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ПОЛТАВСЬКИЙ НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ ІМЕНІ ЮРІЯ КОНДРАТЮКА

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У збірнику представлені результати сучасних наукових і науково-технічних досліджень та розробок із дослідження, проектування, експлуатації та реконструкції будівельних конструкцій, будівель і споруд; будівельної фізики та енергоефективності будівель і споруд; удосконалення й проектування сільських будівель та вулично-дорожньої інфраструктури.

Призначений для наукових й інженерно-технічних працівників, аспірантів і магістрів.

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UDC 624.131.37

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MIXED TASK OF THE THEORY OF ELASTICITY AND THEORY OF PLASTICITY OF SOIL FOR THE UNIFORM BASIS

Article contains approximate analytical solution of the mixed task of the theory of elasticity and theory of plasticity of soil: formulas for calculation of tension in points of areas of plastic deformations and expressions, allowing to define position and form of the last are presented. Graphics of areas of plastic deformations are given in the uniform basis of the buried base at various values of physic mechanical properties of soil.
Keywords: *mixed task of the theory of elasticity and theory of plasticity of soil, size, position and form of area of plastic deformations, tension components in elastic and plastic areas.*

UDC 621.432.3

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A CASE STUDY OF BRACED EXCAVATION USING STEEL SHEET PILE WALL IN THI VAI SOFT CLAY

The paper presents a case study of braced excavation using sheet pile wall in Thi Vai soft clay in South East of Ho Chi Minh city, Vietnam. The study is focused on stress-strain-displacement behavior with field monitoring of lateral displacement of the wall and settlement of the surrounding area while the 11m excavation of the pump pit was performed. Furthermore, comparison of calculated and monitored data is shown to get insight into actual behavior of the braced cut wall. It is finally found that the ratio between maximum lateral displacement to maximum excavation depth ranging from 1.12, 3.08 and 3.35% respectively for inclinometers INC-01 to INC-03 and that between surface settlement to maximum excavation depth 0.93% without any failure of the braced excavation and effective stress analysis can be used for getting reasonable and practically accepted values of both lateral displacement and surface settlement.
Keywords*: soft clay, sheet pile, excavation, lateral displacement.*

UDC 624.154.9

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A NUMERICAL STUDY ON THE EFFECT OF END RESTRAINT OF SPECIMEN IN CONVENTIONAL TRIAXIAL TEST ON THE YIELD STRENGTH AND THE POST-YIELD BEHAVIOR OF SOIL

The effects of end restraint in a conventional triaxial test on yield strength and the post-yield behavior of soil have been investigated by way of a finite element analysis based on a pressure-dependent and linearly elastic-perfectly plastic constitutive model. The influence of end restraint on the yield strength is insignificant. Unlike the yield strength, post-yield behavior is influenced notably by the end restraint, depending on the confinement pressure. When the axial and radial strains are small, strain hardening after initial yielding generally takes place. As the strain increases further, peak stress appears, followed by strain softening thereafter. As the confinement pressure increases, the peak stress materializes at lowered axial and radial strains, so that from the confinement pressure of 50 psi (344.7 kPa), strain softening starts almost from the initial yielding. As the confinement pressure increases, the degrees of strain hardening by the end restraint at the given axial and radial strains show decreasing trends. This change in yield strength as well as the artificial post-yield behavior (strain hardening or softening) due to the end restraint need to be eliminated in order to extract a true soil property from the triaxial stress-strain curve.

Keywords: conventional triaxial test, end restraint, yield strength, post yield behavior, soil and crushable foam model, finite element analysis.

UDC 624.131.54

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SOIL PLASTICITY IN FINITE ELEMENTS

The phenomenological model for a soil in the form of the associated theory of the plasticity, based on a loading surface of the closed form, is formulated. The analytical form of this surface is offered. Dilatancy, deformation hardening and softening are considered. The paper is focused on nonlinear analysis using finite elements method. The examples of calculations, confirming reliability of model, are proposed.

Keywords: constitutive model of soil, plasticity, finite elements method.

UDC 691.32.008.6

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NEW APPROACH TO THE PILE FOUNDATION DESIGN ON KAZAKHSTAN CONSTRUCTION SITES BY THE USING ADVANCED TECHNOLOGIES

This paper presents the general aspects of Kazakhstan pile foundation design concept. Also such a modern pile technologies as CFA (continuous flight auger) and DDS (drilling displacement system) used in Kazakhstan are mentioned. The paper illustrates comparisons between the existing field pile test results with the results of advanced technologies such as RLT and Centrifuge becoming more applicable. The quality control methods such as PIT and geomonitoring are also noted in this paper.

Keywords: *megaprojects, pile foundation design concept, pile tests, centrifuge modeling.*

UDC 624.136.2:624.131.381

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ANALYSIS OF INTERRELATION OF THE SPECIFIC VOLUME OF THE SOIL SKELETON AND HUMIDITY WITH A RESISTIVITY OF STATIC AND DYNAMIC PENETRATION

The results of soil tests of static and dynamic penetration are presented. The interrelation between the indicators of physical soil condition and the resistivity of static and dynamic penetration is installed.

Keywords: *static penetration, dynamic penetration, specific volume of the soil, humidity, control of soil compaction.*

UDC 624.131.1

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FEATURES OF DEFORMATION OF THE LOESS ROCKS FOR SOAKING AND WATER FILTRATION

Performed compression tests of samples of loess rocks in conditions of capillary moisture and water filtration. It is established that after subsidence deformation of the loess rocks region is comparable with subsidence defined by GOST methodology.

Keywords: *loess rocks, deformation, filtering.*

UDC 624.138.4

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STUDY SILICATE GELS BASED ON PERACETIC ACID OVER A RANGE OF FORMATION

Results of investigation on the basis of silicate gels peracetic acid over a range of their formation.

Keywords: *silicification, peracetic acid, the chemical swelling.*

UDC 624.138.9

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THE SOIL REINFORCMENT WITH THE USE OF GEOMATERIALS

The analysis of experimental results of study of soil reinforcement by geomaterials is presented.

Keywords*: geomaterial, reinforcement, experiment.*

UDC 624.131.54

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IMPROVING METHODS OF BUILDINGS ON CAST-IN-SITU PILES IN PUNCHED HOLES SETTLEMENTS DETERMINATION

A comparison of analytical methods for determining buildings settlements on cast-in-situ piles in punched holes in strip raft is presented. The most reliable one has been determined by comparing the results of long-term geodetic observations of buildings settlements.

Keywords: *cast-in-situ pile in punched hole, strip raft, settlements, geodetic observations, summation method of layer, express-method.*

UDC 624.138.9

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MODIFICATION OF CEMENT-LOESS MIXTURES IN JET TECHNOLOGY DURING MASTERING UNDERGROUND AREA

The results of experimental researches of cement-loess mixtures are shown to develop methods of bearing capacity of strengthening engineering structures increase.

Keywords: *cement-loess mixtures, jet technology, durability.*

UDC 624.131.53

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SEISMIC FACTOR IN CALCULATIONS OF LATERAL PRESSURE OF HETEROGENEOUS ANISOTROPIC SOIL'S GROUNDS

Dependences are got for determination of the superficial loading taking into account seismic influence in the contact tasks of multi-layered anisotropic soil's grounds.

Keywords: *seismic influence, heterogeneous foundation, anisotropy of strength.*

UDC 624.131

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INVESTIGATION OF THE PILE FOUNDATION IN THE WATERED LOESS SOILS

The theoretical investigation results of increasing of the pile bearing capacity in the loess soils in the process of slowly loading/

Keywords: *piles, watered loess soils, increasing of bearing capacity, settlement.*

UDC 624.131

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ANALYSIS OF INJECTION COMPOSITIONS FOR THE SOILS STRENGTHENING BY CEMENTATION

The theoretical investigation results of injection composition for the soils strengthening by cementation are shown. Effectiveness of plasticizing agents' application is substantiated.

Keywords: *water-cement ratio, stable grout, sedimentation, dehydration, mobility, plasticizers.*

UDC 622.271.33:627.514

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SIMULATION RESULTS TAILINGS DAMS FOR EXAMPLE POLTAVA MINING CONCENTRATION PLANT

The results of modeling of the tailings dam construction during the expansion-card double by the finite element method on the example of Poltava Mining Concentration Plant, Komsomolsk.

Keywords: *tails, grain size, dam, tailings, mathematical modeling, deformation, stability factor.*

UDC 624-15:624.137.5

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THE RESULTS OF EXPERIMENTAL AND THEORETICAL STUDIES BUSHES BORED MICROPILES UNDER THE ACTION OF HORIZONTAL LOADS

The article highlights the results of experimental testing of micropiles clusters with various types of artificial addings of various heights concerning their effects on horrisontal loading. The dependence of shifting efforts is proved.

Keywords*: foundations*, *horizontal load, drilled micropiles, retaining walls.*

UDC 627.24

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IMPROVEMENT OF INSTALLATION TECHNOLOGY OF LONG TUBULAR PILES ON BUILDING AND RECONSTRUCTION OF DEEP-WATER WATER-TRANSPORT AND OFFSHORE STRUCTURES

Results of new effective technology development to drive long tubular piles using traditional pile-driving equipment are shown.

Keywords: *tubular pile, driving depth, «soil plug».*

UDC 629.3.012:693.554.6

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THE IMPROVEMENT OF OPERATIONAL CHARACTERISTICS OF ANCHORAGE BEARINGS OF SHEET-PILE BERTHS

The innovative solution of anchor bearings of sheet-pile walls, which are formed as a comb are considered. Such approach improves their operational qualities and shortens the construction of the structure in general. The investigation results of numerical analysis of this solution are shown.

Keywords*: tie-rod, anchor plate, sheet-pile wall, bearing capacity, consumption of materials.*

UDC 624.195

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INTERACTION DESIGN TUNNELS WITH THE SOIL MASS IN THE ZONES OF TECTONIC DISTURBANCES

The actual perspective of determination of tension in the soil massif, formed by tectonic processes is considered. The mechanism of emergence of tectonic violations is reflected in settlement models. Models of sites of the massif with different types of violations and the intense deformed conditions corresponding to them are received.

Keywords: *massif, tectonic disturbance, strain-stress distribution of the massif, tectonic stress.*

UDC 624.131.543:51

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METHODS OF DETERMINING THE CARRYING CAPACITY OF PILES

The authors examine the possibility of using the model of the critical state of the soil to determine the bearing capacity of the bearing capacity of piles and fundamental cent in ramming pits.

Keywords: *«damp» soil, model parameters, condition of a plastic current, critical condition.*

UDC 624.137.2:622′17

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EVALUATION OF STABILITY BANK SLOPE USING WASTE MINING PLANT – THE «TAIL»

Proposed designs for the device ground material, which consists of 70% of the «tails» and 30% loam. Shown how to use this material to address the environmental, technical and economic challenges of industry.

Keywords: *loam, «tails», embankment, stability, slope.*

UDC 624.131.543

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SIMULATION OF STRESSED-DEFORMED STATE OF SOIL MASIF OF LANDSLIDE SLOPE

The methodology and results of 3D simulation of stressed-deformed state of the built-up landslide slope using the finite element methods are presented in this article. It were proposed the engineering solutions for elimination of failure state of the slope, stabilization of landslide effects and following use of slope for parkland or in the case of its building.

Keywords: *landslide slope, numerical simulation, stability factor, stressed-deformed state, finite elements method, retaining structure, soil reinforcement.*

UDC 627.4

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DEVELOPMENT OF PROTECTIVE BUILDING COMPLEXES FOR FLOOD-PRONE AREAS

The algorithm for selecting the optimal shape and material, as well as engineering calculation method of artificial base composite safety of buildings.

Keywords: *artificial base, shell construction, composite materials.*

UDC 624.154.5

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CALCULATION OF SUSPENSION TOWER FOUNDATION BRIDGES BEFORE RECONSTRUCTION

The method of calculation of suspended precast foundation piles suspension tower bridge during its reconstruction with expansion bill span reinforced concrete structure, strengthening beams and slab, change schemes into continuous span.

Keywords: *foundations support, a bridge span construction, expansion and strengthening, reconstruction, calculation, compressible ground foundation, bearing capacity, settlement ground resistance.*

UDC 626/627.03042.0.19.3

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ENVIRONMENTAL SAFETY OF BUILDINGS IN THEIR USE

The modern approach to the definition of the integral importance of environmental safety of buildings and structures is presented in this paper.

Keywords: *environmental security, the overall technical condition, the conditional reliability, durability, risk, environmental rating, social significance.*

UDC 624.131.22

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EFFECT OF ERRORS OF MEASUREMENT OF PHYSICAL AND DEFORMATION PROPERTIES OF SOIL FOR CREDIBILITY DETERMINATION COMPRESSIBILITY FOUNDATION

The error analysis was performed that arise in determining the physical properties of soil deformation and the results of the compression tests.

Keywords: *deformation modulus, compressibility, compression test of soil, error.*

UDC 624.15.001

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PATTERNS OF SEDIMENT GLINSTYH SAMPLES DURING THEIR TESTS ON CREEP AND PULLING A WAY

In the compression compression tested the experimental patterns of sediment surface samples of clay soil when they test static loads and pulling way. It is shown, that in the latter case, soil compacting process stabilization time is reduced by several times.

Keywords*:oil, polzučest', relaksaciâ, draught, load, time*

UDC 624.121.54

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MODELLING OF NATURAL SLOPE DEFORMATIONS UNDER ITS DRAINAGE

Results of mathematical modeling of natural slope deformations under drainage have been given.

Keywords: *displacement, filtration, conform reflection.*

UDC 624.131.1-624.131.22

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EVALUATION OF STRENGTH SURMATIAN CLAY IN CALCULATIONS SLOPE STABILITY

The results of the study of the residual strength of surmat clays are presented. The resulting regression dependence of the angle of internal friction φof the number of plastic J_p can be used to forecast the stability of clay slopes

***Keywords**: surmat clay, strength, plasticity, landslide.*

UDC 725.41:624.131.253:699.8

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THE STRESS-STRAIN STATE FELL IN THE AREA OF KARST FAILURE

Provides a method for determining the stress-strain state structures fell in the area of loosening of the soil around the karst failure. Considered frameless building on плитном Foundation. Investigated the change of the stress-strain state of a base plate with the changes of geometrical parameters of karstic crater.

***Keywords:** stress-strain state , base plate , karst, funnel, subsidence.*

UDC 624.15.04

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COMPONENTS OF STRESSES IN THE BASEMENT OF SEMI-INFINITE EXTENT STRIP FROM THE LOAD SPREAD ACCORDING TO THE TRIANGLE LAW

The obtained formulas which determine normal and tangential stresses can be used to solve elastic-plastic problems including finding the main stresses getting of conditions of strength and solving other problems beyond the limit of elasticity from triangle load.

***Keywords:** normal stresses, tangential stresses, basement, triangle load.*

UDC 624.131.22

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DETERMINATION OF SUBSIDING PROPERTIES OF SOILS BY THE FIELD METHOD AND FEATURES OF ITS APPLICATION

The results of the field researches of subsiding *properties of soils are resulted by the soakage of foundation pit and static tests of experimental foundation of sleeper elements on a macadam ballast.*

Keywords*: exavation, drain holes, soakage,* subsidence, *foundation of sleeper elements, deep and surface marks.*

UDC 624.15.001

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TO THE QUESTION OF DEFINITION OF THE PROVIDED DEFORMATION CHARACTERISTICS OF THE SOIL FOUNDATION REINFORCED BY RIGID VERTICAL ELEMENTS

The factors influencing the precipitation of earth foundations, reinforced by vertical rigid elements. It is shown that for manufacturing the reinforcing element does not make sense to use high-strength concrete.

Keywords: *settlement, reinforcing element, foundation.*

UDC 69.059.22

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THE FORM OF FIXATIVE BODY IN SAND OF MICROPILE WITH LOCAL FIXATION IN SOIL

Experimental information is resulted about the form of fixative body in sand of micropile with the local fixing in soil. The results are got by the imitation of technology of device of the piles in the container with soil.

Keywords: *micropile with the local fixing in soil, the form of fixative body in sand, container with soil.*

UDC 69.059.22

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ESTIMATION OF BEARING CAPACITY OF MICROPILE WITH LOCAL FIXATION IN SOIL UNDER ACTION OF HORIZONTAL LOAD

The comparative analysis of movements of head of micropile with the local fixing in soil under horizontal loads is presented. Compared information by the results of field tests pile in the engineering and geological conditions in Sevastopol with the values calculated with the involvement of the software complex «Lira 9.6» and on the recommendations of the existing standards.

Keywords: *micropile with the local fixing in soil, horizontal moving, field testing, method of finite elements.*

UDC 624.131.532

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EFFECT OF HORIZONTAL VERTICAL COMPONENT OF PRESSURE ON THE STRAIN LATERAL EXPANSION

The technique of determining the coefficient of lateral pressure on the results of field tests of the loess loam with undisturbed and after compaction at a rate of more than 0.8 water saturation and the relationship of its values from the deformation of lateral expansion.

Keywords: *lateral pressure, structural strength, transverse deformation.*

UDC 624.15.04

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ABOUT RATIONALIZATION OF STEP-BY-STEP APPROACH METHOD FOR DETERMINATION OF DIMENSIONS OF FOUNDATION WITH RECTANGULAR FOOTING

Given suggestion on rationalization of determining size of rectangular sole of the eccentric loaded foundation, working without tearing away of sole from the ground foundation.

Keywords*: foundation, rectangular footing, eccentric load позацентрове навантаження.*

UDC 666.972

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IMPROVEMENT OF RELIABILITY AND DURABILITY OF REINFORCED CONCRETE CULVERT STRUCTURES ON HIGHWAYS IN DIFICULT GEOLOGICAL CONDITIONS

Shows a method of improving the reliability and durability of concrete culvert structures under difficult geological conditions. Used and modified concrete and fiber-concrete. A complex modifier, including bridging and plasticizing additives and fillers. Modifier reduces the porosity of the concrete and get the fine pore structure of the composite with high uniformity porosity.

***Keywords**: durability, culverts, modifiers, fiber, dynamic loads.*

UDC 519.642.624.044:624.15

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DESIGN BY THE METHOD OF BOUNDARY ELEMENT ROUND FOUNDATION STRUCTURE OF GRAIN STORAGE SILOS

The article by MBE optimized foundation of the silo. The methodology of calculating the bearing capacity of a circular base plate and circular pile field, taking into account the nonlinear behavior of the soil.

***Keywords:** boundary element method, ring and round foundation design, the theory of plastic flow.*

UDC 622.279

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SETTLEMENT OF DAYLIGHT SURFACE OF SHEBELINKAS' GAS CONDENSATE FIELD AS A RESULT OF GAS RECOVERY

It is considered causes of deformations of earth surface in the process of extraction of gas condensate field. It is adduced a module of undermining superficial rock series under depression of formational pressure. It was carried out calculation of undermining of earth surface on Shebelinkas' gas condensate field.

***Key words:** stress strain behavior, undermining, depression, field.*

UDC 624.15.001

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TREATMENT OF MUTUAL INFLUENCE OF FOUNDATIONS ON THE UPPERMOST LAYER OF THE FINAL THICKNESS

This paper contains the accounting policy on the mutual influence of foundations on the rainfall of each other. The joint scheme and a separate calculation. Concluded that the use of methods to perform the actual calculations cake foundations.

Keywords: *building, base, layer thickness, coefficient of ultimate.*

UDC 624.131.524.4

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V.A. Novskiy, Ph.D., p. teacher
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THE DEPENDENCES ANISOTROPIC PROPERTIES LIMESTONE IN TERMS LABORATORY

Methodology is set out and the results of determining limit firmness on uniaxial compression and the structural strength limestone in instrumentation OISI-4 at different direction vector load about a bedding.

Keywords*: limestone, structural strength, anisotropic.*

UDC 627.26

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ON THE MONITORING AND FAILURE FORECAST OF SOIL SLOPES

The method of landslide mechanism and velocity of motion estimation is proposed. The method is based upon the numerical model of landslide calculation as inhomogeneous viscous media and natural monitoring data analysis to distinguish the type and critical deformation of landslide material.

Keywords*: viscous soils deformation, computational simulation, slopes failure monitoring.*

UDC 624.155

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Donbas National Academy of Building and Architecture, Makeevka

RESEARCH OF PILE FOUNDATIONS, WHICH IS BEING BUILT IN DENSE URBAN AREAS IN DONETSK CITY

The results of experimental research for determination of the bearing capacity of pile foundation, organized by indentation in the dense urban areas of Donetsk and the results of the calculation of this type of foundations settlements. The technology of pile foundations indentation in the construction of the building of children's cardiology center Gusak Academy of Medical Sciences of Ukraine in Donetsk.

Keywords: *pile, indentation piles, installation for pressing piles, experimental research, bearing capacity of pile foundation, the dense urban area.*

UDC 624.15.001

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I.Y. Bulich., magister, V.G. Shapoval, Prof., DrSc.
State Institution of Higher Education «National Mining University», Dnipropetrovsk
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Pridneprovsk State Academy of Civil Engineering and Architecture

IMPACT OF THE DETERMINATION OF SOIL SLOPES STRESS-STRAIN STATE ON THE DESIGN VALUES OF THEIR STABILITY RATIOS

The change laws of slope stability ratios when determining their stress-strain state (SSS) using the theory of elasticity and stage methods are investigated. It is shown that the SSS determination using the theory of elasticity methods in equal terms leads to the stability ratio overvaluation.

Keywords: stress-strain state, soil slope, stability ratio, theory of elasticity methods, stage methods.

UDC 624.131

R.V. Samchenko, c.t.s., associate professor
Zaporozhye State Engineering Academy

CALCULATION METHOD OF TILTED BUILDINGS LEVELLING PARAMETRS

The method of technological parameters of tilted buildings leveling calculation was proposed. Its reliability was confirmed by successful liquidation of tilts in 56 buildings and constructions.

Keywords: *tilt, parameters of tilted buildings leveling, horizontal boreholes, diameter, the pitch of boreholes, foundation settlement epure, soil density.*

UDC 69.034.93:627.03

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Poltava National Technical Yuri Kondratyuk University

THE WATERPROOFING METHOD OF ARTIFICIAL BASIN

The new proposed waterproofing method of artificial basin, which is more economical, reliable and of high in comparison with already known methods

Keywords: *soilcement, waterproofing, artificial basins.*

UDC 624.15

U.F. Tugaenko, Doctor of Science, Prof.
A.P. Tkalich, Ph.D.
L.A. Loginova, Assistant
Odessa State Academy of Civil Engineering and Architecture

EVALUATION OF BEARING CAPACITY OF PILE IN LOESS-WATER SATURATED SOIL

A principle of calculating the bearing capacity of driven piles in saturated loess soils is adduced. Resistance values for the lateral surface of each exam and under the sole piles determined by the results of field studies.

Keywords: *friction along the side surface, resistance of the soil beneath the tip, dense core.*

UDC 622.28

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FEATURES OF WORK AND CALCULATION KREPEY OF SUBWAY TUNNELS

A ground over of the use of collapsible sectional krepi of tunnels and mountain making, possessing structural poddatlivost'yu is brought. Ogranichenno-poddatlivyy the mode of the combined team of krepi is provided by setting between the collapsible elements of sminayuschikhsya gaskets of the set thickness. The method of calculation of krepey is offered on stability.

Keywords: *krep' tunnels, hard mode of operations of krepi, pliable mode of operations of krepi, plastic hinge, sliding hinge, collapsible krep', monolithic krep', earning additionally, gruzonesuschaya ability of krepi, backfilling of zakrepnogo space.*

UDC 624.131.525:624.159.4

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SWELLING SOILS AS A BASIS FOR BUILDINGS AND CONSTRUCTIONS

This work analyzes factors affecting swelling soils and presents a calculation algorithm of structure on swelling soils base, considering orthotropic properties of these soils for the plane problem.

Keywords: *a swelling soils, shrinkage of swelling soils, ortotropical properties, final element method, system «basement – foundation – structure».*

UDC 624.15.001

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THREE-DIMENSIONAL BOUNDARY ELEMENTS METHOD

A modification of the boundary element method (BEM) solving two- and three-dimensional geomechanical problems for cases of finite and infinite calculation area dimensions is proposed.

Keywords: *three-dimensional boundary element method, stress-strain state (SSS), the foundation soil.*

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