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## **Recycling of Building Wastes - A Real Perspective for Bulgaria**

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### **1. Introduction**

The recycling of the building wastes, which is a modern approach for preventing the environment from pollution and, in general, for restricting the demolition of our nature is one solution to that problem. At the same time, because of the mostly solid and non-toxic nature of the building wastes, the recycling is very successful without by itself additionally polluting the environment. During the last fifteen years, the recycling of building wastes developed intensely in a number of European countries, Japan and the USA. However, for Bulgaria, the issue is still a new one, despite the significant changes in the environmental legislature, directed towards preventing the environment from pollution.

### **2. Some achievements in the recycling of building wastes**

Largely, the building wastes are recycled in the form of aggregates because of the broad range of possibilities for their implementation: as general bulk filling, as filling in drainage activities, as sub-base material and as aggregates for new concrete. Depending on the origin and the constitution of the building wastes, a number of approaches for their recycling could be used. In comparison to the production of broken aggregates, the basic differences are in the methods employed for removal of the undesired components. The major peculiarities in the physical properties of the recycled aggregates are caused by three factors: their heterogeneity, the presence of impurities and the attached mortar and cement paste. The high water absorption is the most important difference between the physical properties of the recycled aggregates and those of the natural aggregates. Compared to the concrete made of natural aggregates, the concrete made with recycled aggregates employs a number of drawbacks. These drawbacks are the more crucial the larger the quantity of fine recycled aggregates included in the concrete is. The use of only coarse recycled aggregates makes possible the production of concrete which properties go very close to those of the typical concrete of resistance classes B25-B35. In 1993, RILEM recommended a project for common European Code concerning the utilisation of coarse recycled aggregates.

### **3. Perspectives for Bulgaria**

In general, Bulgaria has a significant amount of natural deposits of the inert materials, necessary for the building. There are, however, several regions, especially in the North-eastern part of the country, that experience shortage of some concrete aggregates. Most of the producers of inert

materials can not obtain the investment capital necessary either for maintenance and technological renewal, or for the transportation of their production. On the other hand, an establishment of recycling process for the building wastes will resolve some of the problems concerning the shortages in the supply of natural inert materials.

Especially important for Bulgaria is the solution of the problem created by the non-utilised building panels that will never enter a construction cycle. We should not ignore also the fact that a significant part of the panel-constructed apartment-buildings in our big cities are about to end their predetermined exploitation periods. The demolition or at least modernisation of a great number of building constructions, that will soon have to be initiated, is expected to create a great number of concrete and reinforced-concrete wastes.

Bulgarian legislation concerning the definition and utilisation of the concrete aggregates addresses predominantly the natural aggregates. In fact, at the moment, all the standardising documentation in the field of the building activity, is a subject of re-estimation and actualisation, in accordance with the trend common for all the laws of Bulgaria to be amended and reshaped in accordance to the European Law. One proof is the vast majority of both amended environmental laws and newly accepted ones. It is to some extent regretful to note that, so far, most of the above changes are more or less of a positive character rather than realised in practice, but they give "green light" to the development of activities for recycling the building wastes.

The activity of recycling the building wastes is for now concentrated largely on the development of the theoretical basis for the future process, and on the search for possibilities for its financing. A scientific collaboration has been initiated between the Central Laboratory of Physico-Chemical Mechanics with the Bulgarian Academy of Sciences and the Laboratory of Materials and Structures with the Artois University in France before three years. A joint research project concerning the problems of the durability of the concrete produced by recycled aggregates is presented for financing with the Nato's program "Science for peace".

A pioneer project called "Recycling of demolition building waste materials", directed to their re-use as concrete aggregates has been prepared with the participation of representatives of the Municipality of Sofia, the municipality-owned company "DOMOSTROENE" and the Bulgarian Academy of Sciences, with the collaboration of the group KRUPP HAZEMAG. The project participated into a contest, organised by the National Trust Ecofund (NTEF). The NTEF is intended to finance projects concerning short term solutions of ecological problems in accordance with the agreement concluded between Bulgaria and Switzerland.

#### **4. Conclusions**

As final notes, the following perspectives for the practical implementation of the recycling of building wastes in Bulgaria could be outlined:

- 1) In the beginning, economically feasible will be the construction of one mobile installation for the recycling of concrete and reinforced concrete wastes;
- 2) Some steps could be undertaken to organise the realisation of the recycled aggregates in the road-construction as well as in the construction of small-scale elements.
- 3) Having in mind that one major obstacle to the recycling of building wastes is the initial financing, some foreign investments could be attracted.
- 4) The collaboration at different levels among institutions, enterprises and leading experts in the field of recycling and reuse of building wastes will be a necessary and productive step on the way to organising the recycling of building wastes in Bulgaria.