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CERTAIN ISSUES OF HYDROGEOLOGY AND ENGINEERING GEOLOGY IN THE DEVELOPMENT AND UTILISATION OF UNDERGROUND SPACE IN CITIES AND MINING REGIONS. REGINA E. DASHKO'S RESEARCH

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EMPRESS CATHERINE II
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CERTAIN ISSUES OF HYDROGEOLOGY AND ENGINEERING GEOLOGY IN THE DEVELOPMENT AND UTILISATION OF UNDERGROUND SPACE IN CITIES AND MINING REGIONS. REGINA E. DASHKO'S RESEARCH

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Abstract

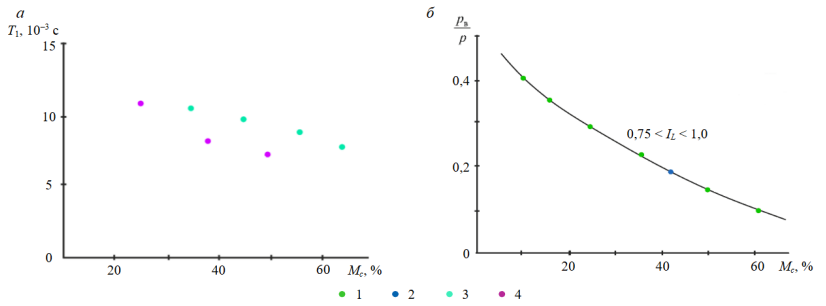
The scientific works of Professor Regina E. Dashko have always been distinguished by an interdisciplinary research approach, a multifactorial analysis of processes and phenomena occurring in soils, and a breadth of thinking free from dogmas and clichés, even if the latter are hallowed by long-standing tradition and protected by established prejudices within the scientific community. The combination of impartial analysis in the study of each process and phenomenon in underground space with the synthesis of extensive knowledge from related fields – engineering geology and hydrogeology, soil mechanics and geotechnical design, microbiology and physical chemistry – is a characteristic quality of Regina E. Dashko's works. The research of Professor R.E. Dashko has not only significantly shaped the development of modern engineering geology and served as the foundation for the St. Petersburg scientific school she leads, but has also had a decisive influence on modern geotechnics.

The rapid computerisation of all spheres of human activity tempts many minds, whether wittingly or unwittingly, to substitute the virtual world for the real one. The accompanying schematisation and simplification of processes and phenomena, and the disregard for nuances (which under certain conditions can become determining factors), can be dangerous, especially concerning such a complex creation of nature as soil in its interaction with a structure. The book by R.E. Dashko is the best antidote to this temptation.

Dr. of Geol.-Mineral. Sci. A.G. Shashkin

Dashko R.E., Kolosova D.L., Mazur A.S., Ievlev A.V. Nuclear magnetic resonance as a method for revisiting the theory and practice of filtration consolidation in water-saturated clay soils // Journal of Mining Institute. 2025. Vol. 276. Iss. 1. P. 67-76. https://pmi.spmi.ru/pmi/article/view/16528

Abstract. This article outlines the key principles and assumptions that form the basis of the filtration consolidation model for water-saturated clay soils described by K.Terzaghi in 1925 for calculating the settlement of structures. One of the main assumptions that requires revision is the notion that the pore water in clay soils has properties identical to those of bulk water. In the modern context, pore water should be considered in terms of its structuredness under the influence of the active centers of solid particles, ions, and other factors. The results of experimental studies on the effect of active centers of the solid surface, primarily clay particles, on the change in water structure via nuclear magnetic resonance relaxometers of various generations are presented. The patterns of changes in the structure of pore water in water-saturated clay soils of different granulometric and mineral compositions in the range of changes in their conditional physical state by moisture are shown. The structuredness of pore water in soils contributes to its inertness to the perception of external pressure and to the need to revise the concepts of filtration consolidation in favour of the rheological model for predicting the development of settlements as the main criterion for their stability.



Variation in water structuring degree by T_1 value (a) and relativepore pressure ratio p_w/p (b) versus clay fraction content M_c and liquidity index I_L
1 – laboratory tests; 2 – tests in situ; 3 – ECHO-4; 4 – ECHO-12

Dashko R.E., Karpenko A.G. Current state of above-ground and underground structures of the Alexander Column: an integral basis for its stability // Journal of Mining Institute. 2023. Vol. 263. P. 757-773. https://pmi.spmi.ru/pmi/article/view/16219

Abstract. The Alexander Column as a compositional center of the architectural ensemble of Palace Square in Saint Petersburg, Russia, has always been a matter of concern for both the public and specialists due to progressive deterioration of its granite shaft caused by crack formation. The article examines previous studies related to the inspection and restoration of the column's shaft and other parts above ground level, as well as reasons for crack initiation and propagation in the column. An analysis was performed on the anomalies in the Fennoscandian Shield and the structural-tectonic conditions at the Montferrand quarry site, revealing the presence of faults and circular features within the studied area. The research considers N.Hast's measurements of excess tectonic stresses in anomaly zones (southeastern Finland), which acted horizontally and resulted in the development of tensile cracks within the granite massif and later in the column's shaft after its installation. The most dangerous type of deformation for the Alexander Column is its tilt in the northeast direction, recorded in 1937 and 2000. The article analyzes the construction features of the column's foundations and additional underground elements, as well as soil and groundwater characteristics based on archival data. The contamination history of the underground space is taken into account, and an analogy-based method is used to assess the engineering-geological and hydrogeological conditions of the underground load-bearing structures within the placement zone of the Alexander Column and the New Hermitage buildings. The results of visual observations on the nature of deterioration and deformation of the pavement around the monument, as well as its pedestal, indicating the development of uneven settlement of the foundation, are presented. The article concludes with general recommendations for organizing and implementing comprehensive monitoring to forecast the deformation dynamics of the Alexander Column.

Dashko R.E., Lokhmatikov G.A. The Upper Kotlin clays of the Saint Petersburg region as a foundation and medium for unique facilities: an engineering-geological and geotechnical analysis // Journal of Mining Institute. 2022. Vol. 254. P. 180-190. DOI: 10.31897/PMI.2022.13

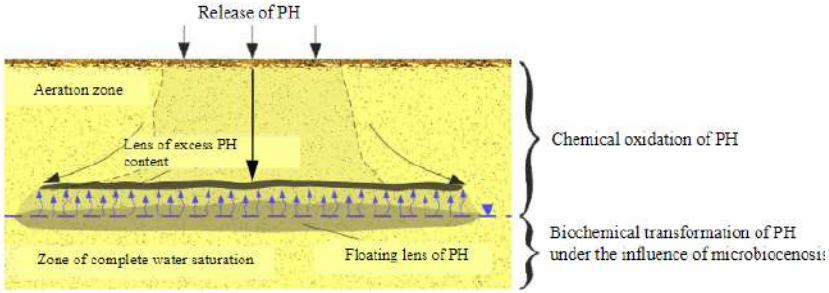
Abstract. The article reviews the issues concerned with correctness of the engineering-geological and hydrogeological assessment of the Upper Kotlin clays, which serve as the foundation or host medium for facilities of various applications. It is claimed that the Upper Kotlin clays should be regarded as a fissured-block medium and, consequently, their assessment as an absolutely impermeablestratum should be totally excluded. Presence of a high-pressure Vendian aquifer in the lower part of the geological profile of the Vendian sediments causes inflow of these saline waters through the fissured clay strata, which promotes upheaval of tunnels as well as corrosion of their lining. The nature of the corrosion processes is defined not only by the chemical composition and physical and chemical features of these waters, but also by the biochemical factor, i.e. the availability of a rich microbial community. For the first time ever, the effect of saline water inflow into the Vendian complex on negative transformation of the clay blocks was studied. Experimental results revealed a decrease in the clay shear resistance caused by transformation of the structural bonds and microbial activity with the clay's physical state being unchanged. Typification of the Upper Kotlin clay section has been performed for the region of Saint Petersburg in terms of the complexity of surface and underground building conditions. Fissuring of the bedclays, the possibility of confined groundwater inflow through the fissured strata and the consequent reduction of the block strength as well as the active corrosion of underground load-bearing structures must be taken into account in designing unique and typical surface and underground facilities and have to be incorporated into the normative documents.

Dashko R.E., Romanov I.S. Forecasting of mining and geological processes based on the analysis of the underground space of the Kupol deposit as a multicomponent system (Chukotka Autonomous Region, Anadyr district) // Journal of Mining Institute. 2021. Vol. 247. P. 20-32. DOI: 10.31897/PMI.2021.1.3

Abstract. The underground space of the Kupol deposit is analyzed as a multicomponent system – rocks, underground water, microbiota, gases (including the mine atmosphere) and supporting structures – metal support and shotcrete (as an additional type of barring) and also stowing materials. The complex of host rocks is highly disintegrated due to active tectonic and volcanic activity in the Cretaceous period. The thickness of sub-permafrost reaches 250-300 m. In 2014, they were found to contain cryopegs with abnormal mineralization and pH, which led to the destruction of metal supports and the caving formation. The underground waters of the sub-permafrost aquifer are chemically chloride-sulfate sodium-calcium with a mineralization of 3-5 g/dm^3. According to microbiological analysis, they contain anaerobic and aerobic forms of microorganisms, including micromycetes, bacteria and actinomycetes. The activity of microorganisms is accompanied by the generation of hydrogen sulfide and carbon dioxide. The main types of corrosion – chemical (sulfate and carbon dioxide), electrochemical and biocorrosion are considered. The most hazardous is the biocorrosion associated with the active functioning of the microbiota. Forecasting and systematization of mining and geological processes are carried out taking into account the presence of two zones in depth – sub-permafrost and below the bottom of the sub-permafrost, where mining operations are currently underdone. The importance of assessing the underground space as a multicomponent environment in predicting mining and geological processes is shown, which can serve as the basis for creating and developing specialized monitoring complex in difficult engineering and geological conditions of the deposit under consideration.

Dashko R.E., Lange I.Yu. Engineering-geological aspects of negative consequences of contamination of dispersive soils by petroleum products // Journal of Mining Institute. 2017. Vol. 228. P. 624-630. DOI: 10.25515/PMI.2017.6.624

Abstract. The article presents the features of transformation and migration of petroleum products in the underground environment, which are determined by the physical and physicochemical properties of petroleum hydrocarbons (density, viscosity, solubility in water, etc.) and their enclosing soils (sorption capacity, humidity, etc.). The main processes of degradation of oil products in the soil stratum are considered. The influence of oil products on the change in oxidation-reduction and acid-alkaline conditions of the underground space, development of activity of various forms of microorganisms is shown. The change in the composition and properties of dispersive soils of various degrees of water saturation is experimentally studied. The analysis of the causes of the reservoir destruction used for storage of fuel oil is given. It was established that the development of microbial activity at its base led to the transition of sands to quicksands, and moraine loams to quasi-plastic varieties. Intensive gas formation of methane and its homologues, nitrogen, carbon dioxide, hydrogen in sands was recorded. Based on the analysis of the results of long-term monitoring of the effect of contamination of dispersive soils by oil products, their bearing capacity in the base of the structures has been reduced to 50% of the initial value. The role of microbial activity in the formation of an aggressive environment in relation to building materials is shown.



Flow chart of main processes of petroleum hydrocarbons(PH) transformation after release in soil

Dashko R.E., Lange I.Yu. Forecasting bearing capacity change of sandy-argillaceous soils in course of their contamination by oil-products // Journal of Mining Institute. 2015. Vol. 211. P. 16-21. https://pmi.spmi.ru/pmi/article/view/5243

Abstract. The paper deals with the main petroleum hydrocarbon sources in the earth cover. Oil products influence on intensification of different microbial forms activity as well as on bio-chemical transformation of the pollutants themselves is shown. Changes in state and properties of soils due to microbial degradation of oil products are experimentally studied. The analysis of reservoir destruction through the example of black oil fuel storage is carried out. Results of determining different groups of microorganisms in soils and groundwater in the fuel oil storage tank area cross-section are given. The role of microbial activity in bearing capacity change of sandy-argillaceous soils with specific reference is presented.

Dashko R.E., Alexeev I.V. Influence of drainage water injection in the lower carboniferous aquifer on stability of the protective aquiclude of the Yakovlevsky mine of the same-name deposit KMA (physical-chemical and biochemical aspects) // Journal of Mining Institute. 2013. Vol. 206. P. 11-15. https://pmi.spmi.ru/pmi/article/view/5426

Abstract. Drainage water formation of the Yakovlevsky mine (Yakovlevsky deposit, KMA) is considered, as well as the features of its discharge to soak away and thereto related ecological issues. Ways of drainage water treatment are presented. The particular focus is given to the project of its disposal in the high-head Lower Carboniferous aquifer using injection methods. Negative effects of this measure and nature of its impact on the water-protective layer, determining safety of mining operations, are stated.

Dashko R.E., Karpova Yu.A. Problems of engineering geology of Primorskiy district of Saint Petersburg associated with the prospects of its underground space development // Journal of Mining Institute. 2013. Vol. 206. P. 16-21. https://pmi.spmi.ru/pmi/article/view/5427

Abstract. The analysis of engineering and geological conditions of Primorskiy district of Saint Petersburg associated with the prospects of its areas development up to the year 2025. Its structural and tectonic conditions are represented. Results of microbiological analysis of soils from the section of Juntolovskiy reserve are given. The research of microbial flora of Lakchtinskoye swamp peats are carried out. The analysis of basic engineering and geological problems related with microbial activity is given. The main natural and technogenic sources of underground water and soils contamination are considered, and also some measures that provide longterm competence of constructions of different appointment are recommended.

Dashko R.E., Korobko A.A. Engineering-geological substantiation of safety building and operation constructions of different function within the lowland Predglintovaya (the Western part of the Leningrad region) // Journal of Mining Institute. 2013. Vol. 206. P. 22-25. https://pmi.spmi.ru/pmi/article/view/5428

Abstract. The analysis the characteristics and specificity the formation of Predglint lowlands is carried out. The regularities of changes in the state and the strength of blue clay at the depth of cut, taking into account their degree of disintegration – layering and fracturing. The influence of macro- and microcracks in the blue clay zone predglint on their strength and deformation ability is investigated. Basic provisions of engineering-geological analysis of the territory are developed. Recommendations to improve the safety and reliability estimates of blue clay as base of constructions of different function are offered.

Dashko R.E., Perevoshchikova N.A., Vlasov D.Yu. Influence of some geoecological factors on destruction of concrete constructions of Cheboksary hydroelectric power plant // Journal of Mining Institute. 2013. Vol. 203. P. 160-165. https://pmi.spmi.ru/pmi/article/view/5629

Abstract. The short characteristic of engineering-geological and hydrological conditions of the grounds of concrete constructions is given. Factors of formation of ecological conditions in a benthonic zone of a water basin of Cheboksary hydroelectric power plant are analyzed. Dynamics of change of activity and number of microorganisms in water and bed deposits of a water basin is considered. Results of specialized shooting in dry footway about a condition of concrete of a hydroelectric power plant building of and an overflow dam in 2010-2011 are stated, the comparative estimation of microbiological activity which promotes development of the vigorous activity of biocorrosion of concrete and metals is spent. It is shown high microbes prevalence the materials applied to repair work (seals of various defects in concrete designs).

Dashko R.E., Perevoshchikova N.A., Vlasov D.Yu. Engineering-geological and geoecological aspects of a substantiation of long stability of concrete constructions of Cheboksary hydroelectric power plant // Journal of Mining Institute. 2013. Vol. 200. P. 185-192. https://pmi.spmi.ru/pmi/article/view/5788

Abstract. Features of engineering-geological and hydrological conditions of the basis of concrete constructions are analyzed. Factors of formation of ecological conditions in a bottom zone of a water basin of Cheboksary hydroelectric power plant are analyzed. The maintenance and change of activity and number of microorganisms in water and ground adjournment of a water basin is considered. Results of specialized shooting in dry gallery about a condition of concrete of a building of hydroelectric power plant and a spillway dike in 2010-2011 are stated, the comparative estimation of microbiological activity which promotes development of active biocorrosion of concrete and metals is spent.

Dashko R.E., Shidlovskaya A.V. Physical and chemical genesis of swell and osmotic shrinkage of clay soils in construction's base by results of experimental researches // Journal of Mining Institute. 2013. Vol. 200. p. 193-200. https://pmi.spmi.ru/pmi/article/view/5789

Abstract. The effect of physical-chemical and chemical factors on peculiarities of swelling and osmotic shrinkage of clay provided the absence of a membrane effect is analyzed. It is demonstrate that the genesis of swell due to water inflow in soil and its outflow is principally different and depends on different correlation of clay pore water concentration (C_p) and solutions filter-passing (C_f). The balance equations for five types of swells are adduced. The experimental researches are allowed to obtain the equation for calculation of solution concentration (boundary of osmotic shrinkage C_{bos}). The exceeding of C_{bos} leads to osmotic shrinkage of clay formation. The conclusion of strength and deformation capacity of clay by swell and shrinkage is gained.

Dashko R.E., Kotyukov P.V., Shidlovskaya A.V. Hydrogeological conditions effect on safety of underground space expansion during transport tunnel construction // Journal of Mining Institute. 2012. Vol. 199. P. 9-16. https://pmi.spmi.ru/pmi/article/view/5812

Abstract. The estimation of main factors which exerts influence upon functioning reliability of system "tunnels – underground space" is executed. It is shown that hydrogeological conditions have a special importance for construction and maintenance of subway tunnels in Saint-Petersburg. The hydrodynamic effect of regional and local water-bearing horizons on development and activation of different processes such as groundwater flow, quicksands, head water inrush, underground constructions deformation is analyzed. The influence of hydrochemical conditions on formation of underground space aggressiveness to constructional and waterproofing materials of the tunnels is established. The negative effect of underground microbiota activity on degradation of reinforced concrete and castiron tunnel lining is shown.

Dashko R.E., Feller E.N. Formation and development of mining-and-geological processes in relation to changes in engineering-geological and hydrogeological conditions on Yakovlevsky mine // Journal of Mining Institute. 2012. Vol. 199. P. 151-160. https://pmi.spmi.ru/pmi/article/view/5836

Abstract. Complexity of hydrogeological and engineering-geological conditions of the Jakovlevsky deposit and the basic tendencies of their change is characterized at expansion of front of mining works and increases in volumes of extraction of rich iron ores. It is noticed that safety of conducting mining works is defined by formation and development of dangerous mining-and-geological processes. Substantive provisions of forecasting of mining-and-geological processes on Jakovlevsky mine are resulted. Possibility of occurrence of underground waters breaks from undrained water bearing horizons is considered. Ordering of processes of native and native-technogenetics genesis within an allotment of Jakovlevsky mine is executed and the basic directions of actions for increase of safety of exploitation of mine are planned.

Dashko R.E., Shidlovskaya A.V. Biotic and abiotic components in underground space: genesis and effect on condition and properties of sandy soils // Journal of Mining Institute. 2012. Vol. 197. P. 209-214. https://pmi.spmi.ru/pmi/article/view/5993

Abstract. The study presents influence biotic and abiotic components in underground space on formation and changes of sandy soils conditions and properties under peat, contamination of leaking sewages and some industrial enterprises. The regularities of decreasing of density, water permeability and shear strength of sand due to good disintegrated peat by experimental are analyzed. The organic component of biotic genesis leading to extremely negative effect on permeability and mechanical properties of water saturated sands till to quicksands is shown. The local constructional norms for Saint Petersburg on the base of getting results should be modernized.

Dashko R.E., Alekseev I.V. Microbial activity in mine working and its influence on high-grade iron ore's and constructional material's properties // Journal of Mining Institute. 2012. Vol. 195. P. 15-18. https://pmi.spmi.ru/pmi/article/view/6091

Abstract. Development's conditions and sources of microorganisms in high-grade iron ore (HGIO) of Jakovlevsky deposit (KMA) were considered. Influence of watering, draining and contamina tion in iron ore on decreasing of shear strength and growth of bacterial mass were noticed. Different physiological groups and species composition of microorganisms in underground space were defined, and their influences on constructional materials which are used to coffer mine workings were studied.

Dashko R.E., Kovaleva E.N. Hydro-geological monitoring on the Jakovlevsky mine as implement of increase safety conducting mine second working in difficult mine-geological conditions // Journal of Mining Institute. 2012. Vol. 195. P. 19-23. https://pmi.spmi.ru/pmi/article/view/6092

Abstract. In article researched difficult hydro-geological conditions of the Jakovlevsky deposit rich iron ores on which mining going under not-drained high-pressured Lower Carboniferous water-bearing horizon. The purpose spent monitoring is resulted. The comparative analysis of results of three cycles of a hydro-geological monitoring which has shown gradual expansion of front of an over flowing of underground waters from not-drained horizon is made. Negative consequences of such process are specified. The development features of various biological forms of a life in mine which destroy construction materials are noted. Actions for decrease in consequences of an overflowing are planned.

Dashko R.E., Pankratova K.V., Korobko A.A. Study of engineering-geological and microbiological factors for assessing the dynamics of fracture in tunnel highway Saint Petersburg – Kiev // Journal of Mining Institute. 2012. Vol. 195. P. 24-27. https://pmi.spmi.ru/pmi/article/view/6093

Abstract. Reasons of transition tunnel construction to the pre-emergency state and the nature of landslide displacements trimmed slope, which can be traced in the context of the Lower Cambrian blue clay are defined. Influence of microbial activity as a negative factor fracture of structural materials, as well as strength reducing of blue clay. Regularities of changes in the state and the strength of blue clay at the depth, taking into account their degree of disintegration – layering and fracturing. The quantitative evaluation of stability of the construction of the transport tunnel, taking into account changes in the strength of blue clay as an fissured medium at different positions of the landslide surface. The strategy of measures to ensure the reliability of the facilities.

Dashko R.E., Shidlovskaya A.V., Aleksandrova O.Yu., Alekseev I.V. Engineering-geological and hydrogeological problems of St. Isaak cathedral's long-term stability substantiation (Saint Petersburg) // Journal of Mining Institute. 2012. Vol. 195. P. 28-32. https://pmi.spmi.ru/pmi/article/view/6094

Abstract. In the paper construction specificity of St. Isaak Cathedral's underground space and engineering geological profile features are considered. The comparative assessment of condition and properties modification of water-saturated quaternary sandy and clay soils during 55 years are taken up (1954-2009). The dynamic of groundwater contamination due to leakage sewers and its aggressiveness are estimated. The research on microbe activity in soils which are characterized by quasi-heavy values are completed. The structural of complex monitoring to secure of St. Isaak Cathedral long-term stability are proposed.

Trushko V.L., Dashko R.E., Kuskov V.B., Kornev A.V., Klyamko A.S. Preparation of iron-ore materials for iron and steel industry // Journal of Mining Institute. 2011. Vol. 194. P. 120-123. https://pmi.spmi.ru/pmi/article/view/6169

Abstract. Briquetting in ferrous metallurgy is the earliest way clotting. In the beginning of the 20th century briquetting has been forced out by agglomeration basically for the reason considerably more productivity of process of agglomeration. As alternative to agglomeration pelletizing became. It started to be popular in the the 20th century, that is quite explainable by essential increase of manufacture fine particle concentrates. However briquetting has a number of advantages. For some kinds of iron ores briquetting can be preferable process. Such ores are rich iron ores with iron content 60 % and more. The technology of briquetting includes crushing, preliminary screening for removing of large particle size classes; dispensing and mixing martite ore, and hydrohematite ores; mixing with binder substances; pressing; screening for removing of small size briquettes; drying. The received briquettes have density 3200-3600 kg/m^3, durability on uniaxial compression more then 4,5 MPa.

Dashko R.E., Shidlovskaya A.V., Pankratova K.V., Zhukova A.M. Technogenic transformation of the basic components of megacities underground space and its account in geomechanical calculations (on the example of Saint Petersburg) // Journal of Mining Institute. 2011. Vol. 190. P. 65-70. https://pmi.spmi.ru/pmi/article/view/6426

Abstract. Engineering-geological and hydro-geological features of rent of St. Petersburg are considered. It is noted that at designing buildings for different purposes, in order to ensure their long-term stability it is necessary to analyze the possibility of their transformation the main components of underground space (rocks, underground water, gas, microbiota, underground structures) under the influence of natural and technogenic factors. Examples of transformation of sand-clay soils under the influence of physical and chemical conditions change and activation of microbial activity in underground space are given. The case of transition of a heavy construction to a pre-emergency condition because of mistakes in engineering research and incorrect assigning of computative parameters is analyzed.

Dashko R.E., Kotyukov P.V. The engineering geological control of underground transport tunnels exploitation reliability in Saint Petersburg // Journal of Mining Institute. 2011. Vol. 190. P. 71-77. https://pmi.spmi.ru/pmi/article/view/6427

Abstract. The natural and technogenic factors effect on exploitation reliability of subway tunnels located in Upper Vendian clays are analyzed. It is noted what the fractured clays has been studied during the exploring of the first metropolitan lines. It is emphasized what the intensity of clay fracturing increases in thalweg zones of paleo-valleys within the bounds of which the quantity of underground water leakages in tunnels increases. The hydrodynamic and hydrochemistry conditions of Vendian high head horizon (lied under clays) influence on deformation and destruction of tunnels lining are investigated. The reduction of clays shear strength parameters under the interaction of clays and liquid phases is experimentally studied. The water extracts chemical composition of disintegrated construction materials and sinter forms are resulted. The important role of biocorroion in constructional and waterproof materials (included bitumen) disintegration is shown. The protection methods of tunnels constructions from biocorrosion are recommended.

Dashko R.E., Kovaleva E.N. Complex monitoring of underground waters on the Jakovlevsky deposit of rich iron ores and its role in increase of mine works conducting safety in the conditions of not drained water-bearing horizons // Journal of Mining Institute. 2011. Vol. 190. P. 78-85. https://pmi.spmi.ru/pmi/article/view/6428

Abstract. Specificity of hydro-geological conditions of the Jakovlevsky deposit and operating system of a drainage on the mine with the same name is resulted. It is underlined that mine works are conducted under not drained high pressure water-bearing horizons. The complex hydrochemical and hydrodynamic monitoring of underground waters is considered as implement for increase of safety of extraction mine works in difficult mine-geological conditions. The comparative analysis of hydro-geological monitoring three cycle's results which has shown gradual expansion of underground waters overflowing front from not drained horizon is carried out. Negative consequences of such process are specified. The development features of various biological forms of a life in mine which destroy construction materials are noted. Actions for decrease in consequences of an overflowing are planned.

Trushko V.L., Dashko R.E., Kuskov V.B., Klyamko A.S. Technology of "cold" briquetting of rich ores of the Jakovlevsky deposit // Journal of Mining Institute. 2011. Vol. 190. P. 133-137. https://pmi.spmi.ru/pmi/article/view/6438

Abstract. Rich iron ores of the Jakovlevsky deposit are fine metallurgical raw materials. These ores are suitable for melt of high-quality metal at the minimum cost price as doesn't demand mineral processing. Ores contain a considerable quantity of fine classes particles and need briquetting. Mining operations include quality control of mined ore. The technology of briquetting includes, preliminary screening for removing of large classes; dispensing and preliminary mixing 85-90 % martite, iron-micaceousmartite ores and 10-15 % hydrohematite ores; mixing with connective substances; pressing; drying. The received briquettes have density 3200-3500 kg/m^3, durability on compression 4.5 MPa.

Dashko R.E., Zhukova A.M. Engineering geological problems of high-rise construction with underground space development in Saint Petersburg // Journal of Mining Institute. 2011. Vol. 189. P. 19-22. https://pmi.spmi.ru/pmi/article/view/6476

Abstract. The history of high-rise construction is considered summarily. The main features of high-rise buildings and difficulties connected with theirs engineering and construction especially with underground space development and deep excavations in soft water saturated soils are characterized. Territorial construction guides "Residential and social high-rise buildings" prevail in Saint-Petersburg are analyzed in the context of recommendations for reliable basement choice. Brief description of Pre-Quanernary clays (Upper Vendian clays and Lower Cambrian clays) as basement for high-rise constructions are given. It is placed emphasis that the main feature of Pre-Quaternary clays is zone sequence of physical and mechanical properties and fissuring in depth. Physical and mechanical properties of Upper Vendian clays, Lower Cambrian clays and glacial clays are given. In addition, it is confirmed that glacial soils are not recommended for use as a basement for high-rise buildings.

Trushko V.L., Protosenya A.G., Dashko R.E. Geomechanical and hydrogeological problems of the Yakovlevsky deposit development // Journal of Mining Institute. 2010. Vol. 185. P. 9-18. https://pmi.spmi.ru/pmi/article/view/6762

Abstract. The article deals with geomechanical and hydrogeological problems under the Yakovlevsky ore deposit development including variations in strength properties. The estimation of feasible underground water inrush inside the mining excavation is done. In situ results of ore strata deformation around excavation are discussed. Numerical modeling of stress and strain in the waterproofing ore pillar due to partially backfilling of excavation is carried out.

Dashko R.E. Principles of development of geological engineering and geological criteria for safe burial of low radioactive wastes in lower cambrian blue clays in the Leningrad region // Journal of Mining Institute. 2009. Vol. 183. P. 187-195. https://pmi.spmi.ru/pmi/article/view/6891

Abstract. It is noticed that the chosen territory for nuclear-waste disposal in Lower Cambrian clay massif nearby Koporje of Leningrad region takes place in a tectonic zone. Lower Cambrian clays are considered as the block-fractured rock mass having a depth zone structure. The long radioactive irradiation of dark blue clays has led to transformation of their structure, physical-chemical and physical-mechanical properties, and also to activation of microbial activity. Nine criteria to the geoenvironmental and engineering geological characteristics allowing in a complex to estimate safety and reliability of a nuclear-waste disposal in clay formations on an example of dark blue clays are suggested.

Dashko R.E., Shatskaya E.Yu., Vlasov D.Yu. Some data on the causes of structural failure of underground structures in St. Petersburg // Journal of Mining Institute. 2007. Vol. 172. P. 69-73. https://pmi.spmi.ru/pmi/article/view/7621

Abstract. The main natural and anthropogenic factors determining the nature and mechanics of fractures of deep underground tunnel structures lining are considered. On the basis of the conducted research in underground excavations the systematization of the main forms of destruction is carried out. The composition of water extracts prepared from the destroyed concrete and various forms of neoplasms was investigated. Determination of the number and types of microorganisms – micro-mycetes, bacteria and actinomycetes – was carried out. Based on the results of experimental studies, a conclusion is made about the role of biocorrosion in the destruction of tubing and waterproofing jacket. Particular attention is paid to the impact of pressure water of the Lower Kotlin aquifer, which creates favorable conditions for the development of microbiota and its aggressive effect on structural materials.

Dashko R.E., Timchenko A.A. Analysis and evaluation of the results of hydrogeochemical monitoring of groundwater to ensure the safety of mining operations at Yakovlevsky mine // Journal of Mining Institute. 2007. Vol. 172. P. 192-196. https://pmi.spmi.ru/pmi/article/view/7647

Abstract. The basic principles of organization and carrying out of hydrogeochemical monitoring according to the set parameters of chemical compounds of mine water at Yakovlevsky mine are given. Monitoring allows to estimate the activity of overflow and secondary moistening of rich iron ores in the mine. At carrying out of monitoring the general occurrence of hydrogen sulfide (H_2S) of various genesis is revealed. The correlation of H_2S and chlorionic maintenance was obtained. Zones of active water overflow from low-carbon limestone at horizons -425 m and -370 m were outlined. The possibility of corrosion of concrete and metals under the influence of H_2S is shown.

Dashko R.E., Kotyukov P.V. Investigation of bio-aggressiveness of underground environment of St. Petersburg in relation to structural materials of transport tunnels and foundations // Journal of Mining Institute. 2007. Vol. 172. P. 217-220. https://pmi.spmi.ru/pmi/article/view/7653

Abstract. The main natural and anthropogenic factors determining the vitality of diverse microbiota in the underground space (US) of St. Petersburg are analyzed. The data on characteristic microbial flora of buried bogs, contributing to the growth of microorganisms in the underlying soils are given. The processes influencing the formation of reductive-oxidizing and acid-alkaline conditions and viability of various physiological groups of microorganisms in RS are considered. Peculiarities of destruction of foundation brickwork, reinforced concrete and cast-iron lining of some transportation tunnels are considered. A comparative assessment of the influence of water extracts selected from fractured building materials and new formations on the chemical composition of tunnel

linings is given. The metabolism of various bacteria and microfungi leading to the destruction of building materials is characterized.

Dashko R.E., Stukkei A.G. To the influence of the natural-technogenic regime of the Lower Kotlin aquifer in St. Petersburg on the safety of operation of surface and underground structures // Journal of Mining Institute. 2007. Vol. 172. P. 197-200. https://pmi.spmi.ru/pmi/article/view/7648

Abstract. The problem of surface subsidence under intensive downward influence of artesian waters is considered. Changes in the Lower Kotlin aquifer affecting surface and underground structures in St. Petersburg are characterized. Examples of destruction of structural materials during the construction of transportation tunnels are shown. Recommendations on prevention of corrosiveness of structural materials are given.

Dashko R.E. Engineering and geological characteristics and assessment of the rich iron ores of the Yakovlevsky mine // Journal of Mining Institute. 2006. Vol. 168. P. 97-103. https://pmi.spmi.ru/pmi/article/view/7919

Abstract. The nature of the formation of the physico-mechanical properties of rich iron ores is considered as a product of chemical weathering of ferruginous quartzites. The influence of residual and secondary cementation bonds on the strength and stability of BZHR is analyzed. The data on the evaluation of the physical properties of drained and water-saturated BZHR are presented. It has been shown that decompression of BZHR leads to a significant increase in their porosity to 50% or more. The features of the deformation behavior and strength of ores are considered based on the results of experimental studies conducted on samples of undisturbed composition. The range of shear resistance indicators of the BZHR allows for stability calculations under various conditions of their water saturation and dehumidification.

Dashko R.E., Volkova A.V. Investigation of the possibility of groundwater breakthroughs from the Lower carboniferous aquifer into the mine workings of the Yakovlevsky mine // Journal of Mining Institute. 2006. Vol. 168. Iss. 3. P. 142-148. https://pmi.spmi.ru/pmi/article/view/7925

Abstract. The general provisions of the possibility of formation of water breakthroughs during mining operations under water bodies, including non-drained aquifers, are considered. An example of emergency situations during the excavation of underground workings below sea level is given. Calculations of the allowable pressures have been performed using the real strength characteristics of the BZHR and the design spans of single workings. It is shown that only under conditions of complete ore drainage can the stability of the ceiling be guaranteed during mining operations at a horizon of -370 m. The possible time of water flow from the Lower carboniferous aquifer into the ore column has been calculated. The organization of special monitoring of groundwater flow according to hydrochemical indicators is proposed.

Gusev V.N., Dashko R.E., Petrov N.S. Basic principles of the organization and development of hydrogeomechanical monitoring in the underground workings of the Yakovlevsky mine // Journal of Mining Institute. 2006. Vol. 168. P. 149-158. https://pmi.spmi.ru/pmi/article/view/7926

Abstract. Hydrogeomechanical zoning was performed at the primary mining site of the Yakovlevsky mine, which made it possible to identify three zones of different permeability of rocks in the stratum that separates the high-pressure lower carboniferous horizon from the ore-crystalline horizon. The main approaches to the organization of hydrogeomechanical monitoring directly in the underground mine workings, including groundwater monitoring and geomechanical monitoring, are proposed. Methodological recommendations are given for the formulation of the main works included in the hydrogeomechanical monitoring system.

Dashko R.E., Volkova A.V., Vlasov D.Yu. Microbial activity in underground workings and its effect on the properties of rich iron ores and structural materials // Journal of Mining Institute. 2006. Vol. 168. Iss. 3. P. 165-174. https://pmi.spmi.ru/pmi/article/view/7928

Abstract. The main factors determining the development of microbial activity in the ore body of the rich ferruginous ores of the Yakovlevsky KMA deposit are considered. The effect of humidification, pollution, and drainage on bacterial mass growth in rich iron ores has been studied. The relationship between the strength of ores and the bacterial mass is shown. Some physiological groups and types of microorganisms, including micromycetes, as well as their abundance, have been experimentally determined. The activity of the impact of biocenoses in the conditions of the Yakovlevsky mine on structural materials – metals and concretes – is analyzed.

Dashko R.E., Shidlovskaya A.V. Parametric support for calculations of long-term stability of structures during construction and reconstruction of buildings in the territory of development of weak water-saturated sandy-clay sediments // Journal of Mining Institute. 2004. Vol. 156. p. 113-117. https://pmi.spmi.ru/pmi/article/view/8940

Abstract. The main leading factors (changes in the stress state of rocks at the base of structures, physico-chemical and biochemical conditions) determining the long-term stability of surface structures are analyzed. It is noted that filtration consolidation is not of practical importance when considering the compressibility of rocks. The influence of physico-chemical factors on sandy-clayey rocks is evident when polluted by runoff with a wide range of mineralization and composition. The effect of intensification of microbial activity, during which biochemical gases are formed and the increase in the content of bacterial mass, on reducing the strength and deformation capacity of clayey rocks is particularly emphasized. It was found that the transformed clay rocks are usually characterized by the presence of quasi-plastic state.

Dashko R.E., Volkova A.V. Geomechanical analysis of St. Petersburg bedrock clays as a fractured-block environment // Journal of Mining Institute. 2004. Vol. 156. P. 118-122. https://pmi.spmi.ru/pmi/article/view/8941

Abstract. The features of the structure of the St. Petersburg bedrock clay massif as a fractured-block environment are considered. The genesis of fracture formation due to tectonic and non-tectonic factors is analyzed, the zoning structure of the clay strata along the depth of the section, which is determined by the block size and the range of humidity and density changes. The regularities of changes in the parameters of shear resistance and general deformation modulus of clays by depth, as well as the influence of the scale effect on the same parameters of mechanical properties, are presented.

Dashko R.E., Eremeeva A.A. Analysis and evaluation of safety enhancement of low-level waste disposal in the Lower Cambrian blue clays of the western part of the Leningrad Oblast // Journal of Mining Institute. 2003. Vol. 154. P. 131-135. https://pmi.spmi.ru/pmi/article/view/9178

Abstract. The composition, structure, physical, physical-chemical, and mechanical properties of blue Lower Cambrian clays in the western part of the Leningrad Oblast have been analyzed. The blue clay formation is considered as a medium for the disposal of radioactive waste near the Koporje settlement. Complex analysis and assessment of the conditions of formation and transformation of blue clays under the influence of natural and anthropogenic factors has shown that prolonged radioactive irradiation of clay strata leads to an increase in the disintegration of clays, reduces the resistance to shear and deformation properties indicators of the activation of microbiological activity, which are considered as a negative factor. Changes in clay properties contribute to the disturbance of hydrodynamic conditions and increase the risk of aquifer pollution. Nine criteria for safe operation of underground storage facilities based on the study of engineering-geological and geo-environmental factors are proposed. Long-term safety of operation of underground storage facilities in clay strata should be based on the multi-barrier concept of environmental protection.

Dashko R.E., Ivanov I.P. Scientific legacy of V.D. Lomtadze and prospects for the development of engineering geology at the St. Petersburg Mining Institute // Journal of Mining Institute. 2003. Vol. 153. P. 7-14. https://pmi.spmi.ru/pmi/article/view/9235

Abstract. Analysis of the scientific legacy of V.D. Lomtadze shows that the main directions of engineering geology have been developed by many followers and have been recognized both at home and abroad. Three laws of engineering geology, proposed by V.D. Lomtadze in 1978, namely the law of geological correspondence, the law of accounting the dynamics of the earth crust and the law of detailed study of the geological environment have been confirmed in modern scientific research. At present there is some stagnation in engineering research due to the reduction in the rate of construction, and the primary statement of V.D. Lomtadze that engineering geology is aimed at solving problems of rational use and protection of the geological environment turns out to be true.

Dashko R.E., Norova L.P. Engineering-geological and geoecological studies of the impact of operational factors on the stability of civil and industrial structures // Journal of Mining Institute. 2003. Vol. 153. p. 144-148. https://pmi.spmi.ru/pmi/article/view/9277

Abstract. Statistical data on the reasons of buildings and structures transition to emergency and pre-emergency state are analyzed. In more than 60 % of cases the loss of stability of structures is observed as a result of activation of various factors acting during operation of buildings. The results of experimental studies showing the negative transformation of sand-clay soils under the influence of sewage runoff and the activation of microbial activity are presented. Empirical dependencies of changes in the coefficient of filtration of sands and strength of clayey soils when the bacterial mass increases are given. The role of organic pollutants in changing the redox conditions in the city underground space has been analyzed. The recommendation of the necessity to take into account the technology of industrial production in the practice of engineering surveys is given.

Dashko R.E. Integrated assessment of clay rock transformation under the influence of radiation exposure // Journal of Mining Institute. 2001. Vol. 149. P. 152-154. https://pmi.spmi.ru/pmi/article/view/9609

Abstract. The influence of long-term radiation irradiation on changes in composition, physical and chemical activity and mechanical properties of Lower Cambrian blue clays serving as the base of low-activity waste storage facilities has been analyzed. It is shown that as a result of formation of defects in the crystal lattice of rock-forming and cementing minerals and their amorphization there is a significant decrease in the values of the total deformation modulus and shear resistance parameters, absorption capacity and swelling ability of clays increases 2 times. It was noted that the thickness of these clays is characterized by a high content of bacterial mass, which indicates active microbiological activity, especially in the upper part of the section.

Dashko R.E., Norova L.P. Technogenic evolution of underground space in Saint Petersburg: causes and consequences // Journal of Mining Institute. 2001. Vol. 147. P. 71-85. https://pmi.spmi.ru/pmi/article/view/9766

Abstract. Natural and technogenic factors determining the evolution and destabilization of the geo-ecological state of the underground space of St. Petersburg are analyzed. Special attention is paid to buried marshes, drainage network and groundwater pollution as the least stable parts of the underground space. The main pollutants of the city are sewage and buried wastes, which bring not only a large amount of organic substances easily assimilated by microorganisms, but also additional microflora. Since the mid-20th century, petroleum hydrocarbons are considered to be active pollutants in the underground space. Large amounts of organic matter in the underground space leads to

the formation of a reducing environment and microbiological activation. Conducted mass sampling of redox potential, determining the features of the chemical composition of groundwater, as well as assessing the bacterial mass in sandy clay sediments of the section indicate the importance of physico-chemical and biochemical processes in the evolution and destabilization of the underground space of the city. As a result of these processes, negative transformation of dispersed soils, leading to the formation of floats, the active development of gas-dynamic phenomena, and a high level of environmental aggressiveness are observed. A special form of corrosion of building materials caused by the activity of microorganisms (bio-corrosion), which enhances chemical, electrochemical and other types of underground exposure, has been analyzed. It was found that more than 50 percent of the total destruction of underground pipelines, foundations, and basement walls is the result of bio-corrosion.

Dashko R.E., Rudenko E.S., Norova L.P. Geoenvironmental problems of transformation of redox conditions in groundwater and dispersed rocks // Journal of Mining Institute. 1995. Vol. 142. P. 194-207. https://pmi.spmi.ru/pmi/article/view/9872

Abstract. Natural and anthropogenic factors of formation of redox conditions in watered dispersed rock strata are analyzed. The influence of reducing conditions and activity of microbiological activity on changes in composition and physical and mechanical properties of sandy-clay sediments is shown. Examples of rock transformation at contamination of groundwater and rocks with organic components are given.

Dashko R.E., Rudenko E.S. Engineering and geological aspects of the role of the biotic component in the operation of tailings dumps at Phosphorit PA // Journal of Mining Institute. 1992. Vol. 133. P. 26-38. https://pmi.spmi.ru/pmi/article/view/10053

Abstract. Operation of industrial hydraulic engineering structures such as tailings ponds at the PO Phosphorite involves the solution of a set of problems associated with the forecast of the impact of these structures on the geological environment, as well as to ensure the reliability of their functioning and, above all, stability for the entire period of operation.

Dashko R.E. Engineering-geological problems of rational utilization of territories and protection of geological environment at operation of tailing dumps (on the example of "Phosphorit") // Journal of Mining Institute. 1989. Vol. 118. P. 18-24. https://pmi.spmi.ru/pmi/article/view/10315

Abstract. Tailings and sludge storages, referred to the structures of industrial hydraulic engineering, are part of the complex of mining and industrial enterprises, linking in a single and indissoluble system of mining and processing of minerals, including enrichment.

Dashko R.E. Engineering-geological aspects of geologic environment protection during the operation of sludge storage facilities of potash enrichment plants // Journal of Mining Institute. 1986. Vol. 109. P. 31-39. https://pmi.spmi.ru/pmi/article/view/10499

Abstract. The expansion of potash ore mining and processing requires an increase in the area available for solid and liquid waste storage. Within the Verkhnekamskoe deposit more than 20-25 hectares are alienated annually.

Dashko R.E. Nature of deformations of water-saturated clayey rocks at the base of the structures // Journal of Mining Institute. 1984. Vol. 100. P. 40-47. https://pmi.spmi.ru/pmi/article/view/10669

Abstract. Quantitative prediction of the development of deformations in the base of structures should be based on a deep and comprehensive analysis of the processes that occur in the base rocks at their interaction with the structure.

Dashko R.E., Kravchenko L.P., Krysov O.Yu. Investigation of the possibility of screening the sludge storage bed of processing plants in the conditions of the Verkhnekamskoye potash salt deposit // Journal of Mining Institute. 1982. Vol. 91. P. 76-81. https://pmi.spmi.ru/pmi/article/view/10813

Abstract. The expansion of potash fertilizer production entails an increase in the capacity of processing plants. In this regard, there are serious problems of protecting natural waters when storing liquid waste from potash production.

Sylvite-halite ore from the Verkhnekamskoye deposit. From the collection of the Mining Museum

Dashko R.E. Engineering-geological analysis of the process of consolidation of clayey rocks // Journal of Mining Institute. 1981. Vol. 83. P. 86-91. https://pmi.spmi.ru/pmi/article/view/10995

Abstract. Evaluation of the bearing capacity of clayey rocks as a foundation depends on the conditions of their consolidation during construction and operation of structures. Finding out the possibility and nature of consolidation of rocks allows you to predict the deformation of the base, changes in its strength, correctly assign shear resistance indicators, choose the schemes for calculating settlements and assess the stability of structures.

Pink kaolinite. From the collection of the Mining Museum

Timofeev O.V., Dashko R.E., Konokotov N.S. Dependence of strength of layered material on adhesion and friction at contacts of layers // Journal of Mining Institute. 1974. Vol. 64. Iss. 1. P. 34-39. https://pmi.spmi.ru/pmi/article/view/11582

Abstract. Sedimentary rocks usually have a layered structure, and the strength characteristics at the contacts of layers (cohesion s_k and angle of internal friction φ_k) can vary from zero to their values in the material of the layer (c_m and φ_m).

Dashko R.E., Kagan A.A. Influence of cations on the strength of clayey rocks // Journal of Mining Institute. 1971. Vol. 62. Iss. 2. P. 110-112. https://pmi.spmi.ru/pmi/article/view/11825

Abstract. The strength of clay rocks is largely determined by their water content and the ratio of its various categories. At present, most authors consider the types of water categories in terms of their formation under the influence of the energy field of the clay particle. It is known that the strength of any energy field decreases according to the law close to exponential, so the transition of water from one category to another is gradual and smooth. When imposing a particle field on water, its structure is distorted due to changes in the nature of transition motion of water molecules.

Dashko R.E., Kuznetsov Yu.F. Estimation of mechanical properties of complex roof rocks in mines of the Leningrad oil shale deposit // Journal of Mining Institute. 1969. Vol. 57. Iss. 1. P. 45-51. https://pmi.spmi.ru/pmi/article/view/12208

Abstract. The geological section of the roof of the Leningrad deposit is rather complex and is characterized by a great variety of lithological types (from weak clay shales to very strong limestones), their variability in terms of distance from the tundish roof and thickness. The most dangerous in terms of the possibility of collapse is a 90-centimeter layer of rocks, counting from the roof of the promplast, the section of which is the most complex and can be generalized in the following form.

Dashko R.E. On the nature of strength of ribbon deposits // Journal of Mining Institute. 1965. Vol. 48. Iss. 2. P. 117-122. https://pmi.spmi.ru/pmi/article/view/12565

Abstract. A distinctive feature of ribbon deposits is the high value of their natural moisture content, usually close to or even exceeding the yield strength of the rock. At the same time, band sediments in natural conditions are very far from the fluid state (for example, stable slopes of quarries opening band sediments at full capacity, stability of the walls of pits, pits, provided that their natural composition is preserved and there is no additional moistening, etc.).

Dashko R.E. Influence of test duration on the value of shear resistance of clayey rocks // Journal of Mining Institute. 1963. Vol. 48. Iss. 1. P. 56-60. https://pmi.spmi.ru/pmi/article/view/12591

Abstract. In clayey rocks under the action of a certain shear stress τ creep deformations develop in time. At values of shear resistance t, less than some value creep deformations have a damping character. When exceeded, creep deformations are not damped, and in plastic or frozen clay rocks their development in time leads to rock failure. The greater the magnitude of the shear stress, the earlier the clay rock fractures.

Scientific edition

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Digest

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