ТЕОРЕТИЧНІ ОСНОВИ БУДІВНИЦТВА. НОВІТНІ ТЕХНОЛОГІЇ, КОНСТРУКЦІЇ ТА МАТЕРІАЛИ ДЛЯ БУДІВНИЦТВА, РЕКОНСТРУКЦІЇ ТА ВІДНОВЛЕННЯ БУДІВЕЛЬ І СПОРУД

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SHIELDING ELECTROMAGNETIC FIELDS WITH ELECTRICALLY CONDUCTIVE CONCRETE

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Shielding of electromagnetic fields (EMF) is a topical issue for health protection, information security, electromagnetic compatibility and electromagnetic ecology of living spaces, protection of rooms for servers and/or electronic equipment.

The rapid development of television and radio communication, mobile cellular communication, and the Internet is causing more and more environmental pollution. Household appliances, electric vehicles and, of course, computers also make a significant contribution. Induced electromagnetic fields are increasingly causing malfunctions in IT equipment and affecting the quality of communication. At the same time, there is a real possibility of using electromagnetic side emissions and induced electromagnetic fields of electronic devices with special equipment to remove confidential information from servers, interfere with the operation of information systems, listen to conversations or destroy data on electronic media intentionally or negligently.

The only physically justified and reliable way to protect against these types of threats is special shielding of computer rooms or installation of electronic equipment in shielded cabins. With seeming external simplicity, this solution allows, taking into account the peculiarities of radio wave propagation and qualified design of the shielding structure, to achieve a significant attenuation of the background signal. Protective shielding of premises allows, in addition, to exclude the harmful effect on a person of strong electromagnetic fields from various radio transmitting devices and other means of electromagnetic radiation.

Thus, for example, shielding of premises where there are elements of telecommunication networks, information support, control and management systems, separate technical means, as well as premises used for reception, processing and transmission of confidential information, will allow:

- protect the facility from unauthorized information acquisition via radio, EMPIH, electroacoustic channels;
- to strengthen protection of the object from specially organised, using various technical means, information leakage channels;
- eliminate the escape of informative electromagnetic emissions and inductions from the premises by radiating components of office equipment, equipment and the interior of the premises;
- protect users, office equipment, radio-electronic equipment in the room from the destructive effect of directed energy weapons;
- to provide biological protection of users in the room from the effects of increased electromagnetic fields and directed electromagnetic radiation.

The versatility and complexity of tasks existing in the field of information security require the use of multifunctional high-quality shielded volumes and structures designed to operate in a wide frequency range with a high shielding coefficient and providing for various use cases.

To produce such shielded volumes, new highly effective radio shielding materials based on electrically conductive compositions are being developed, in particular, electrically conductive concretes.

Electrically conductive concretes are obtained by introducing electrically conductive fillers into their structure during production.

Portland cement, liquid glass, slag-alkali binder are using as binders in such concretes.

As electrically conductive fillers metal powder, steel fibre, carbon fillers are used. The optimum amount of fillers can be obtained using the theory of percolation. In this case characteristic points on the graphs of dependences “filler quantity − electrical conductivity” in which the conductivity of the composition changes are determined.

At present, the following materials are being tested according to the developed methods of electrical conductivity: technical carbon black, graphite, coke, graphene, carbon fiber.

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