**الفصل الاول / المحاضرة الاولى**

**تقنية صناعة الخرسانة 023/024**

**Definition of Concrete**

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

(16%) and air (6%)

Cement = powder

Cement + water = Cement Paste

Cement Past + Fine Aggregate ( FA) = Mortar

Mortar Paste +Coarse Aggregate = Concrete

Produced cement

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** ( *تخلط او تمزج* ) 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**,

 The **fin aggregate** 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**.

***Chemical Admixtures***

**Materials added to alter )**تغيير **(the properties**

**of concrete including :**

**• Air entrainment**

**• Set accelerators** *مسرع تماسك الاسمنت*

**• Set retarders :** *مواد معوقة للإسمنت*

**• Water reducers** *خليط مضاف مخفض للماء*

 **\*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 during cold weather . *تمكين عمليات التشطيب أن تبدأ في وقت اقرب خلال عمليات التشطيب*

**\* 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***, رماد متطاير***hydrated lime, silica fume**

*غبارالسيليكا* **and ground blast furnace**فرن **slag** *خبث* **.**

Many of these materials have like properties of cement, increase زياده the

strength and density of the concrete. The generally improve the workability, density and long-term strength of concrete.

**Definition of Synthetic Fibers** *الالياف الصناعية*

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 الكيميائي* .

\* Ability to be Cast to forming any shape.

\* Fire resistant *مقاومة الحريق*

 \*On – site fabrication *يمكن صناعته 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.

Limitations of Concrete

\* Low tensile strength

\* Low ductility

\* instability Volume عدم استقرار الحجم