available locally and during the period of shortage of ordinary Portland cement lime provides a cheap and alternative to cement.



CONCRETE

Concrete is an engineering material that simulates the properties of rock and is a combination of particles closely bound together. Concrete is a complete building material used for **foundation walls, concrete slabs, patios, and many other masonry structures.**



Main Component of Concrete

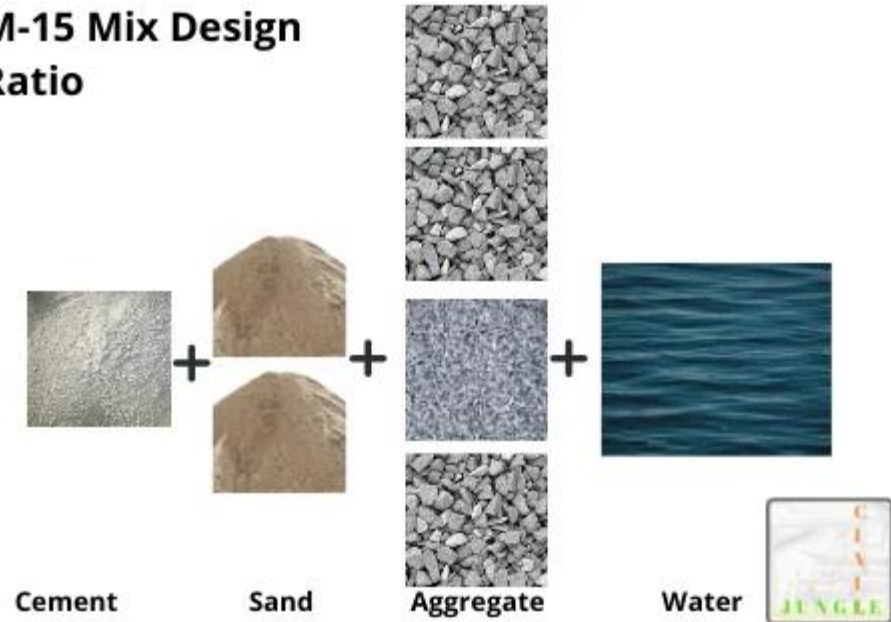
1. Cement
2. Coarse aggregate
3. Fine aggregate
4. water



Concrete Mix Proportions

The safest bet for any concrete mix is four-two-one: four parts crushed rock; two parts sand; and one part cement. The four-two-one mix, obviously, has seven parts.

M-15 Mix Design
Ratio



TYPES OF CONCRETES & THEIR USES:

Concrete are classified into different types as follows:

- According to binding material used in the preparation of concrete.
- According to design of concrete.
- According to purpose of concrete

Classification according to the binding material:

A .Cement concrete:

The concrete consisting of cement, sand and coarse aggregate mixed in suitable proportions in addition to water is called cement concrete.

b. Lime concrete:

The concrete consisting of lime, a fine aggregate and coarse aggregate mixed in suitable proportions in addition to water is called lime concrete.



Classification according to design:

a. Plain cement concrete :

- The cement concrete in which no reinforcement is provided is known as plain cement concrete. It is commonly used for **foundation** work and **flooring of buildings**.

b. Reinforced cement concrete (R.C.C):

- The cement concrete in which reinforcement is embedded for taking **tensile, excessive compressive** or **shear stresses** is called reinforced cement concrete.

C• Pre-stressed cement concrete (P.C.C):

- The cement concrete in which high compressive stresses are artificially induced before their actual use is called pre- stressed cement concrete.

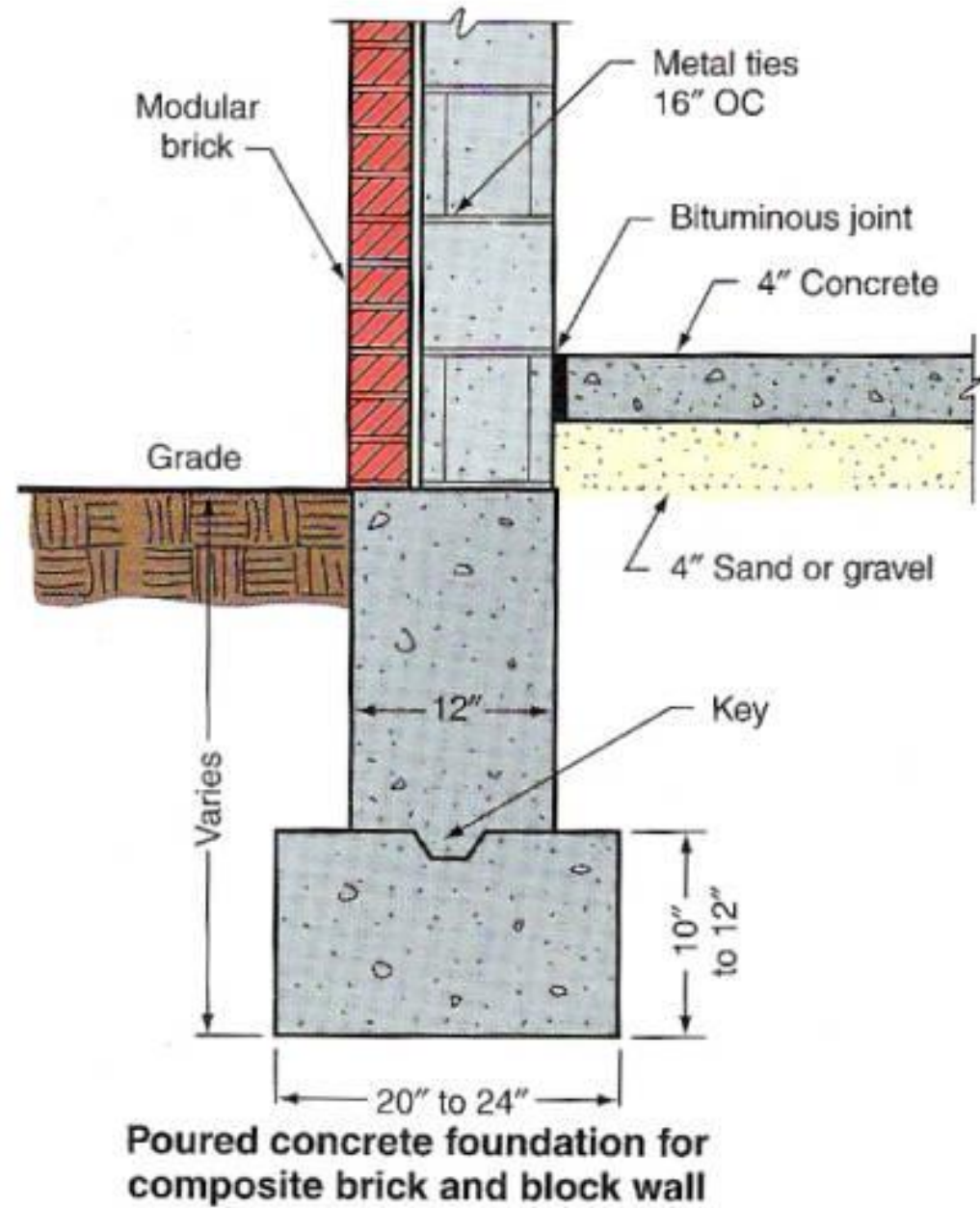
CHARACTERISTICS OF GOOD CONCRETE:

- Crushing strength
- Durability
- Impermeability
- Resistance to abrasion

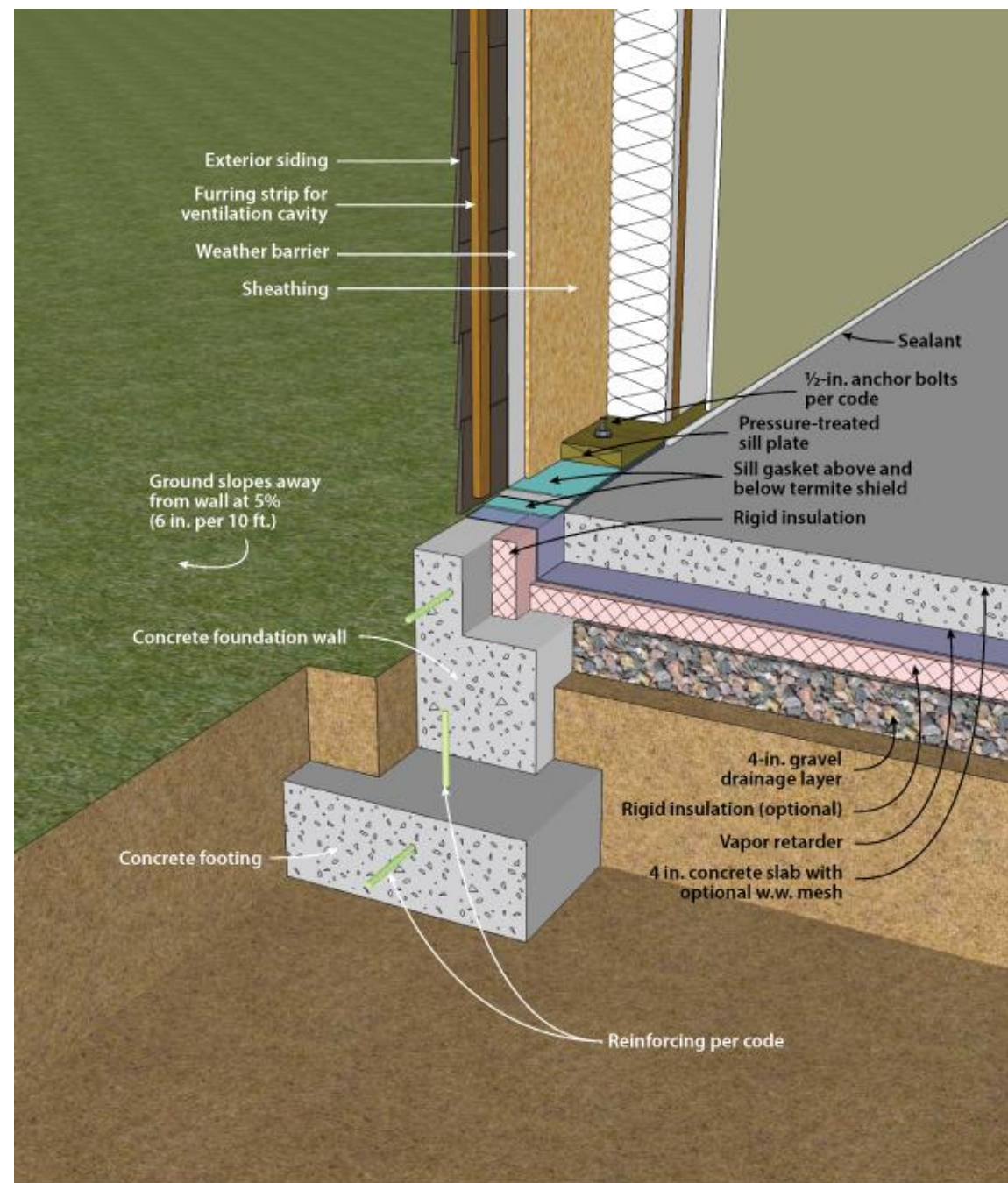
Resistance to fire

- Workability
- Compactness
- Shrinkage
- Economy.
- Appearance

Use of Concrete

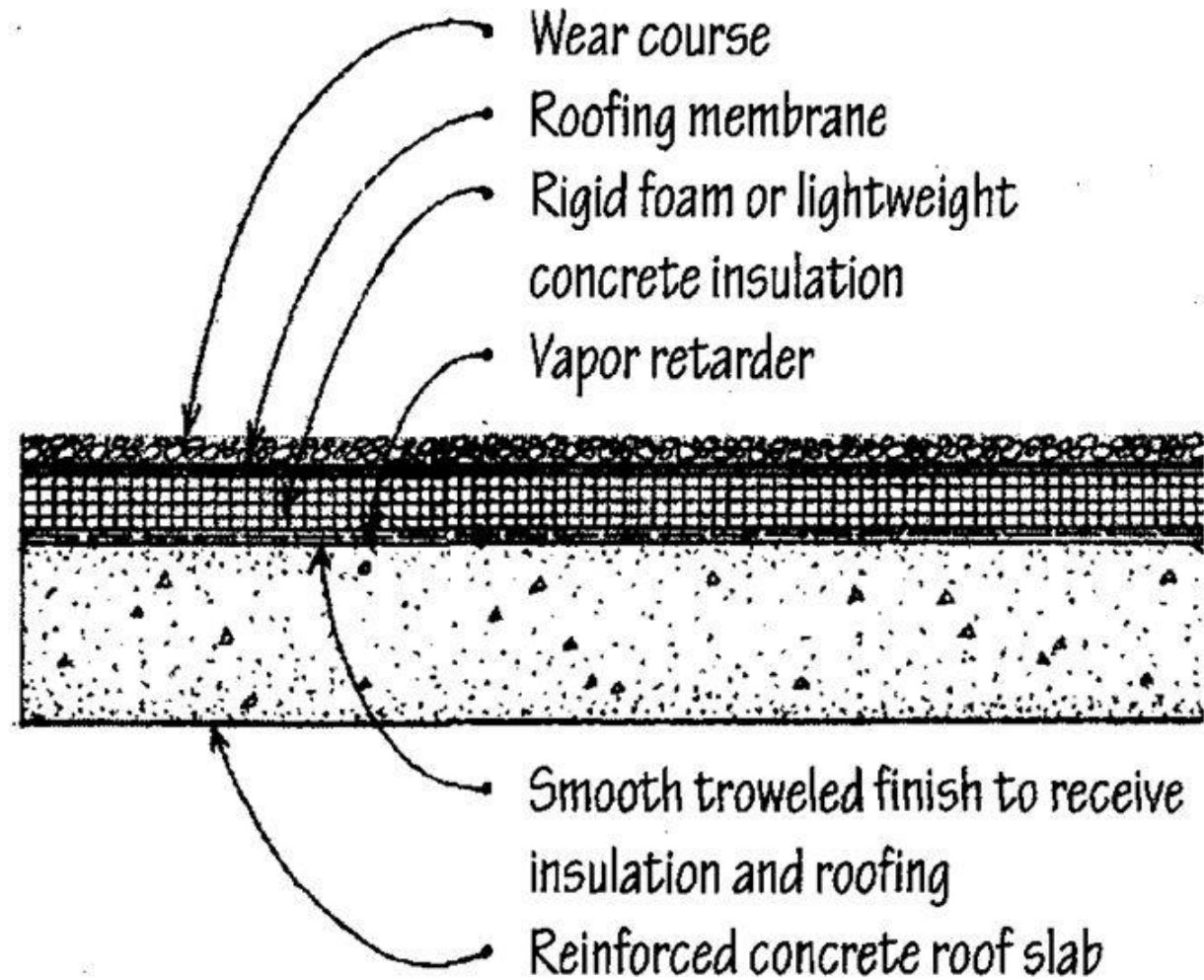


Use of Concrete



FLAT ROOF SECTION

Use of Concrete



Discussion part

1. What are different types of aggregates for making mortar and concrete?
2. Discuss the requirements of water for (a) Making concrete (b) Washing aggregates (c) Curing concrete
3. what is different between Lime and Cement.
4. clarify concrete component proportion types.
5. Use of concrete in construction
6. Concrete mixture type and their purpose of use

**THANK
YOU**