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# White Cement Concrete as an Element Sustainable Construction

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### ABSTRACT

The effect of materials on local air temperature is a rapid expansion of research. Basic research in this area is directed to color and the composition of materials and their ability to reflect or absorb (and emit) solar radiation. The color and composition of materials greatly affect the temperature Materials exposed to solar radiation. The thermal energy from the absorbed solar radiation will They eventually enter the surrounding atmosphere, causing local heating. Smog levels It has also been associated with high temperature. Thus, as urban temperature It increases, as does the potential for smog and pollution. One of the discounted items, among other things, the above-mentioned negative effects on the environment are white Cement. White cement concrete is very popular with architects thanks to it Pure and uniform appearance. The paper presents the properties of white cement, white Concrete and the benefits of its use as a component of sustainable construction practice.

The main research significance is producing white concrete mix by using sustainable white material made from natural material and compare it with normal concrete the results that this study conclude was:

White concrete made from white material with cubic compressive strength (35.), cylindrical compressive strength (277 MPa) at 28 days of curing and density (2274 kg/m<sup>3</sup>) it can be used in the structure's construction. Otherwise, the cubic compressive strength of the normal concrete was (29.2 MPa) cylindrical compressive strength (25 MPa) at 28 days of curing and density (2474 kg/m<sup>3</sup>).

Splitting Tensile Strength (*f<sub>ct</sub>*) was 3.57 for wc and 3.64 for Nc at age of curing 28 days, percentage decrease in the tensile strength for white concrete by 3% to the normal concrete as a reference mix due to the density of the mix.

Flexural Tensile Strength (Modulus of Rupture )74 for white concrete and 5.1 for normal concrete. there were an decrease by 7% compared to reference mix

## 1.Introduction

There are a large number of papers proving that daytime temperatures Big cities are higher than their suburbs. The term "heat island" describes built-up areas that are hotter than nearby rural areas Regions. The average annual air temperature of a city with a population of one

million or more people can be 1–3 degrees Celsius warmer than its surroundings. In the evening the difference can reach 12 degrees Celsius [1]. The "urban heat island" (UHI) effect is a problem in warm summer climates It increases the demand for electricity for air conditioning and increases... Smog concentration. Rising temperatures in urban

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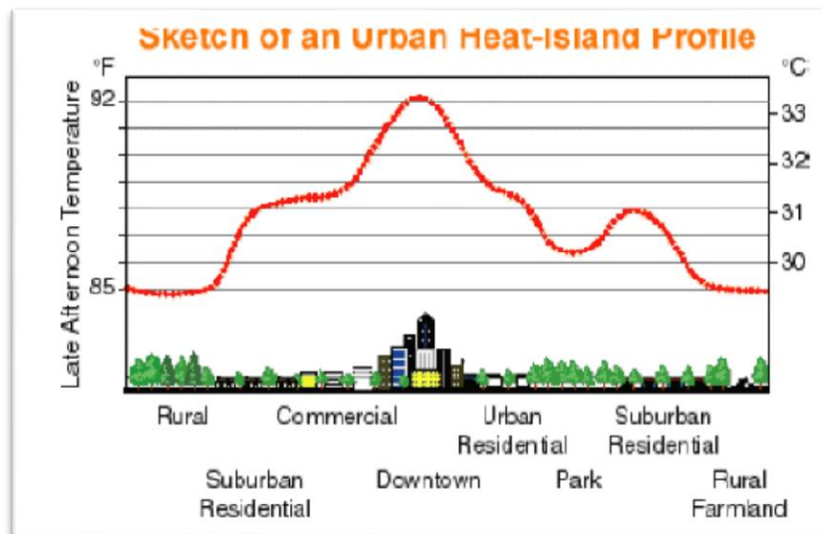
centers can lead to the following negative impacts:

- Accelerate the chemical reactions that produce ozone and smog at ground level is likely to threaten public health and affect the comfort of residents,
- Rising temperatures in urban areas can exacerbate extreme weather events such as heat waves affect city dwellers and may cause heatstroke, especially in urban areas big

- May increase cooling costs and associated uses electricity generation [1].

Some causes of UHI are difficult to treat (eg , airflow restriction).Due to buildings and necessary human activities that release thermal energy), but some

It is within our easy control [2,3,4]. Heat island effect as shown in Figure 1.



**Figure 1.** Urban Heat Island Profile [5].

Albedo is the percentage of incoming radiation reflected from a surface. That Albedo 1 means that 100% of the incoming radiation is reflected (no radiation Absorbs); An albedo of 0 means that 0% of the incoming radiation is reflected (all radiation is absorbed). The greater the reflected radiation, the less Global warming that is occurring. It is known how ice caps reflect solar radiation and For this reason, its melting is a big problem. Fresh snow is almost white 0.9 [6]. A composite index called the Solar Reflectance Index (SRI) is used by the United States. The Green Building Council and others estimate how hot a roof gets when exposed to it To full sun. The surface temperature depends on the surface reflectance and radiation, as well as solar radiation. The solar reflectance index (SRI) is used Determine the effect of reflection and emission on surface temperature, and It ranges from 100 for a

standard white surface to 0 for a standard black surface [5]. Table 1 shows the reflectance, emittance and SRI of some common building materials.

Light colored exposed concrete can be used in our urban areas and roads Helping with overall energy savings, safety, comfort, and ambiance for the general public. This is the guideline for Low Impact Development (LID). Light-colored concrete absorbs less heat and reflects more light than dark-colored concrete materials, thus maintaining a low surface temperature. It has been proven that high whiteness concrete has a positive effect on... local ambient temperatures and can reduce energy requirements for cooling buildings. Light-colored sidewalks also require less site lighting for safe night time Lighting levels, whether in parking lots, driveways or sidewalks. Less illumination for sight Requires less energy. Although it is not always an

indicator, light-colored materials have a high score Albedo, where materials that appear darker usually have lower albedo. Material The ability to reflect infrared light is directly

proportional to the ability of the material to reflect Heat from the surface [7].

**Table 1. Solar reflectance (albedo), Emittance, and Solar Reflective Index (SRI) of select material surfaces [5].**

Material surface	Solar Reflectance	Emittance	SRI
Black acrylic paint	0.05	0.9	0
New asphalt	0.05	0.9	0
Aged asphalt	0.1	0.9	6
“White” asphalt shingle	0.21	0.91	21
Aged concrete	0.2 to 0.3	0.9	19 to 32
New concrete (ordinary)	0.35 to 0.45	0.9	38 to 52
New white portland cement concrete	0.7 to 0.8	0.9	86 to 100
White acrylic paint	0.8	0.9	100

## 2. White cement– Properties

White cement takes artistic expression to new heights, allowing architects, Engineers and contractors have the freedom to choose from an unlimited range of colours. Textures, shapes, sizes and patterns to accommodate many applications [8] [3] [9]. AALBORG WHITE® meets the requirements imposed by most countries for rapid hardening Cement is made from pure white chalk and finely ground sand. Therefore, the content of substances that may color cement is limited to a minimum. The Small amounts of colored substances that are always present in the raw materials are bound The coloring effect is eliminated by using special flame cleaning Technique. AALBORG WHITE® has a very low alkalinity and high sulfate content resistance. It is therefore ideal for passive as well as aggressive concrete Environments (such as bridges or structures in contact with sulfurous groundwater). Concrete made with AALBORG WHITE® gains relative height quickly Its compressive strength and ultimate strength are much higher than that of concrete Ordinary gray Portland cement is used. AALBORG WHITE® carries a product Certified and conforms to US EN 197-1 and ASTM C 150 requirements. White concrete with high reflectivity has a higher light reflectance than gray Cement. When gray concrete has a reflectance consistent with a Hunter L value of 40, White concrete has a reflectivity corresponding to a Hunter L value

of up to 85. When concrete surfaces are wet the difference is greater. With wet concrete The Hunter L value for gray concrete can be reduced to approx. 20 where the value is for white Concrete can be reduced to approx. 70 [10]. Product characteristics of Aalborg White Cement - Portland Cement CEM I 52.5 shown in Table 2.

In Table 3, the performance announcement for Portland White Cement appears CEM I 52,5 R - SR5 cement, Aalborg, Denmark, is used in the preparation of concrete And mortar and others [11].

## 3. WHITE CONCRETE

White concrete is synonymous with clear, beautifully coordinated light and colours Rooftops – whether on large or small buildings, or in facilities of any size. Construction works It automatically looks more elegant and slim when created using white Concrete. The light-reflecting property of white concrete is particularly beneficial as Practical function in manufacturing sidewalks, road markings, tunnel ramps and paving Stones, in-situ construction, mortar, paints, and terrazzo [12]. Table 4 shows the albedo reflectance of different pavement surfaces.

**Table 2.** Product characteristics for Aalborg white cement “Portland cement CEM I 52.5” [11].

Cement designation		To EN 197-1		ASTM C 150	
Type		Portland cement			
Designation		CEM I 52.5		I II III V	
Strength class		52.5			
Content of clinker minerals a.o. in %					
C <sub>3</sub> S	C <sub>2</sub> S	C <sub>3</sub> A	C <sub>4</sub> AF	Na <sub>2</sub> O eqv.	CaSO <sub>4</sub>
62	25	4	1	0.2	3-5
Density and setting					
Absolute density		kg/m <sup>3</sup>		3150	
Bulk density		kg/m <sup>3</sup>		1100	
Setting time, initial		100 minutes			

**Table 3.** Declaration of performance Aalborg white cement, “Portland cement CEM I 52,5 R - SR5” [11].

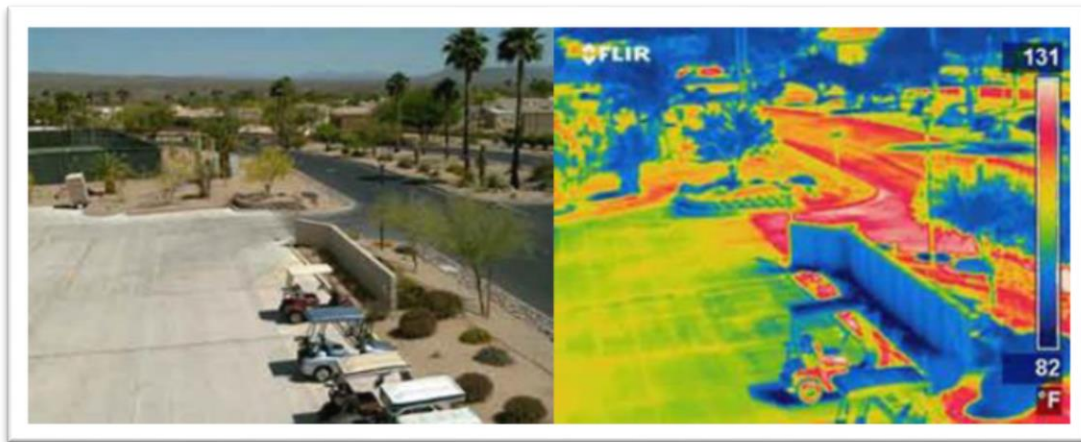
Essential characteristics	Performance	Requirements in EN 197-1
1 day strength	21 - 27 MPa	None
2 days strength	39 - 47 MPa	≥ 30 MPa
7 days strength	53 - 65 MPa	None
28 days strength	66 - 76 MPa	≥ 52.5 MPa
Initial setting time	110 - 160 min	≥ 45 min
Loss on ignition	≤ 2 %	≤ 5.0 %
Insoluble residue	≤ 0.3 %	≤ 5.0 %
Sulphate content SO <sub>3</sub>	1.8 - 2.3 %	≤ 3.5 %
Chloride	≤ 0.04 %	≤ 0.10 %

**Table 4.** Albedo: Reflectance of Pavement Surfaces.

Albedo: Reflectance of Pavement Surfaces	
Asphalt	0.05–0.10 (new)
	0.10–0.15 (weathered)
Gray Portland Cement Concrete	0.35–0.40 (new)
	0.20–0.30 (weathered)
White Portland Cement Concrete	0.70–0.80 (new)
	0.40–0.60 (weathered)

The infrared image, Figure 2, shows that the concrete is light coloured Stays cooler than a dark colored asphalt road. It can easily be estimated that a A city with dark roads and roofs will become hotter resulting in a local

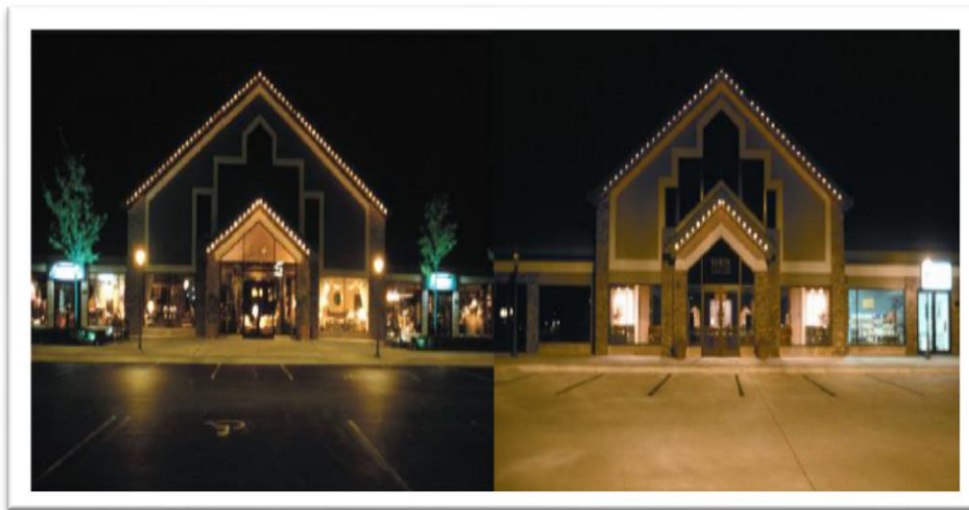
heat island Impacts and effects of global warming on a broader scale. There can be a local heat island effect Significant cost implications.



**Figure 2.** The infrared image demonstrates that the light colored concrete remains cooler than the darker colored asphalt road.

Figure 3 shows that there is a low need for artificial lighting. The surfaces are lighter in color. These two pictures are of similar shopping centers with the same degree of artificial lighting. The difference in scintillation is due to the fact that the parking lot in one of the centers is asphalt and in the other, it is

lighter in color than concrete. Due to increased visibility as a result light-colored concrete has a major safety benefit. Using light-colored surfaces can reduce energy consumption by up to 30% because reducing artificial lighting is required to achieve similar brightness [13].



**Figure 3.** The difference in luminescence between asphalt and lighter colored concrete.

Voorhuter provided an example of pilot testing of white concrete in aggressive environments are described in the paper “The White Concrete of Aggression Allport White Environment” [13]. Besides the reference concrete, each series contains concrete containing the following Powder sets:

- One concrete based on 100% Aalborg White (AW) without any other powder.
- One concrete based on 95% AW and 5% silica fume.
- One concrete based on 100% AW with 2 kg of zinc stearate per cubic meter of concrete.

- One concrete based on 95% AW and 5% silica fume with 2 kg zinc stearate per m<sup>3</sup>. Cement;
- One concrete based on 70% AW and 30% blast furnace slag.

The concrete had a slope of 150±30 mm and an air content of 5.9-7.0%. It should be noted that there was no significant effect of powder composition on air content or slump. However, it was necessary to double or triple the amount of air entraining agent used. Blend designs containing zinc stearate (i.e. hydrophobic agent) [13]. Based on physical and mechanical property tests on concrete mentioned above mixtures, the following conclusions were reached:

1. The ultimate strength of the white concrete was similar to that of the reference concrete at both water/powder ratios examined.
  2. The initial strength of white concrete was higher than the reference concrete.
  3. The initial heat development in white concrete without blast furnace slag was higher than of reference concrete.
  4. Replace 30% of Aalborg white cement with heat-reducing blast furnace slag
- Development regarding concrete based mainly on pure white Bork cement.
5. Chloride diffusion coefficients similar to those of the reference concrete were achieved by adding 5% of silica fume.
  6. The addition of zinc stearate did not significantly affect the measured properties.
  7. All concrete is frost-resistant except for Mix 10, which contains 30% blast furnace slag and water/powder ratio is 0.45. The general result of the examination is: Concrete based on AALBORG WHITE® cement and silica fumes contains a minimum of good properties regarding strength and durability as commonly

used in concrete constructions placed in an aggressive environment [13].

#### 4. Production of White concrete

White concrete is a type of concrete that is mixed with white aggregate such as crushed limestone, marble or quartz instead of traditional gray aggregate such as gravel and sand. The use of white aggregate results in a concrete mixture that appears white or light grey, rather than the typical gray color of traditional concrete. White concrete is often used in architectural and decorative applications where aesthetics are important, such as countertops, floors, and decorative walls. It can also be used in structural applications where a lighter color is desired, such as bridges or other infrastructure. White concrete can be produced using a variety of methods. One common method is to use white cement instead of traditional gray cement in the concrete mixture. White cement is manufactured from raw materials that contain very low levels of iron and other impurities that can cause color changes in the final product. Another method is to add white pigments to the concrete mixture, which can help achieve a consistent white color. White concrete can be more expensive than traditional gray concrete, due to the cost of white aggregate or white cement used in mixing. However, the unique appearance and design potential of white concrete makes it a popular choice for many high-end projects. White concrete can also be polished to a high gloss, giving it a luxurious look often used in high-end residential and commercial applications. It should be noted that although white concrete is generally more stain resistant than traditional gray concrete, it is still porous and can be susceptible to discoloration due to certain materials. As with any concrete surface, proper sealing and maintenance is important to maintain its appearance over time. It should be noted that although white concrete is generally more stain resistant than traditional gray concrete, it is still porous and can be susceptible to discoloration due to certain materials. As with any concrete surface, proper sealing and maintenance is

important to maintain its appearance over time. White concrete is a new type of concrete that can be used in a wide range of construction projects. It can be used for everything from building houses to making sidewalks. The white color comes from a special pigment added to the concrete during the manufacturing process. White concrete allows builders to create highly stylized structures with geometric designs or complex shapes. White concrete was first used in the mid-2000s by architects who were looking for an affordable way to build modern, minimalist buildings. Although they are still very rare in the United States, they are becoming increasingly popular in some other countries due to their cost and versatility.

#### ◦. Characteristics of white cement concrete:

1. The initial setting time for white cement should be 100 minutes.
2. The fineness of white cement should be 395 kg/m<sup>2</sup>.
3. The brightness of white cement should remain 87%.
4. The combined density of white density should be 3150kg/m<sup>3</sup>.
5. The bulk density of white cement is 110 kg/3.
6. Compressive strength after 1 day is 21 MPa, after 2 days is 38 MPa, after 7 days is 61 MPa, and after 28 days is 74 MPa.

#### ¶. APPLICATIONS OF WHITE CEMENT CONCRETE:

1. White cement is effective for decorative works as well as prestige construction projects.
2. White cement is applied to develop brightly colored concrete and mortars.
3. It is suitable for interior and exterior decoration due to its whiteness.

4. White cement is frequently applied in roads to enhance the visibility to highway medians.

5. It is useful for huge numbers of manufacturing precast members.

#### 7. Uses of white concrete

White concrete is a type of concrete to which a white pigment has been added, usually Portland cement. White concrete is used in walkways and patios as well as in exterior walls and fireplaces. White concrete can be used to create decorative walkways, where the color of the concrete is the main point of interest. Although you can use colored cement to add color to your driveway, this type of colored cement does not hold up well over time. If your driveway will see daily foot or car traffic, you should avoid using colored concrete because it will wear away quickly. White Concrete Construction Concrete contractors may also choose to use white concrete for interior masonry projects such as fireplaces and walls. For interior design purposes, white concrete can be stained almost any color. However, if your goal is simply to help keep the sun from entering your home or business through windows or skylights, white cement alone may do the job without adding any other colors. White Concrete Patio Pavers If you are planning to create a patio area for outdoor entertaining purposes, you may want to consider using white polymer sand (WPS) mix for your patio pavers or brick. With WPS, people looking for low maintenance options have found an answer they like because they don't have to shut down the WPS once it's installed on their property. WPS products are available online and at most brick and paving wholesalers nationwide.

#### 8. SUSTAINABLE BENEFITS OF WHITE CONCRETE

Thermal properties of concrete materials can be much higher than others Competitive materials. Light reflection for use in flooring applications in shopping malls, Schools, airports and other large buildings, reducing excessive requirements Lighting, which in turn reduces

energy costs. Reduce the heat island effect by using white-based blend designs Manufacture of light-colored decking and flooring in corridors, corridors and patios Deck flooring, and light-colored flooring in hallways, walkways, and around swimming pools. White cement can be dyed to different colors without the need for painter stains thus eliminating VOCs (Volatile Organic Compounds - according to the EPA, Some VOCs are suspected of causing cancer in animals and humans, while others are carcinogenic Actually known human carcinogens). When concrete products reach the end of their long life They can be recycled and used to manufacture other products [14] [15]. There is a growing interest in using white or aggressively colored concrete Environments.

## **9. Experimental work**

### **9.1 Research significance**

The main research significance is producing white concrete mix by using sustainable white material made from natural lime stone as an ingredient gravel, crushed lime stone as white sand and white cement for producing white concrete simultaneously, Producing bright white concrete from purely local materials available in nature and comparing it the normal concrete made from normal material .

### **9.2 Materials used in this study**

Two type of concrete were used in this research and the material which they used were:

#### **9.2.1 cement**

Iraqi ordinary Portland cement (OPC) and Iranian white Ordinary Portland Cement (WPC) which conforms to Iraqi specifications requirements No. 5/2019 [16],table 5, 6 shows the Chemical Composition and Physical Properties of (WPC), table 7,8 shows the Chemical Composition and Physical Properties of (OPC)

**Table 5** Chemical Composition of WPC

Compound composition	Chemical composition	Percentage (by Weight)	Limits of Iraqi Specification No. 5/2019 [1]
Magnesia Oxide	MgO	2.40	Not more than 5%
Sulfate	SO <sub>3</sub>	2.25	Not more than 2.5%
Loss on Ignition	L.O.I	2.80	Not more than 4%
Insoluble residue	I.R	1.35	Not more than 1.5%

**Table 6** Physical Properties of WPC

Physical Properties	Test Results	Limit of Iraqi Specification No. 5/2019.
Finess using Blain air permeability apparatus(m <sup>2</sup> /kg)	284.5	Not less than 280
Soundness using autoclave method	0.74	Not less than 0.8%
Setting time (vicats method)		
The initial setting (min)	1.45	
The final setting (hrs.)		Not less than 45

	2.35	Not less than 10
Compressive strength (MPa)	17.45	
For 2-days		Not less than 10
For 28-days		Not less than 32.5

**Table 7** Chemical Composition of the OPC

Compound composition	Chemical composition	Percentage (by Weight)	Iraqi Specification No. 5/2019 [1].
Magnesia Oxide	MgO	2.30	Not more than 5%
Sulfate	SO <sub>3</sub>	2.28	Not more than 2.5%
Loss on Ignition	L.O.I	2.85	Not more than 4%
Insoluble residue	I.R	1.32	Not more than 1.5%

**Table 8** Physical Properties of OPC

Physical Properties	Test Results	Limit of Iraqi Specification No. 5/2019
Finess using Blain air permeability apparatus (m <sup>2</sup> / k g)	285	Not less than 280
Soundness using autoclave method	0.72	Not less than 0.8%
Setting time (vicats method)		
The initial setting (min)	153	Not less than 45
The final setting (hrs)	2.40	Not less than 10
Compressive strength (MPa)		
For 2-days		
For 28-days	17.60	Not less than 10
	----	Not less than 32.5

### 9.2.2 Aggregate

A local fine aggregate with a maximum size of 4.75 mm and crushed limestone as white sand, also ,local coarse aggregate and limestone aggregate as a component in white concrete they all conforms to Iraqi Specifications Requirements No. 45/1984 [17].

As shown in Figure 4 , table 9 ,10 showed Grading of Fine Aggregate, table 11 ,12 showed Grading of coarse Aggregate as illustrated above each table .

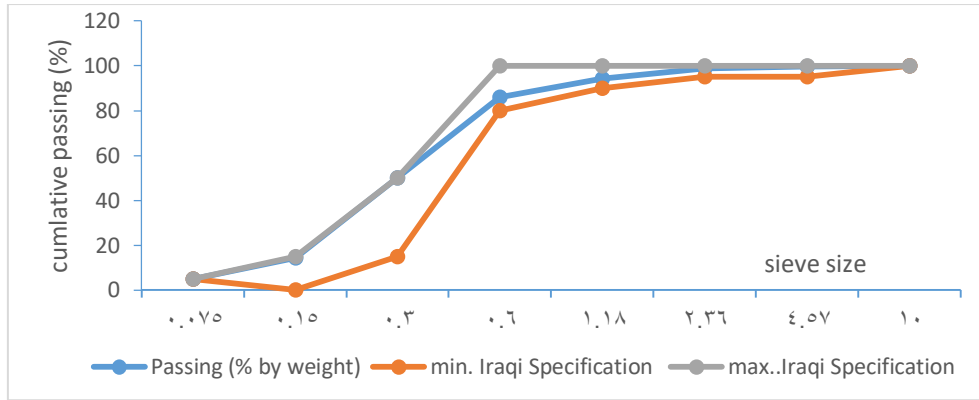
Figures 5,6,7,8 showed Grading Curve of Aggregate(normal and limestone).



Figure 4 Aggregate (white and normal )

Table 9 Grading of Fine Aggregate (white Sand)\*

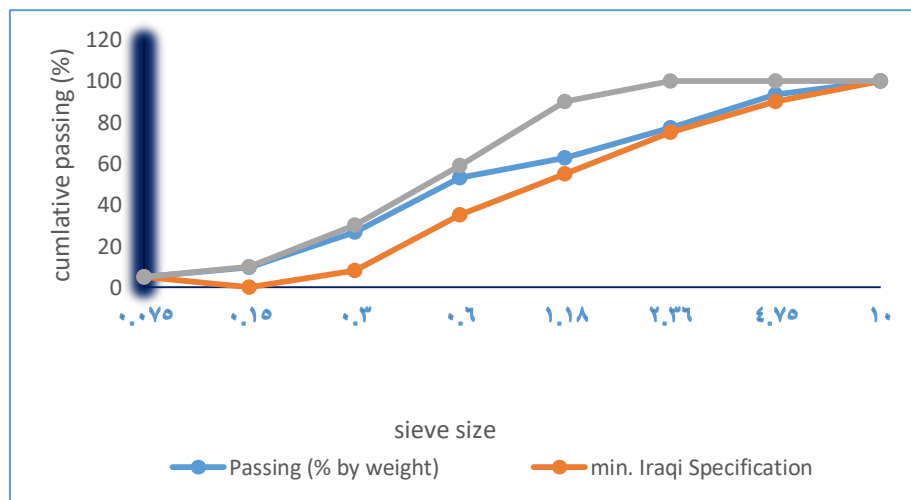
Sieve Size mm		Passing weight (%) by	Limits of Iraqi Specification No. 45 /1984 & rev.2/201 (zone 4)
Mm	No.		
10	3/8	100	100
4.75	4	99.76	95-100
2.36	8	98.86	95-100
1.18	16	94.40	90-100
0.6	30	85.94	80-100
0.3	50	50	15-50
0.15	100	14.5	0-15
0.075	200	5.1	5



**Figure 5** Grading Curve of Fine Aggregate (white Sand)

**Table 10** Grading of Fine Aggregate (Sand)\*

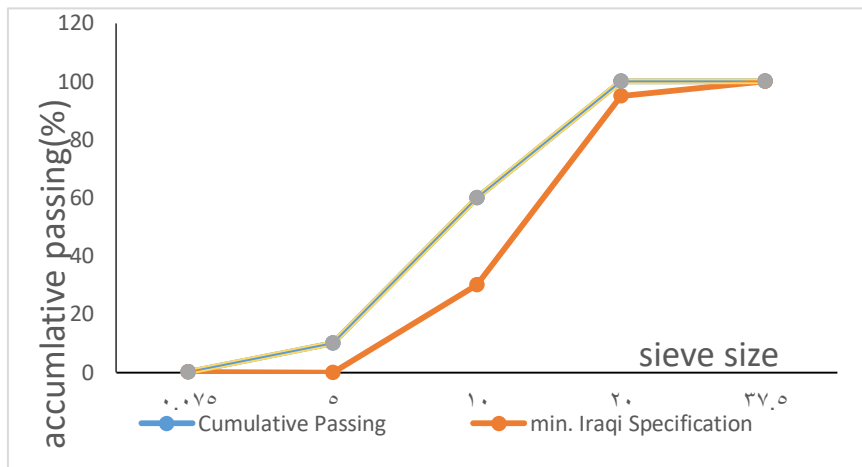
Sieve Size mm		Passing (% by weight)	Limits of Iraqi Specification No. 45/1984 & rev.2/2010 ( zone 2 )
Mm	No.		
10	3/8	100	100
4.75	4	93.46	90-100
2.36	8	77.32	75-100
1.18	16	62.64	55-90
0.6	30	53.02	35-59
0.3	50	26.88	8-30
0.15	100	9.76	0-10
0.075	200	5	5



**Figure 6** Grading Curve of Fine Aggregate (Sand)

**Table 11** Sieve analysis of white coarse aggregate

Sieve Size (mm)	Cumulative Passing (% by weight)	Limits of Iraqi Specification No. 45 /1984 & rev.2/2010 zone(5-20)mm
75	100	-----
63	100	-----
37.5	100	100
20	100	95-100
14	99	-----
10	60	30-60
5	10	0-10
2.36	0.32	-----
0.075	0.03	Allowable3%



**Figure 7** Grading Curve of white coarse aggregate

**Table 12** Sieve analysis of coarse aggregate (Natural Gravel)\*

Sieve Size (mm)	Cumulative Passing (% by weight)	Limits of Iraqi Specification No. 45 /1984 & rev.2/2010 zone(5-20)mm
75	100	-----
63	100	-----

37.5	100	100
20	95.9	95-100
14	37.78	-----
10	31	30-60
5	0.1	0-10
2.36	0.02	-----
0.075	0.02	Allowable3%

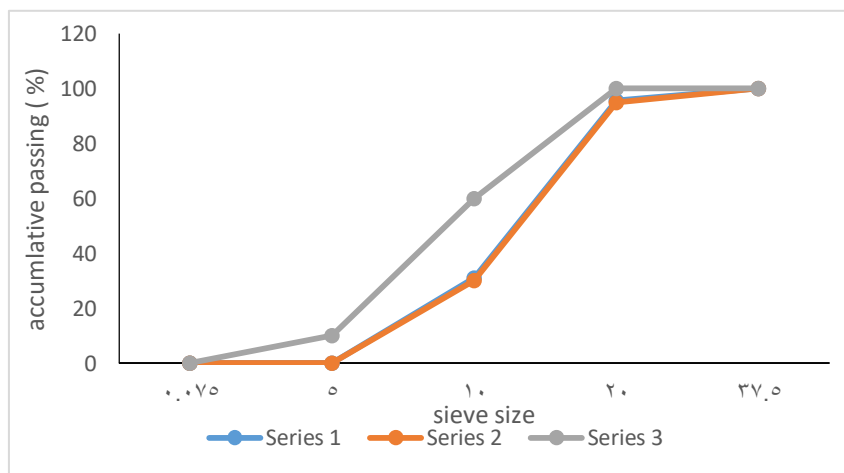


Figure 8 Grading Curve of Coarse Aggregate (Natural Gravel)

**9.3 The mix design**

The mix proportions are shown in Table 13 These quantities have been adopted and

designed from ( ACI 211.1-91) [ 18 ], with compressive strength 25 (MPa).

Table 13 Mix proportion by weight (1:1.78:2,42)

Cement	Sand	Aggregate	water cement ratio w/c
425 kg/m <sup>3</sup>	760 kg/m <sup>3</sup>	1030 kg/m <sup>3</sup>	0.5

1- White Concrete made from White cement,sustainable aggregates (crushed limestone as sand and limestone aggregate as a gravel) ,The dry density of white concrete was 2274 kg/m<sup>3</sup>

2- Normal concrete made from Ordinary portland cement natural aggregates (Gravel and sand),The dry density of normal concrete was 2474 kg/m<sup>3</sup>.The density was found according to ASTM C567 [19]

**9.4 Previous study related to experimental work**

White Portland cement (WPC) has similar bonding characteristics as gray Portland cement. WPC has also higher performance due to use of high-quality materials and control process in its production.

Production of white concrete with a compressive strength between 25 and 50 MPa is possible by using white cement It was also found out in a study that white concrete had higher compressive strength than normal gray concrete [20]

**9.5 Results and discussion of Tested samples**

Standard cubes (10\*10\*10 ) cm , cylinder(10\*20 ) cm and prism samples with dimension (15x15x52) cm were cast and tested for determination of compressive strength, tensile strength, modulus of rupture at 28 days .Table 14 summarizes result of tests

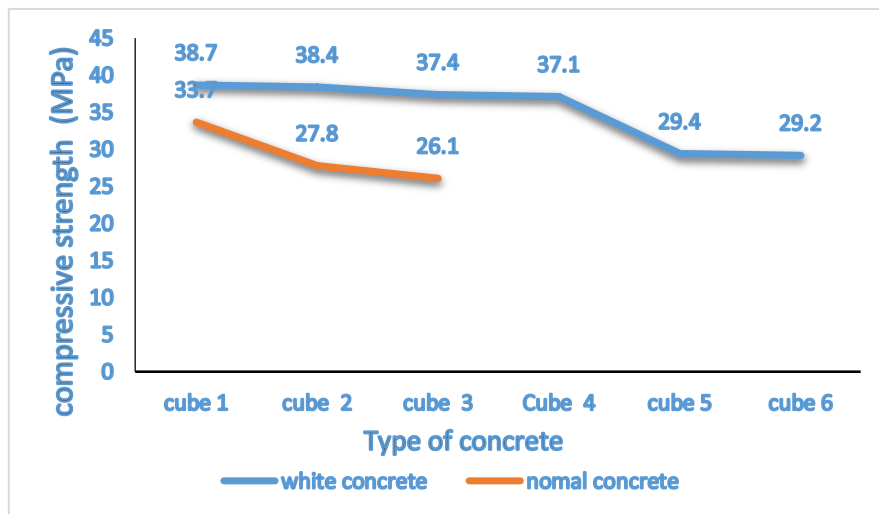
performed on samples Results represent the average value of three sample as shown in Figure 9 , figure10 ,11 shows the test results

**Table 14** result of mechanical tests

Type of concrete	Fcu (MPa) age 28 days	Compressive strength(MPa) <i>f'c</i>	plitting tensile strength(MPa)	Modulus of rupture (MPa)
White	35.03	29.77	3.57	4.74
Normal	29.2	25	3.64	5.1



**Figure 9** tested samples



**Fig 10** compressive strength results

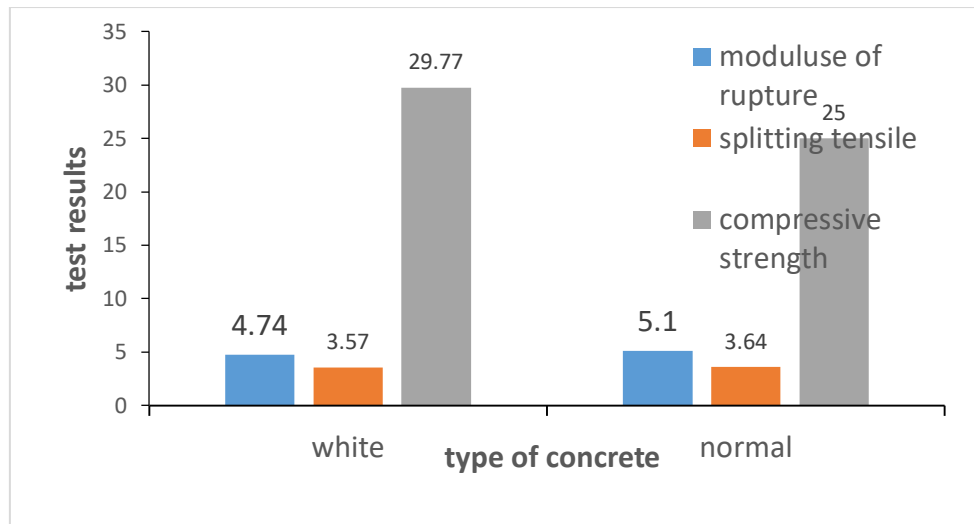


Figure 11 result of tests

### 9.6. Discussion of experimental results

1- White concrete made from white material with cubic compressive strength (35.03 MPa), cylindrical compressive strength (29.77 MPa) at 28 days of curing and density (2274 kg/m<sup>3</sup>) it can be used in the structure's construction. Other wise the cubic compressive strength of the normal concrete was (29.2 MPa) cylindrical compressive strength (25 MPa) at 28 days of curing and density (2474 kg/m<sup>3</sup>).

2- Splitting Tensile Strength ( $f_{ct}$ ) was 3.57 for wc and 3.64 for Nc at age of curing 28 days, percentage decrease in the tensile strength for white concrete by 3% to the normal concrete as a reference mix due to the density of the mix.

3- Flexural Tensile Strength (Modulus of Rupture) 4.74 for white concrete and 5.1 for normal concrete. their were an decrease by 7% compare to reference mix

### 10. Result

Although white cement has been used only for aesthetic and decorative purposes, white cement can be used in the production of white concrete due to its sufficient high compressive strength. The unit weight and compressive strength of white concrete prepared with crushed stone and white cement increase when the dosage of white cement increases. The compressive strength of concrete specimens

with a maximum aggregate size of 16 mm was higher than that of concrete specimens with a maximum aggregate size of 32 mm. The compressive strength of WPC 42.5 mortar specimens was within the range of values given in the standards. Lightweight white concrete has sufficient strength to be used in the construction of wall panels and slabs. White cement is a special product He is expected to become an increasingly successful producer across the world. All efforts are directed To increase the production process Efficiency and cost reduction. This article It contains a detailed presentation regarding traditional and new raw materials that Used to produce raw white concrete Even if it is the first sintering of white concrete It happened more than 100 years ago, Developing this manufacturing of white concrete and its importance in modern construction Today it is an intense topic Research to reduce production costs No environmental impact Only from the cement industry however And also the role of white cement in Environmental performance of structures.

### 11. CONCLUSION

The light color of Portland cement concrete has always been one of the colorsThe most important properties of matter. However, not only white cement is usedFor building facades - it is also finding increasing acceptance in countertops, floors, Pavement, concrete masonry units (CMUs), mortar, plaster and site

furnishings. While aesthetics is the primary factor that drives the use of white concrete Brilliance/reflectance also contributes to energy efficiency, safety and more Functional considerations. The enhanced reflectivity of white concrete can be used to conserve energy and meet sustainable building standards. White concrete can also create flooring They reflect more light, virtually reducing the energy needed for indoor lighting 20 percent compared to regular gray concrete floors. The inherent reflectivity of light-colored concrete also improves visibility and safety on the roads. The reflectivity is especially striking in wet weather due to the gray color Concrete tends to darken when wet. For many transportation departments it has begun White concrete reduces constant coasting from repainting highway barriers and bridges Sidewalks, barriers, median strips and other structures must be white Safety reasons [21].

Through the tests, it was concluded that white concrete had higher compressive strength than normal gray concrete and did not differ much from Normal concrete in terms of mechanical properties. The previous study and the experimental results showed that the decrease in mechanical properties does not exceed 7%, and this is a small percentage. White concrete has proven its quality in construction field in addition to architectural works.

## 12. Future work

The future scope of the white concrete business is promising, with increasing demand, innovation, customization, sustainable construction practices, global market expansion, collaboration and effective marketing strategies all playing important roles. By capitalizing on these opportunities, white cement manufacturers can drive growth, establish a strong market presence, and meet the evolving needs of the construction industry.

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