INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES
www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898
Volume: 03 Issue: 2 March-April 2021

Physical processes as a result of concrete concrete in dry-hot climate conditions

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Abstract: *In this article, it is giveh the issues of heat processing of concrete in winter and the results of exheriments of the effects of the water cement of the concrete.*

Key words: *heat treatment, temperature gradient, cement exothermic, temperature rise, cooling, temperature field, isothermal exposure, surface modulus, environmental heat*

Introduction

In natural conditions with high temperatures and low specific humidity, delayed or untimely maintenance of cast concrete from the beginning, as well as failure to perform at the required level, leads to deterioration of the physical and mechanical properties of hardened concrete. [5.6.7.8].

The main part of the research was carried out at the open landfill at the 4th Experimental Research Station of Reinforced Concrete in Aktash, Namangan region under the Ministry of Agriculture and Water Resources, using natural solar energy in dry and hot climates.

The experimental work used materials produced mainly in Central Asia and tested to state standards. [1.2.3.4].

№	Portland Creek Cement	Normal placement of the cement mixture	Freezing limit		Strength limit 28 sut, MPA 28day, MPA	
			Initial min.	The end of min.	In Crushed	In the jam
1	2	3	4	5	6	7
1.	Oxangaron-1	20,9	196	279	5,7	42,4
2.	Oxangaron-2	21,3	192	269	5,6	40,8
3.	Alinitli	24,1	26	56	6,3	41,0
4.	Quvasoy	22,4	170	252	5,92	40,6

One of the important aspects of the dry-hot climate that leads to adverse conditions in concrete hardening is the occurrence of continuous evaporation on the open surface of the concrete. Continuous evaporation of moisture from freshly laid concrete is always a continuous evaporation in hardened concrete - j (kg / m^2 S), Δm -concrete weight, Δτ-time lost weight and F-evaporating surface, which is expressed as follows:

$$j = 1/F\,;\Delta m/\Delta\tau = const$$

During this interval, the external equilibrium exchange rate is the largest, causing continuous evaporation on the concrete surface, during which time it does not correspond to the internal equilibrium of the concrete. As a result, there is a gap between the complete transfer of moisture from the inner layers of concrete to its surface (the transfer of moisture to the evaporating surface).

This, in turn, depends on the vapor pressure released from the surface, the size of the evaporation area, as well as the velocity of the medium. [9,10,11,12]. Experimental results have shown that in concrete that has not been maintained or adequately cared for since the initial period, dehydration (loss of moisture due to evaporation) occurs at a rate of 50-70% of the total water consumption of the concrete during the first day. Most importantly, this figure occurs within 6 -7 hours of the initial period. Evaporation, which occurs at a large rate in this range, adversely affects the compaction and interconnection of newly formed internal structures in concrete. Continuous evaporation causes a significant initial subsidence in concrete, a radical change in its physical and mechanical structure in dry and hot climates. In the initial hardening of concrete, plastic subsidence occurs when the new concrete is in a soft state that has not yet hardened. In the initial hardening of concrete, ie when the concrete is in a soft state that has not yet hardened, "plastic subsidence" causes small cracks and other small defects during the period when the concrete takes its structural shape. As a result, small cracks and other small defects appear on the surface of the formed concrete. in subsequent periods it was found that it continued insignificantly even in concrete stored under normal conditions. Under such conditions, the water absorption index of hardened concrete is 8-10 times, and the frost resistance is significantly reduced. [13,14,15,16].

If the concrete is not cared for, then the size of the void layer on the concrete surface is assumed to be infinite (∞), so that -j reaches its maximum value. It follows that the greater the clearance distance between the concrete surface and the helioplate, the greater its dewatering. That is, the larger the gap between them, the greater the dehydration in the top layer of concrete.

As a result, the "plastic sinking" of concrete will be just $(\Delta l/l)_{\max} = f_{(i)}$ as great. Conducting research under natural conditions is mainly focused on the fulfillment of the equation ($\Delta l/l$)max = f(j) . Some of the experiments obtained separately were performed at different times of the year, over a period of 6–7 months (Fig. 1).

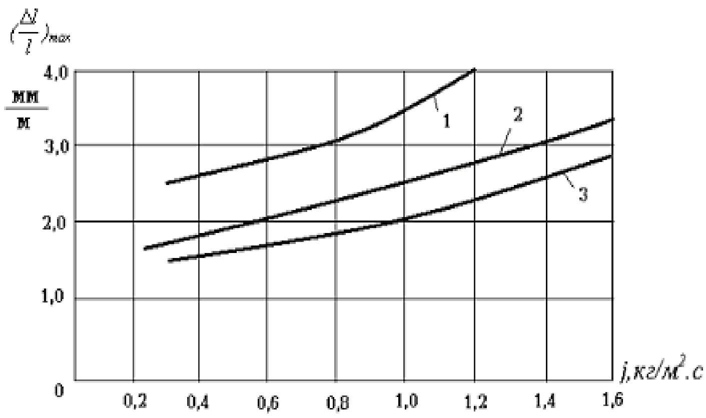

Figure 1. Depending on the amount of water used to harden the concrete, the size of the plastic sink formed by continuous evaporation

Depending on the purpose of the experiment, the types and descriptions of the materials used were changed. Wind effects were not taken into account [17,18,19]. The results of the experiment showed that the hardened concrete surface in dry and hot conditions should be treated with certain coatings or special coatings that create a hermetic dense state on the surface. In this case, the layer of space between the concrete surface and the coating is important. If the concrete surface is cared for by means of solar panels (SVITAP) with a hermetically dense cavity layer with a device based on many years of experience, continuous evaporation - j will depend significantly on the cavity size and hermetic density index.

If the gel coating touches the concrete surface in

RESEARCH PARKS

INTERNATIONAL JOURNAL ON HUMAN COMPUTING STUDIES

www.journalsresearchparks.org/index.php/IJHCS e-ISSN: 2615-8159|p-ISSN: 2615-1898

Volume: 03 Issue: 2 March-April 2021

a dense state without gaps, then the magnitude of the j-index is close to zero.

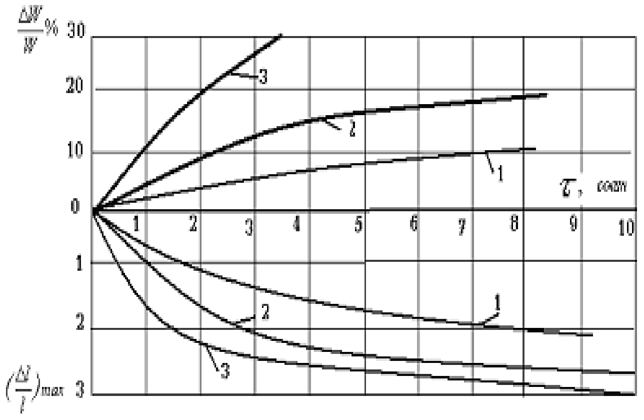

Figure 2. In continuous evaporation of concrete (j, kg / m2h) its plastic settling and water loss index

1. if j = 0.077; 2.if j = 0.28; 3. if j = 0.65
2.

The results of the scientific work are that in hardening concrete under different environmental conditions 1) t=20^0 C, φ=40 %; 2) t=40^0 C, φ=22-25 %; 3) t=60^0 C, φ=6...7 %; the magnitude of continuous evaporation in turn j_{max}=0,213, j_{max}=0,583, j_{max}=0.834 kg / m2 h, whereas in the experimental concrete, the magnitude of the plastic subsidence changed insignificantly, and in the range of 2.4, 2.41, 2.46 mm□m, respectively. In his scientific research, it can be seen that the plastic deposition of concrete does not change significantly at certain intervals under close environmental conditions.

However, according to the results of the study, $(\Delta l / l)_{max}$, max increases with increasing j-quantity [25].In conducting the experiments, locally produced binders and fillers were used[20,21,22,23].

The results of experiments show that in dry-hot climates, the plastic deposition formed in the hardening concrete occurs depending on the amount of water leaving its surface, ie "evaporation".

If the continuous evaporation index is **j**, in the following intervals 0.2 = 0.3 ≤ j ≤ 1.0 = 1.1 kg / m2.h, $(\Delta l / l)$ max is the same or insignificant change, if this value is j ≥ At 1.1 kg / m^2·hour, we observe a gradual increase in the max indicator. An increase in the level of evaporation from the hardened concrete surface, if ***j*** = 1,0-1,1 кг/м^2 hours, then leads to an increase in the value of $(\Delta l / l)_{max}$, which, in our opinion, significantly increases the magnitude of the j-value, the state of the concrete and the is associated with the appearance of a voltage indicator in the small cavities (Fig. 2).

That is, the magnitude of the "plastic sinking" that occurs as a result of continuous evaporation does not change at intervals of 0.2-0.3 ≤ j ≤ 1.0-1.1 kgm^2.

Therefore, the larger the j-value, the faster the "plastic sinking" that occurs. To do this, based on the above considerations, it is necessary to take into account the impact of physical processes occurring in the initial period when selecting the most perfect state of the void layer between concrete and solar coating.

The presence of a void layer left on the surface of the newly poured concrete ensures the following [24,26]:

а) The light-transmitting material used for solar coating prevents the concrete surface from sticking to each other while fully retaining its light transmittance.

б) The light-transmitting material used creates a “efficient greenhouse” state on the concrete surface.

в) In addition to the calculation of the hollow layer, which retains heat, there is a concentration of the heat source.

г) When hardening concrete products, the norm provides the best conditions for high humidity.

д) Increases the long-term durability of the light-transmitting material and allows it to be used repeatedly as a solar coating.

e) Concrete products provide quality hardening of surface parts.

The clearance parameters between the helioplate and the hardening concrete surface shall be as follows [23,24]**:**

1). During sunless days, the surface of the concrete is provided by increasing and decreasing the thermal resistance of the heat-protective layer from the environment.

2). Examining experiments on the rapid evaporation of concrete, the expansion of heat in freshly poured concrete and the impact of "plastic subsidence", as well as other physical processes on the internal structure, and the presence of interconnections are important aspects of its comprehensive protection.

3). Occurrence taking into account the conditions of practical use of solar panels in the conditions of production.

One square meter per hour. if the total amount of heat received passing through the surface is expressed by **Q** -, then**:**

$$Q = Q_1 * Q_2 * Q_3 \ (\text{ккal}/м^2 \ hour)$$

Where: Q1 is the amount of heat passed through the coating in terms of thermal conductivity;

Q_2 - the amount of heat passed through the coating by heat rays.

Q_3 - the amount of heat collected from the circulating motion of the air in the cavity.

In terms of thermal conductivity, heat transfer is expressed on the basis of the law of heat transfer in solids:

$$Q_1 = (\tau_1 - \tau_2)\ \lambda_1 / \ \delta$$

where: τ_1 - the temperature at which the product is heated (including the concrete surface), ^{0}C.

τ_2 - light-transmitting material bounded by the environment, temperature, ^{0}C.

λ_2 - The coefficient of thermal conductivity of the non-rotating air in the cavity is / kcal / m.h, ^{0}C.

δ – the thickness of the hollow layer, см.

The circulating motion of air in space occurs due to the presence of a temperature difference at the boundary faces, and is similar to the circular motion of air in natural conditions. Therefore, in surface areas with high temperatures, the air in the space is heated and moves from the bottom up, and conversely, on the surfaces with low temperatures, the cold air flow moves from the top to the bottom. Thus in the hollow layer there is a constant circulation of air. If we determine the heat transfer coefficient - λ_3 then the amount of heat in circulation is expressed by the formula in the sun.

$$Q_3 = (\tau_1 - \tau_2)\ \lambda_1 / \delta;$$

Basically, λ_1 and λ_2 the difference between that the constant is not calculated, but varies with respect to the thickness of the hollow layer, ie the air temperature in it, the temperature difference at the boundary surfaces and other parameters. The air gap is the basic size of the δ / λ_3 -ratio, which represents the thermal resistance of the layer. Construction Norms and Regulations (SNiP) - 2.01.04-97 * The data given in “Construction Heat Engineering” are that the change of the air gap layer, increasing from 1cm to 2cm, in turn increases the thermal resistance from 0.15 to 0.16 m2.s. We know that it leads to a change in the 0S / kcal range [16,20,21,23,24,26]. The increase in the air gap layer to 5 cm is explained by the fact that the thermal resistance remains unchanged. If the layer increases to 10 cm, then the thermal resistance increases to 0.17m^{2}c^{0}C / kcal. The results showed that if the thickness of the hollow layer decreases to less than 1 cm, the transfer of air circulation and the amount of heat passing through it decreases, if the thickness of the layer is d = 0.5 cm, the amount of heat passing through the thickness of the hollow layer is "zero". will be. In such layers, the incoming and outgoing "air tone" stops. As a result, the decrease in rotational motion in the heat transfer through the cavity layer can be assumed to be in the case of cavity thickness d <1 cm. Experimental results have shown that the thickness of the hollow layer decreases by 2-3 cm when using light-transmitting material under production conditions, mainly when using polymer films, they are significantly deformed and cool at high temperatures, which is practically impossible. The fact that the thickness of the hollow layer increases from 1cm to 5cm and then to 10cm, changes its heat resistance at an insignificant rate. Therefore, based on the conditions of increasing the thermal resistance of the air layer in the cavity, its thickness can be around 2-5 cm on average as a result of satisfying this condition in production conditions in practice [24,26].

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