

ASH AND SLAG HANDLING

3.5. Applications of ash and slag from power coals

3.5.2. Road construction

3.5.2.1. Standardization and perspectives of using ash-and-slag mixtures from TTPs in road construction in Russia

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ABSTRACT

In the paper important factors and solutions of a problem on using ash-and-slag materials in road construction are presented. Importance of development of normative and technical documentation on using ash and slag from thermal power plants is defined.

INTRODUCTION

Since 1972 right after the relevant government regulation of USSR was issued, scientists of the Siberian State Automobile and Highway Academy (SibADI) have been actively studying the questions of using fly ash and ash-and-slag mixtures from TTPs in road construction. Our scientists took part in development of one of the first regulations: RBN 185-75. Technical directions for using fly ash and ash-and-slag mixtures from burning of various types of solid fuel for construction of a roadbed, road base and topping of highways (1975). Today this document is outdated but it is still in power.

A lot of issues were studied in recent years, pilot sites were constructed and studied, guidelines concerning effective using of ash-and-slag materials in road construction were developed.

The simplest way of using large tonnage of ash-and-slag mixtures is constructing road embankments. From 20 up to 70 thousand m³ of industrial soil is used in order to construct 1 km of such a road. Depending on the conditions the effective length of transportation of ash-and-slag mixtures may reach 50 km. The difference between costs of a road bed constructed with the use of ash-and-slag mixtures and the cost of the road bed constructed from traditional materials can make from 2 up to 5 million rubles per 1 km. Proper road bed construction and using of geosynthetic materials prevent potential frost swelling of ash-and-slag mixtures, washing of roadsides and slopes. Schemes of the road bed constructed with ash-and-slag mixtures are shown in fig.

Using ash-and-slag mixtures for construction of reinforced road bases from ash mineral mixtures and weak concrete is also effective. Modern road science proved that unreinforced road beds made of crushed stone in the roads of high technical category cannot provide the required flatness and durability.

Pilot sites with reinforced bases serve for a long time showing very good results. Meanwhile the amount of cement used is lower by 20...40 %; cracking in the reinforced layers is also lower.

A lot of ash-and-slag mixtures particularly together with the granulated bottom ash can be used in the subbases of road, they can function as draining or frost resistant layers of the road base with 5...10 thousand m³ on 1 km. used.

Research shows that using asphalt-concrete and bituminous-mineral mixtures made with fly ash and ash-and-slag mixtures used as mineral powder in road bed and road base construction gives not only positive results. There're several reasons for it: acid character of low calcium ash or vitrified ash particles of high calcium ash-and-slag materials. Usually all problems can be solved by activation of ash-and-slag mixtures using grinding with special chemical agents. This activation helps active mineral powder to fulfill its functions in the asphalt-concrete.

Thus our studies and activities of our colleagues provide us with defined recommendations on effective usage of ash-and-slag mixtures in road constructions. Nevertheless we are still facing with not willingness of road institutions to facilitate road constructing with the use of ash-and-slag materials. One of the reasons is the absence of modern normative regulation documents and guidelines, which will erase all the questions and re-

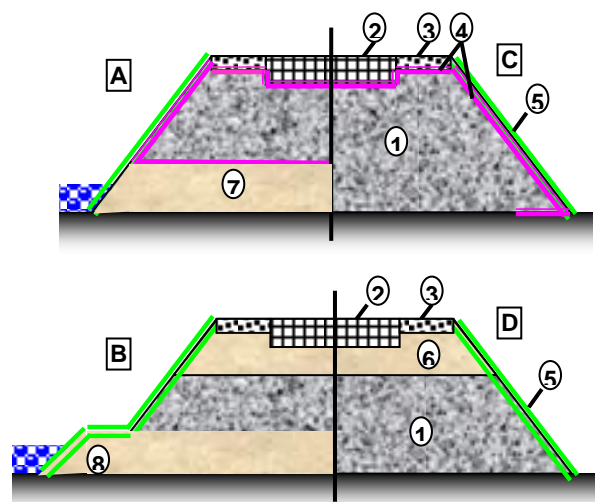


Fig. – Cross sections of the road bed from ash-and-slag mixtures: A, B – at II, III types of territories concerning conditions of watering; C, D – on the dry sites; 1 – ash-and-slag mixtures; 2 – road base; 3 – reinforced roadways; 4 – nonwoven geotextile material; 5 – reinforced slope; 6 – medium sand, sand and crushed stone mixture, non swelling and low swelling ground; 7 – responsibility from producing departments. In respond to all these arguments scientists of SibADI started working on development of regional documents taking into account peculiarities of ash-and-slag materials as well as natural and climatic conditions of the particular region.

We have already developed two documents concerning usage of ash-and-slag materials in road construction. These documents were developed for Irkutskenergo. Another document is being considered these days; it is the Standard of organization “Using of Omsk TTPs’ ash-and-slag materials in road construction. Technical note”. We are ready to work out corresponding normatives for other Russian regions. We have already addressed to “Rosavodor” with such an offer and we hope that the offer to reconsider outdated regulations Industry building code 185-75 will meet understanding, since this document, approved 35 year ago, is not completely reflecting the modern understanding of opportunities and reasonability of applying ash and slag

from power generation in road construction as substituents of both natural fillers and binders.

Unfortunately, road institutions use every single argument and “rumor” in order to escape nontraditional solutions decreasing the cost of objects but demand more careful meeting norms and regulations. That is why we consider that at the modern stage of market economy development and ecology responsibility in Russia it’s legally required to prohibit baseless land acquisition for soil banks located at the defined distance from ash-and-slag disposals.

It should be mentioned that in Poland, USA, India and other developed countries of the world ashes and slags from power generation are widely used in road construction.

CONCLUSION

Improvement of the existing and development of the new normative and technical documents on beneficial use of ash-and-slag materials from TTPs are one of the most important aspects of legal, scientific and technical policy at all the levels of power at solving a problem on rational using of investment assets, replacing natural resources with by products and decreasing in further environmental degradation resulting from economic activity.

REFERENCES

1. **CRR 2.05.02-85***. Automobile roads.
2. **GOST 25100-95**. Soils. Classification.
3. **GOST 22733-2002**. Soils. Method of laboratory definition of maximum density.
4. **RBN 185-75**. Technical directions for usage fly ash and ash-and-slag mixtures from burning of various aspects of solid fuel for a construction of a roadbed and the device of a base of road and coatings of highways”
5. **IRC 218.046-01**. Projecting nonhard road coatings.
6. **GOST 23558-94**. Crashed stone-soil-sand mixtures and soils which have been processed with nonorganic binding materials and used in road, airfield and asphaltic concrete. Technical standards.
7. **GOST 9128-97**. Asphaltic concrete mixtures road, airfield and an asphaltic concrete.
8. **GOST R 52129-2003**. Mineral powder for asphaltic concrete and organic-mineral mixtures. органоминеральных смесей.
9. **GOST 30491-97**. Organic-mineral mixtures and soils reinforced by organic binding materials used in road, airfield and asphaltic concrete. Technical standards.
10. **OST 34-70-542-2001**. The fly ash of heat power plants. Standard performances.