FORMING STRATEGIES OF ASPHALT CONCRETE ENTERPRISES DEVELOPMENT ON THE BASE OF BALANCED SCORECARD

A.V. Silkin

The issues of strategic direction planning at the enterprises producing asphalt mixes are reviewed. The balanced scorecard usage is proposed.

Key words: enterprise strategic development, asphalt concrete enterprise, efficiency indicators, incentive scheme.

LOCAL SOILS STRENGTHENING BY STABILIZER FOR ROAD CONSTRUCTION IN CONDITIONS OF THE NORTH

G.V. Egorov, A.V. Andreeva, O.N. Burenina

The article deals with the research results of physical and mechanical properties of samples of soil strengthened by stabilizer for road construction. The optimal composition of the stabilized soil mixture is determined.

Key words: stabilizer, strength, density, moisture, road pavement, frostresistance, water absorption, portland cement.

A NEW METHOD OF ROAD STRUCTURE FROST RESISTANCE VERIFICATION

G.L. Kagan, A.Y. Velsovsky

The article deals with normative method deficiencies of road structure frost resistance verification. A hypothesis is suggested on the indirect modelling of soils frost heaving intensity. A new method of road structure frost resistance verification with the use of this hypothesis is proposed. Its implementation is illustrated by calculation examples.

Key words: road structure frost resistance, soils frost heaving intensity, laboratory tests, frost heaving deformation.

A RESEARCH ON THE USE OF OIL SLIME WASTE PRODUCT AS A MODIFIER FOR HEAVING SOILS

M.E. Beshenov, I.N. Habibullina

The article deals with the road test section construction using soils modified by additives at the top of the subgrade. During the construction process the effect of hydrophobizated oil slime waste product on technological parameters of utilized soil mixture (workability, compaction) as well as on physical and mechanical properties of treated soils is revealed. The economic benefits arising from the use of the soils treated by oil slime waste product at the top of subgrade of pavement structure versus equivalent pavement structure without stabilizing soil subgrade are determined.

Key words: heaving soil, subgrade, modification, physical and mechanical properties, oil slime, additive, oil slime waste product.
DESIGN OF PROBLEM ROAD SECTIONS WHEN PASSING FROM A CUT TO AN EMBANKMENT

A.M. Kulizhnikov

The article deals with the design peculiarities of problem road sections when passing from a cut to an embankment. The design typical errors are reviewed and the recommendations for their correction are given. The presented georadar research results allow confirming the findings correctness.

Key words: roads, design, ground water, water outlet, drainage, GPR studies, engineering and geological researches.

USE OF DOUBLE-CONE HOLLOW PILES IN ROAD CONSTRUCTION

B.S. Yushkov, A.A. Degtyar

The article deals with the variant of using double-cone hollow piles in road construction, especially for embankments on the seasonally frost heaving soils. The subgrade structure using double-cone hollow piles with geogrid developed for logging roads is considered. The feasibility study of the structure design is presented.

Key words: double-cone hollow piles, tridimensional geogrid, frost heaving, soft soils, road embankment, logging road.

SOME ISSUES CONCERNING THE IMPROVEMENT OF ROAD PAVEMENTS DESIGN NORMS

S.V. Efimenko, V.N. Efimenko, M.V. Badina

The algorithm of specifying the location of boundaries of road-climatic zones on the territories of certain administrative entities with the use of methods of mathematic modeling is reviewed. The peculiarities of clay soils composition and properties on the territory of West Siberia are considered.

Key words: road-climatic zone, road area, design humidity, clay soils, elasticity module, road pavement.

INTERNATIONAL ROUGHNESS INDEX AND ITS USAGE IN THE COUNTRIES OF THE CUSTOMS UNION

K.V. Mogilny, N.A. Lushnikov, O.A. Krasikov

The article deals with the existing in the countries of the Customs Union road pavement evenness standards, used measurement instrumentations of surface roughness, indices for road pavement roughness estimation, which include international roughness index, and available correlation equations binding certain roughness indices. Comparative analysis of evenness standards in the countries of the Customs Union, which could be useful in developing harmonized evenness estimation standard for road pavement is presented.

Key words: evenness standard for road pavement, the Customs Union, international roughness index, measurement instrumentations of surface roughness, roughness indices.
A STUDY OF THE CAUSES OF PREMATURE DETERIORATION OF ASPHALT CONCRETE PAVEMENTS OF URBAN ROADS

S.V. Aleksikov, A.A. Ermilov

The characteristics of asphalt concrete mix when paving and their influence on repair quality of urban roads are examined.

Key words: asphalt concrete density, asphalt concrete surface temperature, probability assessment of asphalt concrete compaction, coefficient of variation of asphalt concrete density.

SNOW ACCUMULATION ON ROAD EMBANKMENTS

O.V. Gladysheva, S.M. Shiryaeva

The problem concerning the estimation of snow accumulation on road embankments is considered. The models determining snow deposits amount on the road surface after a snow drift taking into account the losses of the snow precipitated earlier that are caused by thaw and the effect of wind are developed. For models realization the algorithm scheme is proposed and the calculation programme is elaborated. The validation of the models is performed to determine snow accumulation of embankments based on observations at the test sections. According to observation results the calculation of actual snow deposits amounts is fulfilled. The comparison of calculation results and snow surveys is carried out.

Key words: roads, winter maintenance, snow accumulation, mathematical modeling, snow survey.

STUDY ON THE TEMPERATURE DEVELOPMENT OF ROAD PAVEMENT

T.V. Samodurova, Yu.V. Baklanov

The article deals with the approaches for calculating the periodicity in works on winter road maintenance. According to the results of mathematical modeling the parameter of road pavement temperature transition through 0 °C from positive values to negative ones is analyzed. The distribution histograms for road pavement and air temperature transitions through 0 °C are presented. The distribution rule of air temperature at the moment when the road surface temperature transiting through 0 °C, as random variable, is obtained. The regression equation of pavement temperature transition time through 0 °C, which depends on the air temperature gradient, is received.

Key words: road, winter maintenance, periodicity of works, temperature transition through 0 °C, air temperature gradient, modeling.

ASSESSMENT OF RELIABILITY OF NON-RIGID ROAD PAVEMENTS ON THE BASIS OF THE LAWS OF DISTRIBUTION OF EQUIVALENT MODULI OF ELASTICITY

V.V. Stolyarov, E.E. Zverkova, A.S. Fomina, Yu.M. Anikin

In the article the fundamental laws of distribution applied in formulas of an assessment of reliability level of road structures and determination of probability of their destruction are presented. On the basis of statistical treatment of measurements results the influence of road pavements durability on type of the law of distribution and its convergence with experimental data is shown taking into account the level of destruction and straining of an asphalt concrete
pavement. The comparative analysis of reliability levels determined on the basis of normal distribution and distribution of Weibull under various conditions of deformed pavement is done. According to the comparison results the conclusions on applicability of the above-mentioned laws of distribution to an assessment of reliability and probability of destruction of non-rigid road structures are given.

*Key words*: non-rigid road pavements, normal law of distribution, Weibull distribution, equivalent modulus of elasticity, straining, destruction, asphalt concrete pavement, probability of destruction, reliability level.

**PECULARITIES OF DIAPHRAGMS FUNCTIONING AT THE BRANCHING OF STEEL-CONCRETE COMPOSITE SPANS OF OVERPASSES**

**V.I. Popov, Maryam Morid Asadi**

The article deals with functioning of diaphragms at the branching of steel-concrete composite spans of overpasses. The influence of temporary rolling load (in accordance with the Iran standards) and temperature is analyzed. In the case of diaphragm maximum loading the results confirming that the temperature effect will be more important than the respective effect generated by temporary rolling load are received.  

*Key words*: steel-concrete composite span, box girder, reinforced concrete slab, temporary rolling load, temperature, stresses.

**ABOUT IMPROVING ROAD TRAFFIC SAFETY**

**V.I. Alferov, N.V. Merkushov**

The article contains a description of some measures to reduce the accident rates on accident concentration road sections and prevent their occurrence. The proposals related to improving the regulatory requirements of in the field of road traffic engineering and safety are exposed.

*Key words*: roads, traffic safety, vehicle, junctions, intersections.

**READY-MADE ROAD BUMPS**

**B.B. Anokhin, B.M. Volynskiy**

The article is devoted to the elaboration of interstate standard on road bumps. Different constructions and technical requirements for bumps are presented. The road bumps control methods during their process of application and operation are described.

*Key words*: roads, ready-made bumps, bump constructions, technical requirements, control methods.

**DEVELOPMENT OF MODIFIED ASPHALT CONCRETE MIXES FOR ROAD CONSTRUCTION IN CONDITIONS OF THE NORTH**

**O.N. Burenina, L.A. Nikolaeva, V.E. Kopylov**

The article deals with the influence on the physical and mechanical qualities of asphalt concrete of binder modified by dispersed and activated zeolite.

*Key words*: roads, road pavement, asphalt concrete, mechanical activation, modified tar.
RESEARCH OF ROAD-CONSTRUCTION MATERIALS
ON THE BASIS OF ORGANIC BINDERS WITH RUBBER CRUMB

S.E. Filippov, M.D. Sokolova, A.A. Khristoforova

The article presents the research results of the properties of road construction materials produced on the base on bitumen modified with rubber crumb and natural mineral filler. The mechanical activation technology to ensure passing modifiers to active state is considered.

Key words: asphalt concrete, mechanical activation, modified bitumen, rubber crumb, zeolite.

RESEARCH ON THE ROLE OF BITUMINOUS MASTICS
IN ASPHALT CONCRETE MIXES COMPOSITIONS

A.V. Rudensky

The article presents the testing results of bituminous mastics as asphalt binders in asphalt concrete mixes compositions. The strength and deformation characteristics of different bituminous mastics under 2°C and 25°C are determined.

Key words: bituminous mastics, asphalt binders, strength, deformability, modifying additives.

THE ROLE OF MINERAL FILLER
IN FORMING THE STRENGTH AND ADHESION PROPERTIES OF BITUMEN BINDER.

Yu.L. Shishkin

A new rheological test-method was used to assess the effect of the mineral filler on the strength and adhesion properties of bitumen binders. According to the rheological curve plotted in the range from +80 to -35°C the temperatures of softening, flow, glass transition, brittleness as well as the values of binder shear strength are obtained. As the temperature decreases the shear strength increases from about 0,001-0,002 to 2,5 MPa for the reference bitumen BND 90/30 and to 4,6 MPa for the same bitumen with 50-60 % of filler MP-1. A mineral filler of sufficient quality at concentration around 50 % contributes to the binder thickening at higher (above zero) operation temperatures and to its plastification at lower (sub zero) temperatures, thus expending its ductility(working)range.

Key words: bitumen binder, shear strength, rheological curve, mineral filler, softening and brittle temperatures.

EXPERIMENTAL VERIFICATION OF PROCEDURES
FOR THERMAL STABILITY INCREASE OF ASPHALT CONCRETE MIXES

A.A. Shtromberg, V.N. Garmanov

The article is concerned with the research on verification procedures for increasing asphalt concrete mixes thermal stability. The findings of the realized experimental researches could be used in designing asphalt concrete compositions with increased thermal stability.

Key words: asphalt concrete, viscosity, degree of plasticity, rutting, shear adhesion.
EXTERNAL IMPACTS MODELING IN ACCELERATED TESTING OF ASPHALT CONCRETE

N.S. Kovalev

The article deals with method, equipment and research results when modeling vibrating-vacuum saturation, ultraviolet irradiation and freezing-defrosting impacts on structural and mechanical properties of asphalt concrete with slag materials.

Key words: roads, road pavement, asphalt concrete with slag materials, modeling, vibrating-vacuum saturation, ultraviolet irradiation, freezing-thawing.

ENERGY-SAVING PROBLEMS WHEN USING STONE-MASTIC ASPHALT MIXTURE OF INCREASED DURABILITY

S.A. Chernov, A.V. Kaklyugin, M.V. Maksimenko

The article deals with the research results related to the development of a «warm» stone-mastic asphalt mixture (SMA-15) used in road pavements construction when ensuring increased durability and energy-saving up to 30 %. The use of the complex polymer-stabilizing additive of rubber-containing thermoelastolayer RTEP and the chemical energy-saving additive EVOTHERM®J-1 is reviewed.

Key words: stone-mastic mixture, road pavements, durability, energy-saving additive, polymer-stabilizing additive.

PECULIARITIES OF POLYMER MODIFIED ASPHALT BINDERS PRODUCTION AND USAGE WHEN ROAD CONSTRUCTING

V.I. Polyakova, S.V. Polyakova

The processes of polymer modified asphalt binders aging and polymer oxidation decomposition are reviewed. The analysis of physical and mechanical properties of polymer modified asphalt binders using industrial oil and without it is carried out. The peculiarities of polymer modified asphalt binders production in the industrial conditions are presented and the recommendations on maintaining the required level of physical, and mechanical polymer modified asphalt binder indices are given.

Key words: polymer modified asphalt binder, butadiene styrene thermoelastoplasts, polymer oxidation decomposition, aging, thermal stability, industrial oil, polymer modified asphalt binder production, asphalt concrete.

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ECONOMIC AND MATHEMATICAL STAGE ROAD CONSTRUCTION MODELS TAKING INTO ACCOUNT MODERN CRITERIA

V.K. Pashkin, O.A. Krasikov, K.V. Mogilny

The article presents the economic and mathematical stage road construction model, which was developed using the criterion of total discounted costs as well as additional criteria such as net present value, profitability index, internal rate of return etc. Operating circuit model includes lump-sum road construction costs and operating costs (transport and road operation costs; damage costs caused by accidents; damage costs resulting from losses of time during the passengers’ travel). Apart from the problem solving related to the stage road construction
The article substantiates the necessity of multi-criteria evaluation of roads enterprises activity effectiveness in the market management system, with reviewing the case-based methods of its determination. 

_E.V. Dinges_

**APPROACHES AND MULTI-CRITERIA EVALUATION METHODS OF ROADS ENTERPRISES ACTIVITY**

The article substantiates the necessity of multi-criteria evaluation of roads enterprises activity effectiveness in the market management system, with reviewing the case-based methods of its determination.

*Key words:* roads enterprises, activity effectiveness, multi-criteria evaluation.

**LINEAR EQUATIONS OF CLAY SOILS HEREDITARY CREEP**

_B.S. Yushkov, A.S. Sergeev_

On the basis of the simplest Hooke model the linear equations of hereditary creep in the engineering structures foundations, taking into account the history of loading, as well as stresses relaxation are derived.

*Key words:* load, soil, function, sample, module, deformation, equation, relaxation, creep, viscoelasticity.

**SOILS STABILIZERS IN THE RUSSIAN ROAD AND AERODROME CONSTRUCTION**

_T.T. Abramova, A.I. Bosov, K.A. Valieva_

The article concerns the results-oriented transformation of cohesive soils can be made with different compositions stabilizers, which in small doses have a positive influence on the properties formation of road-building materials, either by physical-chemical process activation or by technical processes optimization. In accordance with their impact on cohesive soils stabilizers can be divided into “stabilizers-waterproofing agents” and “stabilizers-reinforcing agents”. The last ones as distinct from the first ones not only reduce heaving processes when soils freezing, but also substantially alter their physical, mechanical and hydro-physical parameters. Expanding the boundaries of the method use for the cohesive soils stabilization (from sandy loams to clays with a 27 plasticity number) could be made with the help of the wide range of modern materials, as well as by additional introducing binders in the system.

*Key words:* stabilization, waterproofing, surface-active agents, cohesive soils, plasticity number, compressive strength, flexural strength, frost heaving, expanding, inorganic binders, cement, lime, organic binders, bitumen emulsions, resins.

**THE USE OF «JET GROUTING» TECHNOLOGY FOR STABILITY IMPROVEMENT OF EARTHWORK STRUCTURES**

_O.A. Makovetsky, D.K. Serebrennikova_

The article deals with the study of method for geotechnical subgrade stabilization by jet grouting. The results of the experimental construction of earthwork structures using this technology in the
Perm region are reviewed. The organizational and technological details of work performance are described.

Key words: jet grouting, subgrade deformation, geomass, soft soils, process-oriented road.

CALCULATION METHODOLOGY OF WORKS CYCLING RELATED TO WINTER ROAD MAINTENANCE

T.V. Samodurova, Y.V. Baklanov

The calculation methodology of works cycling related to winter road maintenance is offered. These calculations are based on the mathematical models of formation of different types of slipperiness on the road pavement surface. The program which allows on the basis of road and meteorological data to model a road pavement surface condition and to calculate a number of works cycles of winter road maintenance is developed. According to the computer modeling results the distribution laws for a number of cycles of snow and ice control materials spreading and patrol snow removal are received.

Key words: road, winter maintenance, works cycling, snow and ice control materials spreading, patrol snow removal.

PRESERVATION OF ROAD ASPHALT PAVEMENTS IN SUMMER MONTHS

A.M. Kulizhnikov, T.S. Kulizhnikova

The article dwells upon the road climatic regionalization in accordance with the terms of introduction of traffic limitations on roads with asphalt concrete pavements in summer period for their preservation. The recommendations on introducing traffic limitations in summer high air temperatures period are reviewed.

Key words: road, asphalt concrete pavements, summer months, temperature, traffic load, traffic limitation, deformations.

MEASURING SONDES FOR MONITORING RESIDUAL STRAINS IN ROAD PAVEMENT LAYERS AND SUBGRADE SOIL

V.P. Matua, D.V. Chirva, V.V. Solodov, S.A. Mironchuk

The article deals with the development of technology and measurement equipment for road structure condition monitoring during its operation by means of measurements of residual strains and temperature in road structures elements. The measuring sondes design allows to conduct measurements of the residual strains and temperature for a long period in each structure layer of road pavement.

Key words: roads, residual strains concentration, rutting, measuring sondes, road structure, real operating conditions.

RESEARCH OF FACTORS AFFECTING THE TRAFFIC SAFETY LEVEL DURING WINTER ROAD MAINTENANCE

T.V. Samodurova, A.S. Gasparyan, B.A. Bondarev, J.V. Fedorova

A systematic approach to study of the safety factors that affect the level of traffic safety in adverse weather conditions during winter road maintenance is proposed. The Subsystem Management Service is added to Driver - Vehicle - Road-Environment System. The factors
influencing traffic safety during winter maintenance are substantiated. For the various winter maintenance technologies the time diagrams of dangerous road condition for overtaking are proposed. A list of completed tasks based on this systematic approach is done. Key words: roads, traffic safety, systematic approach, road surface condition, winter maintenance, works performance technologies.

METHOD FOR DETERMINATION OF DEFORMATION CHARACTERISTICS OF ROAD PAVEMENT BASE COURSES OF UNTREATED MATERIALS

E.M. Baranova

The article deals with the structural approach to the study of road pavements base courses of untreated materials. This approach is based on the fractal theory, which allows to consider the influence of structural nonhomogeneity of the material on its deformation parameters, as well as to predict their change during road operation process. The new procedure of determining elasticity module of base course untreated materials is proposed. 

Key words: road pavements, untreated materials base courses, elasticity module, structure, fractal theory, fractal dimensionality.

A NEW APPROACH TO THE INTERLAYER COHESION ASSESSMENT IN FLEXIBLE ROAD PAVEMENTS

A.N. Tiraturyan, E.V. Uglova

A new non-destructive approach to assessing the conditions of road structures interlayer cohesion based on the complex of theoretical and experimental researches of response characteristics of road pavement under the impact effect is proposed.

Key words: non-destructive testing, acceleration amplitude-frequency characteristic, interlayer cohesion.

USING OF INFLUENCE SURFACES OF STRESSES WHEN ANALYSING SPATIAL WORK OF SPANS ORTHOTROPIC SLABS WITH CLOSED LONGITUDIAL RIBS

M.A. Telegin, I.G. Ovchinnikov

The problem of constructing the analytical model of the span orthotropic slab with closed longitudinal ribs, which would take into account the work specifics of the closed longitudinal ribs, as well as the work of orthotropic slab with the regards to the yielding of the main beams of span is considered. The using of the influence surfaces of the normal stresses for the two design sections - the rib mid-span in the zone of maximum negative moments of the main beams and the rib support section in the zone of maximum positive moments of the main beams is proposed. 

Key words: bridge, orthotropic slab, live load, dangerous section.

BAR ELASTIC-PLASTIC TRANSVERSE BENDING IN THE CONDITIONS OF LIMITED PLASTIC DEFORMATION

S.V. Bakushev

The problem solving of the bar design in the conditions of flat transverse elastic-plastic bending, as well as in limited plastic deformation using computer math software is reported. In the first case as the external load the concentrated force applied in the span middle is taken; in the second
case – uniform distributed load acting along total length of the bar. The solution allows to
determinate the bar bearing capacity when plasticity limiting, elastic and plastic deformations
boundary, bar residual stresses after its complete unloading, bending bar axe and bar residual
deflections after its complete unloading.

Key words: bending bar, deformation, plasticity, elastic-plastic bending, section with two axes of
symmetry.

ANALYSIS OF METHODS FOR CALCULATING ULTIMATE STRAINS
OF CROSS SECTION OF CORRUGATED CULVERTS

I.A. Osokin, A.S. Permikin

The article gives a brief overview of the use of corrugated metal structures. The analysis of
corrugated culverts performance when operating in the Ural region, on the basis of visual
inspection and measurement of strains, as well as of the calculation by the methods exposed in
the normative document VSN 176-78 is done. The results of calculation are compared with those
of visual inspection and strains measurement.

Key words: corrugated culvert, strains, calculation, structure work.

INCREASING OF URBAN ROADS CAPACITY BASED ON ASSESSMENT
OF TRANSPORT FLOWS SPEED REGIMES

S.V. Aleksikov, S.V. Volchenko

One of the methods to increase the capacity of urban roads is the introduction of the coordinated
traffic regulation based on the green wave. In order to improve the effectiveness of such
regulation it is necessary to determine the driving speed on green wave depending on road traffic
conditions. The performed researches of traffic regimes on the Volgograd urban roads have
revealed the dependence of steady speed on road section length, traffic congestion level and road
surface deformations presence.

Key words: urban road capacity, traffic flow, traffic regimes, traffic coordinated regulation,
section length, road surface deformations.

ABOUT REGULARITIES OF CHANGE IN RISK INDEX
OF ROAD ACCIDENTS

A.V. Kochetkov, D.A. Strizhevskiy, A.A. Sukhov

Qualimetical and econometric justification of earlier revealed in researches of Chvanov V.V.
discretization of change in road accident risk index depending on a complex road quality and
condition index is offered.

Key words: safety, road traffic, qualimetry, econometrics, risk, road accident.

ALGORITHM IMPROVEMENT OF COORDINATED ROAD TRAFFIC
FLOWS MANAGEMENT (CASE STUDY OF PENZA CITY)

O.V. Sorokina, Yu.V. Sorokina

The article deals with the algorithm improvement of the coordinated management of traffic flows
in real time (case study of Penza-street and road network). Mathematical model of traffic flows
management as well as traffic lights signaling optimization algorithm are proposed.

Key words: road, dynamic ranks, traffic lights signaling, transport flow, road accident.
INTEGRATED IMPACT OF FORMULATING, OPERATING AND CLIMATIC FACTORS ON ASPHALT CONCRETE WITH SLAG MATERIALS

N.S. Kovalev

The article deals with the research results of integrated impact of formulating, technological, operating and climatic factors on properties of asphalt concrete with slag materials using the method of mathematical extremal experiments planning.

Key words: asphalt concrete, slag materials, frost resistance, water resistance, integrated impact of factors.

DETERMINATION OF RESISTANCE TO THE ACCUMULATION OF RESIDUAL DEFORMATIONS OF COLORED POLYMER CONCRETE WITH THE USE OF A COMPLEX POLYMER BINDER WHEN EXPOSING TO DYNAMIC LOADS

D.S. Chernykh, I.V. Mardirosova, D.V. Zadorozhniy

The article considers the accumulation of residual deformations of colored polymer concretes in comparison with different types of asphalt concretes. The findings confirm the high rutting resistance of developed polymer concretes on the basis of a complex polymer binder.

Key words: residual deformations, rut, colored polymer concrete, complex polymer binder, asphalt concrete, rubber, polyethylene, petroleum polymeric resin.

A NEW EFFECTIVE TECHNOLOGY OF OLIGOMER-BITUMEN BINDERS PRODUCTION FOR ROAD CONSTRUCTION

A.V. Rudensky, V.V. Lobanov

The article presents a new technology production of enhanced quality bitumen binders by adding oligomer additives. The data about oligomerbitumen binders properties in comparison with the traditional petroleum bitumen and polymer modified bitumen binders characteristics are given.

Key words: oligomers, monomers, bitumen binders, production technology, binder properties.

OPERATING TEMPERATURE RANGES OF ASPHALT ROAD PAVEMENT SURFACINGS

G.N. Kiryukhin

The article is devoted to operating temperature ranges specification of asphalt surfacings in order to improve road pavement design.

Key words: road, pavement, surfacing, asphalt temperature, frequency distribution, amplitude.

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EFFICIENCY EVALUATION OF CHORD ROAD TRANSPORT DRIVING DIRECTIONS DEVELOPING IN MOSCOW BASED ON COMPUTER SIMULATION

E.V. Dinges, K.R. Nigmatulina, S.V. Chebotarev

The article suggests the methods and the results of social efficiency evaluation of chord road transport driving directions in Moscow.
Key words: chord driving direction, road transport, efficiency, computer simulation, integral effect, investment project, net present value.

PECULIARITIES OF PRINCIPLES AND METHODS
FOR ROAD NETWORK PLANNING IN THE RUSSIAN FEDERATION

D.M. Nemchinov

The article concerns the issues of unified road network development in the Russian Federation, formed by networks of functional purpose. The principles and methods of road networks planning are proposed. The estimation of the road network development level is done. Key words: roads, road network, planning, traffic capacity.

TAKING INTO CONSIDERATION THE PECULIARITIES
OF GEOCOMPLEXES EXTENTION
WHEN ROAD ZONING TERRITORIAL ORGANIZING

S.V Efimenko, V. N. Efimenko, M. V. Badina, A.O. Afinogenov

The organization peculiarities of information base consisting geocomplexes with zonal and intrazonal character when territorial road-climatic zoning are considered. Methodological aspects of road zoning in the "zonesubzone-road area" system are shown. The issues of road design quality assurance in natural conditions in Siberia are reflected. Key words: geocomplexes, road climatic zoning, road, design, subgrade, pavement, efficiency.

ROAD LANDSCAPE DESIGN PECULIARITIES IN WATER RESERVOIRS AREA

O.V. Mikheyeva, E.Yu. Shmagina

This article concerns the basic principles of landscape design for roads in the water reservoir zone and their integrating into the landscape. The calculations of road optimum radius are presented. Key words: road, landscape design, horizontal curve radius, water reservoir, risk magnitude.

FORCES AND STRESSES AT THE TIRE AND ROAD CONTACT PATCH

M.V. Nemchinov, S.K. Aktanov

The results of theoretical and experimental research on normal and tangent stresses at the tire-road contact patch are reviewed. The research methods are presented. Key words: tire, road surface, contact patch, friction force, normal load, tangent strains.

USING OF DEEP MASS MIXING TECHNOLOGY FOR STABILIZATION
OF SOFT SOILS FOR ROAD EMBANKMENTS FOUNDATIONS

A.P. Fomin, S.N. Schiykin, P.N Pudikow

This article covers a new domestic technology for construction of road foundations on soft soils. The principal parameters of mass stabilization technology for soft soils that is for the total embankment foundation area on the required depth are reviewed. The first data of the experimental construction are represented.
Key words: soft soils, mass stabilization, experimental construction, foundation, embankment, road.

IMPROVING OF DETERMINATION ACCURACY OF ROAD PAVEMENT CONSTRUCTIVE LAYERS THICKNESS BASED ON THE GEORADAR SURVEYING RESULTS

A.M. Kulizhnikov

According to the results of GPR (ground-penetrating radar) surveys the determination accuracy of the same road pavement constructive layers thickness varies depending on the use of GPR antenna units with different frequency. The reasons of such tendency are revealed, and it is proven according to the results of field works on road sections that the accuracy of thickness determination considerably depends on materials dielectric values, and the latter depends upon central frequency of contact or air antenna unit applied for investigations.

Key words: road pavement, layer thickness, georadar (GPR), dielectric values, contact antenna unit, air antenna unit.

ABOUT DETERMINATION OF ROAD PAVEMENT ROUGHNESS INDEXES

A.N. Luschnikov, A.P. Luschnikov

The article describes some of the peculiarities of road pavement roughness indexes determination. The results of calculations of various indexes, measurement errors evaluation are done. The question concerning the correlation between IRI index and measurements by the method of threemeter rack is examined.

Key words: road pavement, international roughness index, roughness, threemeter rack, profilometer, bumpometer.

ABOUT THE REQUIREMENTS FOR ROAD PAVEMENT ROUGHNESS DURING OPERATION

O.A. Krasikov, K.V. Mogilny

The article deals with the requirements for road pavement roughness at four stages of their operating: putting a road into operation, warranty end, end of intermaintenance period, roughness degradation to the condition when road accident probability occurring. The examples of road pavement roughness change through time with regard to requirements for four stages are given. The findings about the importance of the initial road pavement roughness, on which its’ degradation depends through time under otherwise equal conditions, are presented. The analysis of the existing normative documents in the Russian Federation is made; the lack of requirements for road pavement roughness according to international roughness index during operation is underlined.

Key words: road pavement roughness standards, international roughness index, requirements for road pavement roughness during operation, stages of the road pavement service, normative documents.
STRUCTURAL SCHEME OF REINFORCED GROUND SYSTEMS WHEN BRIDGE RECONSTRUCTING

A.D. Sokolov

The article proposes constructive-technological decisions for the reconstruction of three-span bridges by enlarging the under-bridge pass-way by means of eliminating cones and replacing them by abutments with separate functions using the reinforced ground systems. The decision for reconstruction of the framed cantilever bridges is presented. Different examples of the effective applying of reinforced ground systems for eliminating accident situations are given.

Key words: reinforced ground systems, abutment with separate functions, bridges and overpasses reconstruction, protection against earth slide impacts.

EXPERT SYSTEM FOR ASSESSMENT OF ENGINEERING PLANNING AND CONSTRUCTIVE SOLUTIONS OF URBAN BRIDGE CROSSINGS

Y.A. Storchak

The principle of expert assessment of urban bridge crossings systems is described. The assessment algorithm of their engineering planning and constructive solutions is presented. The expert system in logic sequence uses mathematical, theoretical and complex assessment mechanisms, including network models, blocks compliance rating system influenced by different factors (technical, planning, architectural, architectonic, esthetic, ecological).

Key words: street-road network (SRN), road junction (RJ), water barrier (WB), urban bridge crossing (UBC), traffic intensity (TI), traffic capacity (TC), road traffic safety (RTS), environment (E), pollutant emissions (PE), noise pollution (NP), transport hub (TH), engineering planning and constructive solutions (EPCS), expert system (ES).

ENHANCEMENT OF CONNECTION CONSTRUCTION OF OVERPASSES AND EMBANKMENT BY INTEGRAL ABUTMENTS

V.I. Popov

The article dwells upon issues related to improving the performance of overpasses abutments and approaches embankment connections. Based on foreign experience the use of integral abutments in the national practice when overpasses constructing is proposed. The advantages of integral and semi-integral abutments overpasses are reviewed.

Key words: overpass, embankment connection, dilatation joint, bearing, integral and semi-integral abutments.

ORGANIZATION OF HOT ASPHALT CONCRETE MIXES TRANSPORTATION WHEN URBAN ROADS REPAIRING

S.V. Aleksikov, M.O. Karpushko

The article deals with the transportation organization of hot asphalt concrete mixes when urban roads repairing. Factors influencing transportation of asphalt concrete mixes on street and road network are revealed. The optimization model of dump trucks route traffic to a construction section is proposed. This model allows taking into consideration urban roads condition and their congestion level, signalized intersections, number and weight carrying capacity of dump trucks as well as asphalt concrete mix consumption rate.
Key words: hot asphalt concrete mix, urban roads repair, transportation organization, haulage, traffic speed, traffic volume, congestion level, normal distribution, dump trucks productivity rate, unit costs, mileage costs.

RATING DANGER EVALUATION OF ROAD SECTIONS WHEN REALIZING ROAD SAFETY AUDIT

A.L. Rybin

The article analyzes statistical data concerning road accidents on the A101 road section during road safety audit. It is proposed in the evaluation of road sections the use of danger rating index, which includes not only the index of road accident risk, but also accident severity. Key words: road accidents, risk, accident severity, dangerous sections, rating.

ROAD NANOSTRUCTURAL OLIGOMER-BITUMINEN BINDERS PROCESS

A.V. Rudensky, V.V. Lobanov

The article deals with technical solutions for oligomer-bitumen binders manufacturing process organization. Constructive concepts for production facilities elements of the reactor, as well as its internal units are presented. Theoretical basics for technological process optimization are pointed out. Key words: manufacturing technology, oligomer-bitumen binders, reactor construction, raw material requirements.

CHOICE OF THE ADHESION ADDITIVES FOR BITUMEN THERMAL STABILITY IMPROVEMENT

A.I. Trautvain, V.V. Yadykina, D.V. Zemlyakova

The paper presents the research results on the effect of bitumen aging on adhesion index in the presence of some adhesive additives. Key words: bitumen, adhesive additive, thermostability of bitumen, aging.

CRYOTROPIC POLYMER MATERIALS FOR REDUCING SOILS FREEZE DANGER IN YAKUTSK REGION

N.P. Sygachev, O.V. Sokolova, N.A. Konovalova, D.A.Grigoriev

The possibility of using cryotropic polymeric materials to prevent and eliminate roadbed defects when constructing, reconstructing and repairing roads, including in permafrost region is examined. The strains of frost heaving silty clay soils widespread across the territory of Yakutsk and often used as a natural roadbase are studied. When injecting polymeric material into the freeze dangerous soil not only its transition into the category non freeze dangerous under identical conditions of freezing as well as increasing its bearing capacity are provided. Key words: cryotropic polymer materials, subgrade defects, freeze dangerous soil, frost heaving strains.
THERMOFLUCTUATIONAL AND FRACTAL MODEL ASPHALT CONCRETE DURABILITY

G.N. Kiryukhin

Based on the theory of fractals and thermoductualional nature of deformation and fracture of asphalt concrete a phenomenological model of long-term durability, which is adequate to the experimental data is proposed.

Key words: asphalt concrete, long-term durability, fractal dimension, activation energy.

ABOUT POSSIBILITIES OF TAR-MINERAL MIXTURES USING FOR ROADS BASES CONSTRUCTION

N.S. Kovalev, E.N. Otarova

The article deals with the research results of strengthening of less durable lime stones and cast slag crushed stone by D-3 coal tar of reduced viscosity during the pavement bases construction.

Key words: coal tar, cast slag crushed stone, tar-mineral mixtures for bases construction, research mixtures properties.

ABOUT SELECTING CRUSHED STONE FOR ASPHALT CONCRETE MIXES

S.V. Polyakova

The article deals with basic principles of crashed stones selecting for asphalt concrete mix in the Russian Federation as well as with the world experience in this direction.

Key words: crashed stone, rocks, quality, application domain, asphalt concrete.

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HARMONIZATION OF PROVISIONS OF CONTRACTS FOR CONSTRUCTION WORKS AND GENERAL CONDITIONS OF FIDIC STANDARD CONTRACTS

V.I. Popov

The issues on the harmonization of provisions of contracts for construction works and general conditions of standard contracts of the International Federation of Consulting Engineers (FIDIC) are considered. The critical distinctions among FIDIC contract conditions and contract conditions applied in Russian road sector based on the experience in working on investment projects realized in the Russian Federation using FIDIC contracts are described. The suggestions concerning the harmonization of contract provisions and general conditions of FIDIC standard contracts are made.

Key words: contract, contract general conditions, engineer-consultant, technical supervision, EBRD, IBRD, IFO.
ABOUT NEW REQUIREMENTS FOR ROAD ENGINEERING SURVEYS

A.M. Kulizhnikov, R.A. Yeremin, I.P. Kolesnikov

This article dwells upon three interstate standards concerning engineering surveys of public roads: «General requirements for surveys», «Requirements for topographic and geodesic surveys», «Requirements for engineering and geological surveys». The road engineering surveys content and requirements justification are specified.

Key words: roads, requirements, engineering surveys, topographic and geodesic surveys, engineering and geological surveys.

ABOUT THE CHOICE IN THE MACHINES SET FOR TRANSPORT TUNNEL CONSTRUCTION USING MINING HEADING TECHNOLOGY

A.A. Domnitskiy, A.S. Nosenko, R.V. Kargin, Y.A. Shemshura

The article dwells upon the issues relevant to the usage of heading technology with machine rock mining, when transport tunnels constructing, taking into account the developed standard determining the characters and classification order of tunnels on public roads. The usage of elevators with pulling and hauling tool ensuring in-andout movement and variable geometry of transporting elements, as well as the selective heading machine is proposed.

Key words: transport tunnel, classification, heading machine, materials transfer vehicle.

ABOUT THE INFLUENCE OF THE COMPOSITE LAYER USING GEOCELL ON THE PAVEMENT BEHAVIOR


The article proposes a methodology for the evaluation of failure probability and service life of road pavements taking into account the geocell behavior in the gravel base of the road structure. The methodology is based on the probabilistic approach to the theory of risk in consideration of the main aspects of the Federal Law №184-FZ «On Technical Regulation».

Key words: geosynthetic material, road structure, service life, probabilistic approach, reinforcement.

ABOUT SECANT ELASTIC MODULUS ESTIMATION OF THE MULTYLAER ROAD PAVEMENT CALCULATED USING SHEARING AND BENDING TENSION CRITERIA

O.A. Krasikov

Based upon the simplest assumptions of the «Strength of Materials» course the development and justification of formula for estimating the secant elastic modulus of multilayer system applied to flexible road pavement calculation using shearing and bending tension criteria are presented. The comparison of this formula with other ones existing and actually being applied is carried out. The conclusion about the necessity of computing experiment realization concerning the influence of analyzed formulas, including new theoretical decisions, on the final result of road pavement calculation is drawn.

Key words: flexible road pavement, multilayer system, secant modulus of elasticity, formula development.
OPERATIONAL STATISTICS ROUGHNESS CONTROL
OF ASPHALT CONCRETE PAVEMENTS

S.I. Romanov, A.Y. Stadnik

The article concerns the regular relationship between the results of indirect measurements of asphalt pavements roughness and the indicators of time-consuming direct measurements by sandy patches method when statistical quality control realizing while roads constructing and operating.

Key words: asphalt concrete pavements, statistics, electric capacity, roughness.

AUTOMATING MEASUREMENT DATA PROCESSING
OF MACROROUGHNESS PARAMETERS OF ROAD PAVEMENTS

L.V. Yankovsky, A.V. Kochetkov, Yu.A. Trofimenko

The automatic method for measurement of road pavements macroroughness is characterized by the full automation of computing procedures, as well as by the analysis of numerical ranks of determination of distance from measuring base of mobile road diagnostic laboratory to a road pavement surface. The procedure for range classification and measurement of geometrical parameters of macroroughness using the laser equipment is offered. For results processing a new parameter – number of traverses of the specified level for macroroughness heights or depths is proposed. The method is successfully approved when analyzing statistical properties of humpback bridge deck structures, railroad crossing pavements, SafeLane™ anticing road macrorough surface overlay.

Key words: automating measurements, macrorough pavements, laser diagnostics, road.

ORGANIZATION PRINCIPLES AND CLASSIFICATION
OF URBAN BRIDGE CROSSINGS

Y.A. Storchak

The urban planning classification developed on the basis of the urban bridges and bridge crossings projects realized in the different countries is proposed by the author. Having regard to this classification it is possible to generate integrated and specialized classifications in view of the need of assignment and solution of purposes and tasks of different type (scientific, practical, complex). The considered classification is based on typology of arterial roads and intersections of streets and roads in the cities and out of them. Besides, it reflects the different common decisions for the bridgehead road and transport junction nodal points.

Key words: street and road network (SRN), arterial highway (AH), urban arterial road (UAR), regional road (RR), road and transport junction nodal point (RTJNP), water barrier (WB), urban bridge crossing (UBC), bridgehead road and transport junction nodal point (BRTJNP), urban passenger transport (UPT), traffic volume (TV), traffic capacity (TC), traffic engineering (TE), road traffic safety (RTS), environment (E), pollutant emissions (PE), noise pollution (NP), engineering planning and architectural constructive decision (EPACD).
ABOUT THE USE OF TIMBER FOR BRIDGES CONSTRUCTION

V.A. Utkin, V.I. Puzikov, B.V. Kazantsev, M.Y. Karetnikov

The article is devoted to the application in practice of new plank and nail spans which meet the modern requirements for load bearing capacity, reliability and durability. The presented data prove the efficiency of the proposed solutions. 

Key words: plank and nail block; spans with composite log girders; threetier girder; timber and wood-based panel; load bearing capacity; reliability; durability.

ROAD TRAFFIC VOLUME FORECASTING METHODS BASED ON A SINGLE DYNAMIC LINE AND THEIR APPLICATION AREA

E.V. Dinges

This article considers some specific examples of the application areas of different road traffic volume forecasting methods based on a single dynamic line.

Key words: road, traffic volume, vehicles, dynamical line, forecasting methods.

RISK INDEXES OF ROAD TRAFFIC ACCIDENTS FOR EVALUATING ROAD SECTIONS WHEN ROAD SAFETY AUDIT CARRYING OUT

A.L. Rybin

The possibility of using risk indexes of road traffic accidents and fatalities for evaluating the danger on road sections when road safety audit carrying out is analyzed. The standards of danger levels on road sections calculated on the basis of C-charts of Poisson distributions of these parameters for federal highways of Russia are given.

Key words: road traffic safety, audit, risk, indexes, road traffic accidents.

PROSPECTS FOR THE USE OF NANOOBJECTS WHEN PREPARING POLYMER-BITUMEN BINDERS

M.A. Vysotskaya, S.Iu. Rusina

This article deals with the carbon-containing nanostructures influence on polymer-bitumen binders (PBB) and asphalt concrete properties. The optimal formulating and technological parameters of nanomodified PBB preparation are considered. The physical and mechanical, as well as deformation indexes of asphalt concrete based on binder such as nanomodified PBB are analysed.

Key words: carbon nanotubes, polymer-bitumen binders (PBB), asphalt concrete, cohesion, rut.

EXPERIENCE OF ENSURING DURABILITY OF AIRFIELD ASPHALT CONCRETE PAVEMENTS IN THE NORTH CONDITIONS

O.N. Nikonova, A.V. Rudensky

This article concerns the practical experience of polymer modified binders and asphalt concretes usage for ensuring durability of airfield asphalt concrete pavements in the North conditions.

Key words: airfield pavement, asphalt concrete, polymer modified bitumen, climate conditions.
ABOUT THE PROSPECTS FOR POLYMER-CEMENT SOILS USAGE IN ROAD CONSTRUCTION

E.A. Golubeva

Road pavement soil cement layers are characterized by a considerable disadvantage that is low crack resistance. This problem can be solved by modifying soil cement with different polymer agents. This article concerns the research results of the physical and mechanical properties of pavement with polymer-cement soil base on the Federal Highway «Amur».

Key words: stress-strain behavior, bending tensile strength, crack resistance, polymer-cement soil, road pavement.

IMPROVEMENT OF CORROSIVE PROPERTIES OF ASPHALT CONCRETE BASED ON MINERALS AGGREGATES USING GRANULAR BLAST-FURNACE SLAG

N.S. Kovalev, Vl.P. Podolsky, A.A. Bykova, Y.N. Otarova

The paper deals with research results of improvement of structural and mechanical properties of asphalt concrete based on mineral aggregates using granular slag. The influence of long water saturation, freezing and thawing, age of asphalt concrete samples on its some properties is analyzed. The infrared spectroscopy and raster scanning microscopy methods are used for asphalt concrete structure study.

Key words: asphalt concrete based on mineral aggregates using granular blast-furnace slag, long water saturation, freezing and thawing, infrared spectroscopy, raster scanning microscopy.

APPROACH FOR EVALUATION OF ASPHALT CONCRETE ROAD PAVEMENT DURABILITY

G.S. Bahrah

A new method for evaluation of road asphalt concrete pavement durability on the fracture mechanics is proposed. The difference of bitumen film disruption processes under different asphalt concrete loading conditions is shown. The calculation results concerning the road pavements durability depending upon asphalt concrete layer thickness and composition are given. The algorithm for durability estimation of reinforcement layer covering cracked pavement is presented. The proposed design method possibilities are illustrated by some examples. Based upon the usage results of the proposed method the practical recommendations are suggested.

Key words: pavement, asphalt concrete, fracture mechanics, reinforcement layer, durability, fatigue cracking.

SOME WAYS TO IMPROVE STONE MASTIC ASPHALT CONCRETE RESISTANCE TO PLASTIC RUTTING

S.A. Chernov, K.D. Golyubin

The analysis of the influence of an organic binder material type on physical and mechanical properties of stone mastic asphalt concrete (SMA-15), as well as its resistance to plastic rutting is done. It was revealed that not only asphalt concrete standard quality indexes, but also its performance depend upon properties of used organic binder materials (viscous road bitumen, polymer bitumen binder or modified bitumen). Modifiers and polymer bitumen binders have the most substantial effect on rutting resistance that contribute to the average decreasing of plastic deformation by 40-50%.
**Key words**: asphalt concrete, stone mastic asphalt concrete, modifier, shear resistance, plastic rutting.

ANALYSIS OF REQUIREMENTS FOR HOT COARSE-GRAINED POROUS ASPHALT CONCRETE MIXTURES

I.V. Mardirosova, S.A. Chernov, N.I. Shiryaev, Y.B. Major

The analysis of the requirements for granulometric compositions of hot coarse-grained porous asphalt concretes depending on the year edition of normative document is done. Using the experimental methods it is revealed that the asphalt concrete selected in accordance with GOST 9128-59 has more developed skeleton and better physical and mechanical properties, such as resistance to plastic rutting than asphalt concrete prepared in accordance with GOST 9128-2009. In addition, comparative tests allow the conclusion that hot coarse-grained porous asphalt concrete according to GOST 9128-59 almost is not inferior in its characteristics than asphalt concrete AC 32 TS prepared according to the German normative document – TL Asphalt-StB-07 currently applied.

**Key words**: hot coarse-grained porous asphalt concrete, granulometric composition, polymer bitumen binder, rutting.

EFFECT OF THE MODIFICATION OF BITUMEN BY AN SBS-TYPE POLYMER ON THE STABILITY OF POLYMER-MODIFIED ASPHALT CONCRETES IN AGGRESSIVE LIQUID ENVIRONMENTS

V.A. Zolotarev, R.A. Khamad

The paper considers lifetime variation mechanisms of asphalt concretes and polymer-modified asphalt concretes subjected to pure bending under the simultaneous action of loads and liquid aggressive environments. It has been determined that comparable results can be obtained under equal stress states of different asphalt concretes. The effect of both binder consistency and method of bitumen modification by a polymer on bitumen stability in aggressive liquid environments is shown.

**Key words**: bitumen, polymer modified bitumen, pure binding, stress-strain state level, aggressive environments, environment durability.

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DEVELOPMENT PLANNING OF MACHINERY FLEET OF ROAD ENTERPRISES BY TAKING INTO ACCOUNT THEIR OPERATION PECULIARITIES

M.N. Abdulaev

The article considers one of the possible approaches to development planning of road machinery fleet based on the dynamic analysis of operational costs.

**Key words**: road machine, physical deterioration, operational costs, costeffectiveness, replacement feasibility, road enterprise.
THE INFORMATION BASE DEVELOPMENT FOR ROAD-CLIMATIC AREAS ZONING

S.V. Efimenko, V.N. Efimenko, A.V. Sukhorukov

The problems of road design quality assurance in natural climatic conditions of Western Siberia are considered. The factors determining the formation of hydrothermal regime of soil subgrade are revealed and the peculiarities of information base development for modeling geocomplex are shown.

Key words: road climatic zoning, road, design, subgrade, geocomplex, information base.

REINFORCEMENT OF WEAK HEAVING SOILS WHEN ROAD CONSTRUCTING BY DOUBLE-CONE HOLLOW PILES METHOD

B.S. Yushkov, A.A. Degtyar

The article deals with the reinforcement method of weak heaving soils in subgrade base by using double-cone hollow piles, tridimensional geogrid, geotextile for roads in the northern regions of the Russian Federation. The method of calculating the road base in the form of pile strip foundation of double-cone hollow piles reinforced by tridimensional geogrid and geotextile on weak heaving soils taking into account traffic loads and weight of subgrade is considered.

Key words: double-cone hollow piles, weak soils, subgrade, frost heaving, porosity coefficient, soil structural strength, pile strip foundation, tridimensional geogrid, geotextile.

ABOUT THE COMPLIANCE OF THE ASSESSMENT RESULTS OF HEAVING SOIL DEGREE BY INDIRECT AND LABORATORY METHODS

V.A. Shorin, G.L. Kagan, A.Y. Velsovsky

This article concerns the problems on the occurrence and taking account of the heaving soil impact on road structure. Some examples of determination of the heaving degree using indirect method recommended by standards, as well as by laboratory testing are given. It is established that the indirect method has unacceptable error and is not recommended for using in normative documents.

Key words: road structure, frost heave, heave formation, heaving degree, indirect method, laboratory method, heaving soil properties assessment.

APPLICATION EXPERIENCE OF STABILIZING AGENT «DORZIN» FOR THE ROAD BASE AT ROAD CONSTRUCTION FACILITIES

A.A. Strukov, D.L. Khusid

The article describes the multienzymatic «Dorzin» stabilizer for road base, applied for soil stabilization, strength and water resistance enhancement of road pavement when road constructing and repairing. The comparative analysis of the efficiency of such stabilizer compared with other analogues is given. The operational principle of stabilizing enzyme and its distinctiveness from the existing ones is presented. The experience of applying the stabilizer at road constructing facilities, confirming the application efficiency of such stabilizer is reviewed.
The stabilizer «Dorzin» application example when road Saraktash-Buruncha-Novomikhailovka constructing in Orenburg region is considered.

Key words: roads, road base, multienzymatic «Dorzin» stabilizer, soil stabilization, repair, construction, efficiency, comparative analysis.

ABOUT PERSPECTIVES OF NONDESTRUCTIVE TESTING USAGE FOR COMPACTION QUALITY CONTROL OF ROAD ASPHALT CONCRETE PAVEMENT LAYERS

R.U. Yusifov

The research results of road asphalt concrete pavement layers compaction are proposed. The aspects of portable density meters application are considered.

Key words: road pavement, quality control, asphalt concrete, compacting factor, asphalt concrete density meter.

DETERMINING OF DYNAMIC IMPACT OF TRANSPORT VEHICLE ON ROAD PAVEMENT CONSTRUCTION

A.V. Korochkin

The research method, as well as experimental results on determining the dynamic impact of different loading capacity transport vehicles on road pavement construction are considered. The analysis of stress and strain state development in rigid pavement with asphalt surfacing layer is also given.

Key words: road pavement, asphalt concrete, cement concrete, strength, dynamics, deflection.

CONCEPT OF ASPHALT CONCRETE COMPOSITION CHOICE FOR ROAD PAVEMENT BASE LAYER

G.S. Bahrah

The concepts of bitumen content assignment in road pavement base layer in Russia and according to «Superpave» method are compared. The ultimate tensile strength at fracture is proposed as a target criterion. It is shown that when reducing the bitumen content by 0,5% against optimal value, road pavement service life may decrease by one year, however, it is not economically justifiable.

Key words: road pavement base layer, optimal bitumen content, service life, rehabilitation cost.

PECULIARITIES OF DESIGN AND ASSESSMENT OF FLEXIBLE ROAD PAVEMENTS STRENGTH ON EXISTING EQUIVALENT AXLE LOADS

O.A. Krasikov

According to the analysis of equations existing in the flexible pavement design theory and computational experiment it is specified that determined required elastic modulus doesn’t depend on equivalent load. However, when calculating the same required elastic modulus is achieved by structural layers of different thicknesses depending on design load. Besides, it is revealed that when assessing the strength, the same road pavement construction might have different elastic modulus depending on which design load the strength is being determined for. It is accentuated
that for the design load equal to 130 kN an individualized approach to constructional design of flexible road pavement with the recommended limits is needed.

Key words: flexible road pavement, equivalent axle loads, required elastic modulus, strength assessing, design peculiarities.

ABOUT THE IMPROVEMENT OF ROAD LONGITUDINAL PROFILE

N.A. Lushnikov, P.A. Lushnikov

Some aspects of road longitudinal profile optimal alignment by milling, when surface repairing, are considered. The comparative analysis of regarded methods from the perspective of providing the better International Roughness Index is given.

Key words: road pavement, repair, longitudinal profile, milling, International Roughness Index (IRI).

BICYCLE AND PEDESTRIAN PATHS DESIGN

B.B. Anokhin, E.I. Avilova, D.A. Gracheva

The article dwells upon the development of the interstate standard GOST «Automobile roads of general use. Bicycle and pedestrian paths design. General requirements», taking into account the requirements of the road design valid standards in the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation. The interstate standard project determines general requirements for bicycle and pedestrian paths design, their placement on roads, as well as main parameters to provide traffic safety and enhance transport performances of public roads.

Key words: road traffic safety, bicycle parking, shared path, bicycle path, bicycle shed, public roads, pedestrian path, bicycle lane.

ABOUT THE IMPACT OF GRANULAR MATERIALS BASE ON STRAINS IN ASPHALT CONCRETE PAVEMENT

A.E. Merzlikin

The article deals with a numerical experiment concerning the effect of nonlinear relation between elasticity modulus and stress condition of granular materials of road pavement base on maximum horizontal normal stresses in asphalt concrete pavement. The «ALGOFORT» program realizing the exact elastic solution to strain-stress state of multilayer half-space charged through circular area is used when conducting the experiment. Witczak and Uzan (1988) nonlinearity model is applied. The numerical experiments specify, when calculating road pavements, the necessity to determine stresses and displacements with program complexes realizing exact elastic solution. This work encourages to forget the reduction method of multilayer pavement to two- or three-layer models, as outdated.

Key words: road pavement, granular material, base, asphalt concrete pavement, nonlinear relation between elasticity modulus and stress condition.
RESEARCH ON STRENGTH AND HOMOGENEITY OF FLEXIBLE ROAD PAVEMENT USING FWD

E.V. Uglova, A.N. Tiraturjan

The questions concerning the assessment of strength and homogeneity of flexible road pavements using FWD (falling weight deflectometer) are considered. As a result of full-scale testing on the operating road sections a high heterogeneity of actual values of the overall elastic moduli of flexible pavement is revealed. An approach to the assessment of flexible pavement condition using FWD on road sections of long length, including the determination of the average actual overall modulus of elasticity, coefficient of variation of the overall modulus of elasticity, and the 95th percentile reduced actual general modulus is proposed.

Key words: homogeneity, nondestructive testing, falling weight deflectometer, overall modulus of elasticity, coefficient of variation.

MODERN TRENDS IN PEDESTRIAN BRIDGES DESIGNING

I.G. Ovchinnikov, I.I. Ovchinnikov, A.B. Karakhanyan

Recent trends in bridge construction are reviewed by the examples of pedestrian bridges. They include: using of bionic approach to shaping of bridge structures; modern methods of computational analysis and modeling of structures behavior allowing to design structures of complex spatial form; application of modern high-strength materials; sustainable design, and realization of the tensegrity principle. For illustrative purposes the 17 bridge projects that enable to implement the examined trends are considered.

Key words: pedestrian bridges, bionic approach, unique bridges, sustainable design, self-stressed structures.

BRIDGES OF MOSCOW, ST. PETERSBURG AND KIEV AS SYSTEM ELEMENTS OF TRANSPORT INFRASTRUCTURES

Y.A. Storchak

The factors, which have influence on forming, functioning and developing the Moscow, Saint Petersburg and Kiev street and road networks, are analyzed. These cities are different regarding the planning schemes, the river characteristics; the architectural traditions etc. Estimated positions, for illustrations purposes and comparisons, are given in tables. It is necessary to take into account the general relevant regularities as well as particular ones during development and implementation of master plans of the cities mentioned above. The documents can be some examples for similar Urban-type settlements of the different countries.

Key words: master plan (MP), water barrier (WB), street and road network (SRN), engineering planning and architectural constructive decision (EPACD), bridge-head road and transport junction nodal point (BRTJNP), traffic volume (TV), traffic capacity (TC), urban bridge crossing (UBC), road traffic safety (RTS), public passenger transport (PPT), arterial road (AR).

TUNNEL CLASSIFICATION FOR GENERAL-PURPOSE HIGHWAY

A.A. Domnitskiy, A.S. Nosenko, R.V. Kargin, Y.A. Shemshura

The article deals with the tunneling classification for public roads, which is developed in the first time. Classification purpose is to specify tunnel during road design, construction, reconstruction, rehabilitation, operation harmonized with international normative requirements. The research is
reviewed, during which, firstly, factors and their variants for road tunnels are specified. Secondly, the taxonomy implementation principles regarding road tunnels is explained. Thirdly, tunneling classification has been developed by types, groups and classes according to the location, design and technical specification which allow identifying, constructive, structural and technical parameters. Fourthly, the structural scheme for public roads tunnel symbolic notation is proposed. Fifthly, typical constructive and technological patterns have been developed.

Key words: public roads, road tunnel, classification, criteria and indexes, standard size, type, class, group, level, span, laying depth, construction mode, constructive and technological decisions, tunnel casing.

ABOUT THE HYDRAULIC CALCULATION OF CORRUGATED METAL CULVERTS

V.I. Altunin, O.N. Chernikh

The article concerns a brief analysis of existing guidelines for calculating hydraulic resistance experienced by the water flow when there is free flow and under pressure flow in corrugated metal culverts with normal and spiral corrugation. The possibility of designing corrugated metal culverts of their work at baffled outlet drop or under pressure modes when design discharge passing is argumented. The experimental hydraulic research results realized in MADGTU (MADI) are done.

Key words: metal corrugated culvert, normal and spiral corrugation, hydraulic resistance, roughness, carrying discharge.

RESULTS OF HIGHWAY BRIDGE «SARATOV-ENGELES» UNDERWATER INSPECTION

V.G. Gratsinskiy, A.V. Kokodeev, I.G. Ovchinnikov

The paper deals with the inspection peculiarities of the highway "Saratov-Engels" bridge underwater parts realized in 2013. The analysis of inspection results of underwater pier parts, characteristics of the Volga River, as well as flora and fauna impact on the material of underwater bridge structures is done. Special attention is paid to the effect of floating-ice on the bridge bearing structures.

Key words: transport structure, bridge, underwater inspection, methods, defect, damage, operation, erosion, flora, fauna, floating-ice.

FACTORS INFLUENCING THE EFFICIENCY ASSESSMENT OF ROAD TRAFFIC SAFETY MEASURES

A.L. Rybin

The article deals with the analysis concerning the effects of an average regression, the general trend of accident rate indicators change, as well as subjective safety on an efficiency assessment of realized preventive measures on roads using «before and after» method.

Key words: road accident concentration sections, average regression, subjective safety, measure efficiency assessment.
LABORATORY STUDY OF COMBINED ASPHALT CONCRETE ROAD PAVEMENT BASED ON THE PRINCIPLE «HOT OVER HOT»

I.S. Sakharov, L.A. Gorelisheva

The article concerns the laboratory tests of combined road asphalt concrete pavement based on the principle «hot over hot». The laboratory research results of the samples of such pavement are presented.

Key words: compact asphalt, laboratory researches, shear resistance, crack resistance, combined road pavement, asphalt concrete.

EFFECTIVE STABILIZING ADDITIVES BASED ON HIGH-DISPERSITY POROUS MATERIALS FOR SMA

J.G. Borisenko, M.CH. Ionov, S.O. Kasaryan

The influence of various high-dispersity porous fillers on the properties of asphalt binders and stone mastic asphalt (SMA) based on them is analyzed. The application effectiveness of high-dispersity crushing screenings of expanded clay as a stabilizing additive for SMA is revealed.

The use of such fillers enables successfully handle some problems concerning mix segregation, as well as enhancement of its strength, heat resistance and water resistance. It was established experimentally that thus modified SMA due to changes in the structure asphalt binders and thermal stresses decrease in pavement material possess greater crack resistance, frost resistance, shear resistance and durability.

Key words: stone mastic asphalt, stabilizing additive, screenings crushing expanded clay gravel, road pavement, asphalt binders.

CONTROL METHODS OF MINERAL STRUCTURE OF ASPHALT CONCRETE

G.N. Kiryukhin

The basic control methods of mineral aggregate structure for improving technological and operating properties of asphalt mixtures and asphalt concrete are considered.

Key words: road pavement, asphalt mixtures, granulometric composition, mineral aggregate, structure.

THE IMPACT OF EVOTHERM, AZOL 1007, ADGEZOL 3-TD ADDITIVES ON BITUMEN PECULIARITIES

A.I. Trautvain, V.V. Yadykina, D.V. Zemlaykova, Yu. P. Chistyakov

The article presents the testing results of bitumen grade BND 60/90 modified by Evotherm, Azol 1007 and Adgezol 3-td additives developed for warm asphalt mixes preparation.

Key words: bitumen, additives, Evotherm, Azol 1007 Adgezol 3-td, warm asphalt mixes, energy efficiency.
RESOURCE ECONOMY AT CONSTRUCTING AND REPAIRING ASPHALT CONCRETE ROAD PAVEMENTS BY MEANS OF EFFECTIVE USAGE OF CRUMB RUBBER

V.A. Mariev, J.V. Perlina, A.V. Rudenskiy, B.M. Slepaya

The article dwells upon domestic and foreign experience of crumb rubber usage produced by waste tire recycling for asphalt concrete properties enhancement. The application of crumb rubber corresponds to the resource economy and ecological improvement, as well as contributes to service life extension. The requirements for crumb rubber modified asphalt concretes and crumb rubber modified bitumen binders are specified.

Key words: road pavement, tire, crumb rubber, asphalt concrete, rubber modified bitumen binder.

CASE STUDY OF THE POSSIBILITY OF APPLICATION OF VARIOUS STABILIZING ADDITIVES IN STONE MASTIC ASPHALT MIXTURES

E.A. Danilyan, S.V. Shulga

The article shows the possibility of obtaining stable stone mastic asphalt (SMA) mixtures by introducing fibrous additives as stabilizing additives: mineral fiber and polyvinyl chloride powder. It is determined that the resistance to delamination of SMA mixtures depends on the content of coarse fractions in the aggregate, and with their less content it is possible to expand the range of stabilizing additives. The properties of asphalt mixtures, when crumb rubber "Unirem" adding, are considered. The scheme of asphalt mixture components introduction, which allows to decrease the duration of mixing and to obtain high-quality asphalts with reducing "Unirem" consumption, is proposed.

Key words: stone mastic asphalt mixtures, stone mastic asphalt, fibrous stabilizing additives, crumb rubber, asphalt mixtures preparation technology, properties, additive consumption.