

كلية المستقبل الجامعة

وزارة التعليم العالي والبحث العلمي
جمهورية العراق

Concrete Technology
Second year
Lecture :1

قسم هندسة تقنيات البناء والانشاءات

Building & Construction Technology Engineering
Department

Session: 2019 – 2020

Produced by:
Alaa Hussein Ali

Chapter 1: Introduction

Definition of Concrete

Concrete is a mixture of cement (11%), fine aggregates (26%), coarse aggregates (41%) and water (16%) and air (6%).

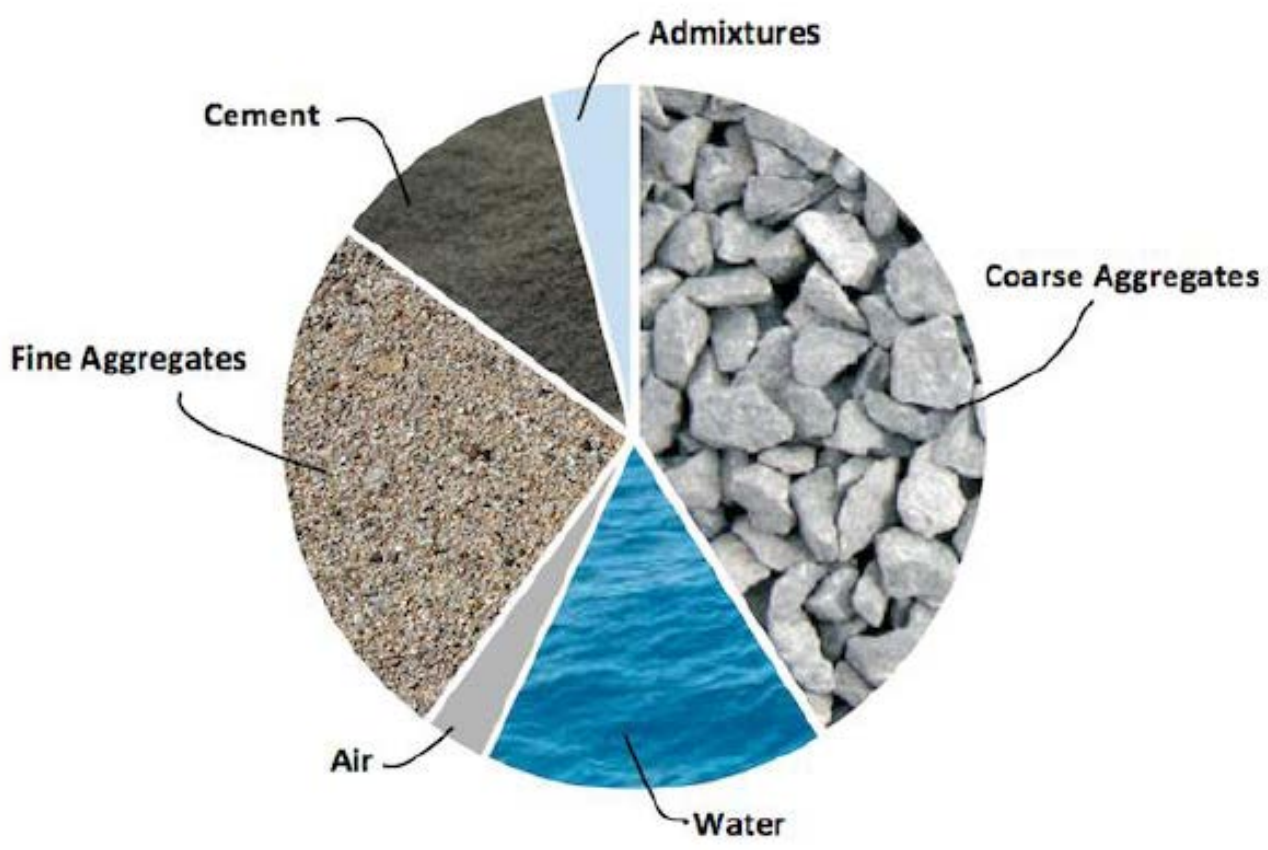
Cement \longrightarrow Powder

Cement + Water \longrightarrow Cement Paste

Cement Paste + Fine Aggregate (FA) \longrightarrow Mortar

Mortar + Coarse Aggregate (CA) \longrightarrow Concrete

Portland cement, water, sand, and coarse aggregate are proportioned and mixed to produce concrete.



• Definition of Cement

Portland cements are hydraulic cements, meaning they react and harden chemically with the addition of water. Cement contains limestone, clay, cement rock and iron are blended (تمزج او تخلط) and heated to 1200 to 1500 C°. The resulting product "clinker". Gypsum is added to control setting time.

- **Definition of Fine Aggregate**

Normally called sand, this component can be natural sand or crushed stone, and represents particles smaller than 4.75 mm. Generally for 30%-35% of the mixture.

- **Definition of Coarse Aggregate**

May be either gravel or crushed stone. Makes up 40%-45% of the mixture, comprised of particles equal or greater than 4.75 mm.

Definition of Chemical Admixtures

- Materials added to alter (تغيير) the properties of concrete including:
 - Air entrainment
 - Set accelerators
 - Set retarders
 - Water reducers
- ❖ Air entraining admixtures add microscopic air bubbles to the concrete, enhancing its resistance to freeze/thaw cycles and makes the concrete easier to finish.

- ❖ Set accelerators speed the set-time of the mixture, enabling finishing operations to begin sooner, useful during cold weather.
- ❖ Set retarders have the opposite effect, slowing the set and enabling delivery to distant sites and finishing during hot weather.
- ❖ Water reducers are used to reduce the amount of water required to produce a given slump. They also making the concrete easier to finish, and produce better cement hydration. By reducing the amount of water required, cement amounts can be reduced because concrete strength is directly related to the water/cement ratio.

• Definition of Mineral Admixtures

Mineral admixtures include fly ash, hydrated lime, silica fume غبار السيليكا and ground blast furnace slag خبث افران الحديد. Many of these materials have like properties of cement, increase زياده the strength and density of the concrete. They generally improve the workability, density and long-term strength of concrete.

• Definition of Synthetic Fibres الألياف الاصطناعية

These are thin polypropylene fibers used as secondary reinforcement. They help control shrinkage cracking and provide some impact resistance.

General properties of concrete

Advantages of Concrete

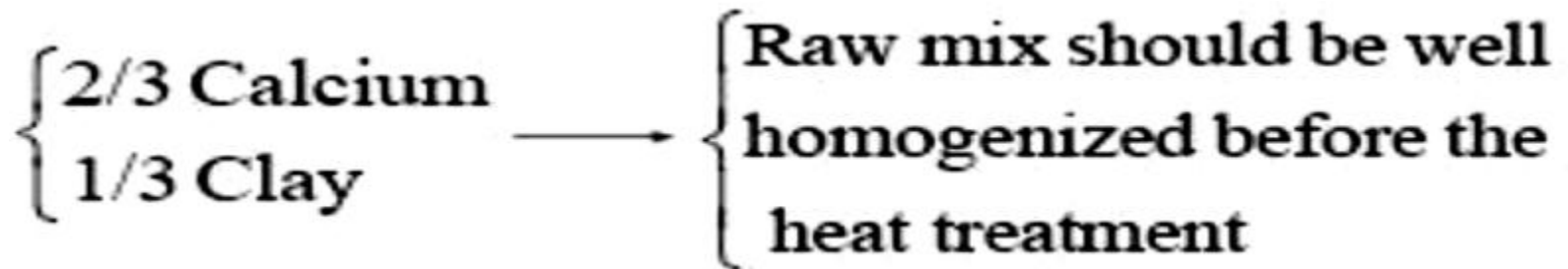
- Concrete has many environmental advantages, including durability ديمومه, heat storage capability, and chemical inertness الخمول الكيمائي.
- Ability to be Cast to forming any shape.
- Fire resistant مقاومة الحريق
- On-site fabrication يمكن صنعة داخل الموقع
- The raw materials used in cement production are widely available in great quantities.

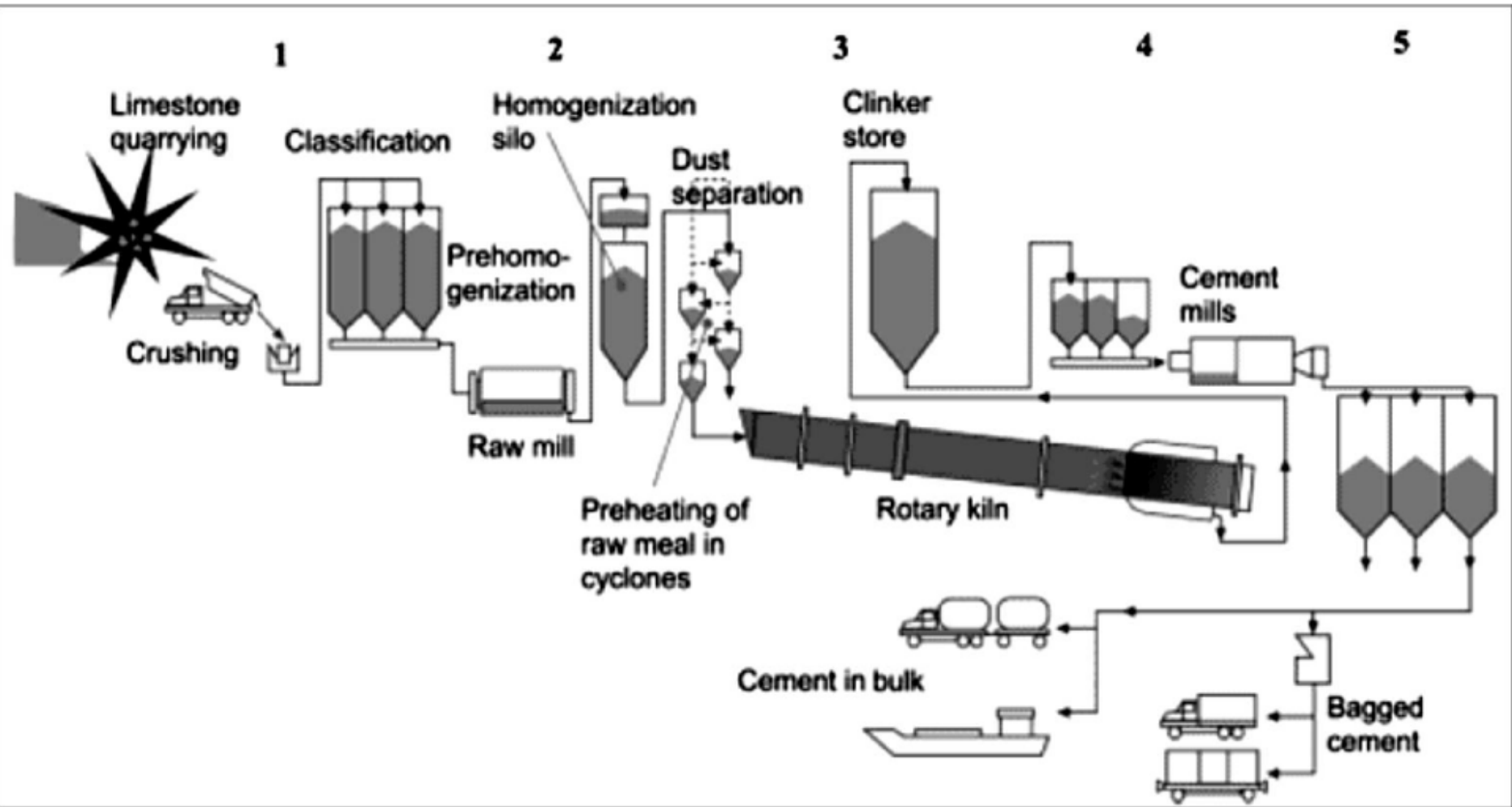
- Needs little or no finish or final treatments.
- Low maintenance.
- Can be **reused** or **recycled**.
- Concrete can be **reused** with bituminous asphalt as road base materials, can be recycled and reused by crushing into aggregates for new concrete or as fill material for roadbeds or site works.

Limitations of Concrete

- Low tensile strength
- Low ductility
- Volume instability عدم استقرار الحجم
- Low strength-to-weight ratio

Process Flow Chart





Cement raw materials

- Calcareous **كلسية** او **جيرييه** material – such as limestone **حجر الكلس** or chalk, as a source of lime (CaO).
- Clayey material – such as clay or shale **صخر طيني** (soft clayey stones), as a source of silica and alumina.

*THANK YOU FOR
YOUR ATTENTION*

YOUR ATTENTION
THANK YOU FOR