Reports and Journals of Concrete Aggregates

Fookes, P.G., 1980, "An introduction to the influence of natural aggregates on the performance and durability of concrete" Quarterly Journal of Engineering Geology, 123, 207-229.

Abstract:

The production of aggregates for construction is the largest of the extractive industries in Britain. Natural aggregates form the main component, by volume, in the manufacture of concrete but the part played by aggregates in the durability and performance aspects of concrete is still relatively little understood.

The paper summarizes the main physical and chemical considerations of aggregate in concrete, especially those leading to cracking and deterioration. It broadly considers the British specification of aggregates, which has largely been built up from decades of local experience, and emphasizes the need in many locations overseas for more specific requirements on use of aggregates in different climatic and geological settings. The strong influence on aggregate performance by the use of geologically weathered rock is little recognized even in good concrete practice and is highlighted in the paper. In conclusion, suggestions are given for all-purpose aggregate testing programmes.

Türk, N. and Dearman W.R., 1988, "An investigation into the influence of size on the mechanical properties of aggregates" Bulletin of the International Association of Engineering Geology, No: 38, 143-149.

Abstract:

Tests have been carried out according to British Standard BS 812-1975 on non-standard and standard size aggregates to study the influence of aggregate size on mechanical properties. Dolerites, granite, limestone aggregates of different sizes have been tested. No basic relations have been found between elongation index and flakiness index, and the different aggregate sizes. Aggregate impact value (AIV), aggregate crushing value (ACV) and 10 per cent fines loads, however, are aggregate size dependent. Tests on larger aggregate sizes give higher test values, whereas tests on smaller aggregate sizes give lower values than test results for standard size aggregates. For each rock type there is a different set of sieve sizes, from those recommended in BS 812-1975, which give the same values as the standard sieve sizes. Additionally, relations have been determined for the mechanical test results for the different size aggregates.

Irfan, T.Y., 1994, "Aggregate properties and resources of granitic rocks for use in concrete in Hong Kong" Quarterly Journal of Engineering Geology, 27, 25-38.

Abstract:

Granitic rocks are the major source of crushed fine and coarse aggregates for use in concrete in Hang Kong. The existing quarries are situated in a variety of granite types. Although some quarries produce coarse aggregates with better properties, most are considered unsuitable for special purposes.

Laboratory testing of the various granite types present in the Territory indicates that fine-rained granites have superior mechanical and physical properties in comparison with other granite types and hence are potentially suitable for many special concrete purposes.

Al Harthi A.A., Abo Saada Y.E., 1997, "Wadi natural aggregates in Western Saudi Arabia for use in concrete" Bulletin of the International Association of Engineering Geology, 55, 27-37.

Abstract:

The engineering properties (physical and mechanical) of Wadi AI-Yamanyah natural aggregate were determined. In addition, correlations between these properties have been made. This Wadi is located in the central part of the western province of Saudi Arabia between Makkah and Taif. The aggregate along the Wadi was studied and five major rock units were identified namely granite, granodiorite, gneiss amphibole schist and andesite. These rocks were classified into three aggregate groups : basalt, granite and schist.

Ninety aggregate samples were carefully collected and tested. The results of overall aggregate properties pointed out that Wadi A1-Yamanyah natural mixed aggregate is within the international and local specification limits and it is suitable for use in concrete. The estimated volume of natural aggregate in the Wadi is about 2 million m^3.

The engineering properties of individual aggregate groups were also determined. Basalt and schist groups, which represent about 65 % of the Wadi natural aggregate, were of higher quality and low degree of alterations than the granite group.

Direct and inverse relationships were found between some physical and mechanical properties for mixed natural aggregate of Wadi AI-Yamanyah with the exception of elongation index (IE). It is recommended to use the derived equations, representing the best fit between the aggregate properties, with care and for rough estimation only.

Tasong, W.A., Lynsdale, C.J., Cripps, J.C., 1998, "Aggregate-cement paste interface II: Influence of aggregate physical properties" Cement and Concrete Research, 28, 1453–1465.

Abstract:

This paper highlights the role played by aggregate with respect to the chemical interactions that take place within the interfacial transition zone between aggregates and cement paste matrix. Four commonly used aggregates with different chemical properties, basalt, limestone, silica sand, and quartzite, were investigated. It was observed that ions are both absorbed and released by the aggregates in all the aggregate-cement solution systems, with basalt being the most active in this respect. The findings reveal that aggregates are more chemically active than has been supposed and that a wide range of chemical interactions between the aggregates and cement should be anticipated.

Poitevin, P., 1999, "Limestone aggregate concrete, usefulness and durability" Cement and Concrete Composites, 21, 89-97.

Abstract:

Inland and on sea coasts, crushed limestone aggregate has been used in France and elsewhere for structural concrete when gravel aggregates were not available. Crushed limestone fillers have, since the oil crisis, been allowed as partial constituent of cement; they are now currently used as additions in concrete mixtures, as partial replacement of Portland cement. Limestone aggregate concretes have not been considered inferior to gravel aggregate concretes, particularly in durability. However, recently some cases of alkali-silica deleterious reactivity and one case of sulphate attack, have questioned their good performance status.

Wu, K.R., Chen, B., Yao, W., Zhang, D., 2001, "Effect of coarse aggregate type on mechanical properties of high-performance concrete" Cement and Concrete Research, 31, 1421–1425.

Abstract:

Tests were carried out to study the effect of the coarse aggregate type on the compressive strength, splitting tensile strength, fracture energy, characteristic length, and elastic modulus of concrete produced at different strength levels with 28-day target compressive strengths of 30, 60, and 90 MPa, respectively. Concretes considered in this paper were produced using crushed quartzite, crushed granite, limestone, and marble coarse aggregate. The results show that the strength, stiffness, and fracture energy of concrete for a given water/cement ratio (W/C) depend on the type of aggregate, especially for high-strength concrete. It is suggested that high-strength concrete with lower brittleness can be made by selecting high-strength aggregate with low brittleness.

Donza, H., Cabrera, O., Irassar, E.F., 2002, "High-strenght concrete with different fine aggregate" Cement and Concrete Research, 32, 1755-1761.

Abstract:

High-strength concrete (HSC) has undergone many developments based on the studies of influence of cement type, type and proportions of mineral admixtures, type of superplasticizer and the mineralogical composition of coarse aggregates. Most studies were carried out using natural sand with rounded and smooth grains. In practice, crushed sands from various sources are frequently used in concrete. In this paper, two aspects of the effect of crushed sands on HSCs are presented. First, the performance of crushed sands in relation to natural sand using a low water/cement (w/c) ratio and fixed coarse aggregate and cement content is analyzed. Results show that concrete with crushed sand requires an increase of superplasticizer to obtain the same slump. It also presents a higher strength than the corresponding natural sand concrete at all test ages, while its elastic modulus is lower at 28 days and is the same after that. Studies on the development of hydration and mortar phase of concrete show that the increase of strength can be attributed to the improvement of paste–fine aggregate transition zone. Second, the influence of the mineralogical source of the crushed sands was studied using three different types of crushed sands (granite, limestone and dolomite) with similar grading. Two mixtures containing 450 and 485 kg/m^3 cement and low w/c ratio are analyzed. Results show the adverse effects of shape and texture on workability of concrete, but the compressive strength of concrete is improved. Granite crushed sand appears as the most advantageous sand for this purpose.

Al-Oraimi, S.K., Taha, R., Hassan, H.F., 2006, "The effect of the mineralogy of coarse aggregate on the mechanical properties of high-strength concrete" Construction and Building Materials, 20, 499–503.

Abstract:

Tests were carried out to study the effect of the mineralogy of coarse aggregate on the compressive, flexural, and splitting strengths. Two aggregate sizes (10 and 20 mm) were supplied locally from five different areas in Oman; namely Muscat, Bidbid, Sur, Nizwa and Sohar. Petrography analysis was carried out on all these samples. The water/binder ratio (w/b) was kept constant at 0.32 and silica fume and superplasticizers were used in all mixes. The 28-days compressive strength varied between 81.3 and 85.6 MPa for the 10 mm maximum aggregate size, and ranged between 72.5 and 77.5 MPa for the 20 mm maximum aggregate size. Therefore, use of smaller maximum aggregate size would give a higher strength and the mineralogy of the coarse aggregate would affect the strength of concrete.

Torgal, F.P., Castro-Gomes, J.P., 2006, "Influence of physical and geometrical properties of granite and limestone aggregates on the durability of a C20/25 strength class concrete" Construction and Building Materials, 20, 1079–1088.

Abstract:

This paper presents an experimental study to evaluate the influence of physical and geometrical properties of granite and limestone aggregates on the durability of a C20/25 strength class concrete. Different granite and limestone aggregates were collected from seven quarries. Physical, geometrical and mechanical properties of aggregates as well as the rock weathering state were quantify by several tests such as, abrasion, surface hardness, uniaxial compressive strength, ultrasonic pulse velocity, water absorption by capillarity, vacuum water absorption and oxygen permeability.

Using aggregates from each quarry, several C20/25 strength class concrete mixes have been produced, with the same workability and volume proportions. Concrete specimens have been cured under water for 90 days; after that time concrete durability parameters were obtained through tests such as, vacuum water absorption, capillarity water absorption, water permeability and oxygen permeability.

Relevant statistical correlations have been obtained between absorption and permeability test of rock material and rock deterioration state (weathering). Valid statistic correlation was also obtained between durability parameters as well as among aggregates geometrical properties and concrete durability parameters.

Loorents, K.J., Johansson, E., Arvidsson, H., 2007, "Free mica grains in crushed rock aggregates" Bullettin Engineering Geology Environmet, 66, 441–447.

Abstract:

Enrichment of free mica (i.e. as monomineralic grains) in the fine fraction of crushed rock aggregates affects the quality of the aggregate end product. Granitoid rock from the Svecofennian Province were used as being representative of crushed rock aggregates commonly used for construction purposes. The results reveal a general trend of enrichment of

mica for finer fractions. For the coarse grained rock a peak occurs at 0.25–0.5 mm followed by a decrease in the amount of free mica; for grains <0.063 mm there is an increase. The general trend and peak are correlated to the microstructural characteristics of the samples.