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THE IMPACT OF CONSTRUCTION INDUSTRY ON THE CONTENT OF HEAVY METALS IN THE AIR ENVIRONMENT OF KRASNOYARSK CITY

Abstract: *The construction industry has a significant role in the environmental situation of the city of Krasnoyarsk providing the population with residential, industrial and road construction facilities. A necessary component of construction activity is the enterprises for the production of building materials using a wide range of chemical compounds that annually enter the atmosphere, water bodies, groundwater, soil in the form of industrial emissions, affecting the environmental situation. The construction industry is also impossible to imagine without the use of vehicles, the operation of which is impossible without fuel that absorbs oxygen and emits exhaust gases containing heavy metals in their composition. From the environment dangerous substances enter the human body through the skin, inhaled air, food and eventually cause its functional changes. Exceeding the maximum permissible concentrations heavy metals can have a toxic effect on the human body, so it is necessary to measure their concentration in the air of Krasnoyarsk city regularly. The most common heavy metals entering the atmosphere as a result of industrial emissions include lead, mercury, cadmium, zinc. Lead has a toxic effect, it accumulates in kidneys, liver and other vital organs, gradually leading to disruption of the entire body functioning. Mercury has a toxic effect on the human body, animals and natural components; it is widely used in various industries and a part of a number of pesticides. Cadmium is a chemical element with toxic properties exceeding the properties of lead. It easily passes from soil to plants. Zinc is widely used in the production of paint products, medicine and printing. In case of excessive intake by the body it has a carcinogenic effect.*

Keywords: *construction industry, heavy metals, urban environment, construction wastes*

The term "heavy metals" includes a wide range of substances that are hazardous to human health and have a negative impact on the environment. Depending on the time of exposure, concentration, chemical, biological and toxicological properties, these substances can cause allergic, carcinogenic or fibrogenic effects on the human body.

Currently, this term is widely used by many scientists in connection with the increasing impact of man-made pollution on the environment of Krasnoyarsk city that leads to the deterioration of the environmental situation [1].

The construction industry is an independent direction of the economic system, designed to provide the necessary facilities for production and non-production purposes.

The most typical pollutants of the construction industry are: dust, nitrogen oxides, sulfur dioxide, suspended solids; toxic pollutants include heavy metals (Tab.1). In the soils of Krasnoyarsk city and its environs, there is lead, nickel, copper, zinc, cobalt, other heavy metals, the concentration of which is lower than the maximum permissible, but at the same time, in some areas of the city and its surroundings the concentration of these substances is close to the maximum permissible. The reason for this may be the wind rose and the proximity of industrial enterprises to certain areas [2].

Table 1

Classes of elements ‘ danger (toxicity)

Class of danger	Elements
I	Arsenic, cadmium, mercury, lead, zinc, 3,4-benz opyrene
II	Boron, cobalt, nickel, molybdenum, copper, antimony, chromium
III	Barium, vanadium, tungsten, manganese, strontium, acetophenone

Heavy metals are a part of rocks of the natural origin, being their secondary components. More heavy metals are found in carbonates and clay rocks.

Industrial wastes associated with the construction industry include a wide range of heavy metals, so one of the main tasks is to measure the concentration of the harmful substances formed in the production process and their emissions into the environment regularly.

In this regard, it is necessary to ensure the binding of heavy metals into structurally stable compounds, to avoid secondary environmental pollution and to eliminate as manyfactors that contribute to the migration of hazardous components from the construction materials as possible.

In some building materials, being exposed to the aggressive environment for a long time, a leaching of oxides, increased porosity occurs and this contributes to further leaching and pollution. Lead, copper, zinc, nickel, cobalt included to the cement concrete are in water-soluble compounds and dissolve in an alkaline medium quickly enough.

Therefore, it is necessary to introduce substances that increase the structural stability of compounds that prevent the destructive processes of hazardous materials and their environmental release in concentrations exceeding the maximum permissible onesinto the composition of building materials (Tab 2).

The highest content of heavy metals is in phosphogypsum, mineral slime, wastes molding mixtures.

Before choosing raw materials for producing construction materials and methods of wastes management, it is necessary to pay special attention to the content of heavy metals water-soluble forms entering the production process. Many production processes of construction materials are based on grinding, crushing the raw material before the production process that causes the formation of a large amount of dust and its impact on the production personnel.

Dust is tiny solid particles that are able to be in the air in suspensionfor some time. The largest amount of dust enters the environment during the production and transportation of building materials, finishing works, cleaning and painting of surfaces, digging of pits, processing and installation of building structures.

The degree of dust negative impact on the human body depends on a number of factors, which include the chemical composition, dispersion, shape, electrical charge, density, speed of deposition of dust particles. Dust adversely affects the personnel’ bodies, getting into the lungs when breathing, it is accumulated in them that leads to pneumoconiosis, skin diseases, conjunctivitisoccurrence. In addition, dust worsens the visibility at construction sites, increases abrasive wear of equipment, reducesthe productivity and work quality and worsens the sanitary and hygienic situation in the workplace.

The weight method for determining the concentration of dust in the air of the production room is one of the most widely used methods based on changing the weight of the filter passed through the test air.

The dispersed composition of dust is determined by means of the devices that are divided intothe ones that work without deposition, or with a preliminary deposition of dustaccording to the principle of action are divided.

To prevent the air pollution by dust in the construction industry, it is necessary to ensure maximum mechanization and automation of production processes that allow eliminating the presence of the personnel in the dusted separation zones, equippingthe production with sealed

equipment and using sealed devices during transportation. The reduction of the dustiness level in the working space is also achieved by the use of moistened bulk components in the production of building materials, the use of aspiration systems. It is necessary to organize air exchange in the production room, providing removal of contaminated air from the room, thereby normalizing the air environment.

An important source of the environmental pollution is numerous types of transport, the use of which is an integral part of the construction industry. They are thesource of chemical, noise and mechanical effects.

Table 2

Permissible concentrations of hazardous substances (ГН 2.2.5.2100-06).

Substance	Content mg/m^3
Oxides NO Nitrogen NOx	0.06 0.1
Lead compounds Pb Pb(NO3)2	0.0003 0.0003
Sulfuroxide SO2	0.2
Carbonoxide CO	3
Carbon, (soot)	0.05
Benzopyrene C20N12	0.000001
GasolineC	1.5

The noise figures vary depending on the mode of transport, the highest level of noise being recorded by trucks and machinery.

As a source of artificial noise pollution, road transport has a negative impact on the nervous system, increases fatigue, leads to neuroses, reduce mental activity. Under the effect of the noise ofcertain intensity there is a change in blood circulation, heart work, reduced muscle endurance, decreased reflex activity. Noise is especially negative for the human body in combination with vibration, causing a complex of the body disorders.

Arising at the level of human respiration, emissions from the transport operation are particularly dangerous, causing allergic reactions, diseases of the respiratory system, circulatory system. The components of exhaust gases produced by various types of engines include a wide range of chemical elements, some of which have carcinogenic effects on the human body.

Within the framework of the current legislation, the enterprises of the construction industry should not exceed the permissible values of emissions into the environment during the production processes and take measures for their regulation. Particular attention should be paid, among other things, to the utilization of construction wastes. The results of the study have confirmed that the emissions associated with the construction industry of Krasnoyarsk city do not exceed the permissible values.

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