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CONCRETE WITH MINERAL ADDITIVES

The efficiency of using cement in concrete can usually be estimated by the following properties: workability, strength, durability. [1]:

According to the research, carried out by foreign scientists on Portland cement with the addition of limestone (PLC) and cement with the addition of ash (PAC), the following conclusions can be drawn:

-water consumption and susceptibility to concrete fading with limestone and ash additive is significantly lower than using simple Portland cement;

-in 28 days the compressive strength of concrete based on PLC and PAC with the same concrete composition, as well as the same standard strength of cement, is not lower than with the Portland cement. The strength can be higher if water saturation of cement is lower, the additives reduce water saturation of cement;

-the key durability indicators such as carbonization, waterproofing, and frost resistance in concrete using cement with additives (PLC and PAC) are almost the same as in concrete with Portland cement or Portland slag cement;

-Bernd Wicht studies indicate that concretes with PLC and PAC can have a higher resistance to sulfate aggression and chloride penetration than concretes of the same composition with sulfate-resistant Portland cement; [1]

-pozzolans and materials with hidden hydraulic properties significantly reduce the dangerous reaction between an alkali and a siliceous component due to hydration reactions and the binding of alkalis into insoluble compounds.

New types of modern concrete are emerging due to high achievements in plasticizing of concrete and mortar mixtures, as well as the most active pozzolanic additives - micro silica, dehydrated kaolin, and highly dispersed ashes. The combination of superplasticizers and especially hyperplasticizers on a polycarboxylate basis allows you to reduce the water-cement ratio to 0.24...0.28 and obtain superfluid cement-mineral dispersion systems and concrete mixtures. Currently, the nomenclature of finely dispersed concrete fillers has been significantly expanded. The pozzolanic activity of some mineral additives is presented in the Table 1.

Table 1

The supplement	Pozzolanic activity, mg$Ca(OH)_2$per 1 g of additive
Calcined bauxite	534
Micro silica	427
Blast furnace slag	300
Ash	875
Metakaolin	1000

Pozzolanic activity of some mineral additives [2]

Based on the above, we believe that using ash production waste in place of a part of cement, compatible with a superplasticizer in concrete composition, is relevant.

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POST-WAR RECONSTRUCTION OF HISTORICAL BUILDINGS BY MEANS OF HISTORIC BUILDING INFORMATION MODELLING

War catalyses the development of new, pragmatic strategies aimed at protecting the nation and its citizens from the ravages of war. Many of these innovative solutions will take shape during the renovation phase. It is already worth thinking about the Ukrainian programme of rebuilding after the war, considering all the previous plans for the implementation of sustainable development principles in Ukraine. The basis of this transformation is the principle of post-war reconstruction: "to rebuild better than it was".

Historic buildings should be considered as an integral component of the sociocultural entity, encompassing the values and communities that reside in or use them, in addition to the architectural structure consisting of physical elements such as walls, floors, ceilings, windows, doors, and stairs. These buildings undergo transformations influenced by user actions and conservation efforts. [1]

The objective of reconstruction is to establish a systematic approach for digitally maintaining and managing historical dwellings. The technique presented in this paper focuses on constructing parametric models that offer modelling benefits, allowing for convenient updates to the Historic Building Information Modelling (HBIM). By swiftly converting various data into a real-time information platform and a robust decision-support system, HBIM significantly enhances the efficiency and accuracy of the reconstruction process. One of the key advantages is its ability to synchronise detailed data regarding building materials and their associated environmental impacts. This synchronisation of data within HBIM empowers stakeholders to conduct thorough environmental analyses. It provides a holistic understanding of the ecological footprint associated with various building materials and products. Consequently, informed decisions can be made during the selection of building materials, considering both historical authenticity and environmental sustainability. [2]