

UNIVERSITATEA DE NORD DIN BAIĂ MARE
FACULTATEA DE RESURSE MINERALE ȘI MEDIU

**BULETIN ȘTIINȚIFIC
AL UNIVERSITĂȚII DE NORD
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SERIA D
Exploatare Miniere
Prepararea Substanțelor Minerale Utile
Metalurgie Neferoasă
Geologie și Ingineria Mediului
Volumul XXIV Nr. 2



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PRETREATMENT OF LIGNOCELLULOSIC SUBSTRATES FOR ACID MINE DRAINAGE TREATMENT IN PASSIVE BIOREACTORS

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ABSTRACT: Acid mine drainage (AMD), generated by the exposure of mine waste to air and water, has adverse effects on the environment due to its acidic pH and high concentrations of metals. Passive bioreactors are sustainable AMD treatment systems because they use biowaste and rely on anaerobic bacteria (including sulfate-reducing bacteria, SRB) for the precipitation of metal sulfides – chemically stable forms. One essential requirement of bacteria is the food source, in the form of available organic carbon. The choice of biowaste is therefore an important decision, which affects the efficiency of passive bioreactors. Lignocellulosic materials (consisting of lignin, hemicellulose, and cellulose) are acknowledged as good prospective substrates because they are long-term sources of organic carbon, as well as good sorbents. A significant drawback of lignocellulosic material is that it cannot be directly used by SRB because of its complexity. Synergetic activity of several groups of bacteria, including cellulose degraders and fermenters, can decompose the cellulose to easily available organic carbon for SRB. However, the kinetics of byproducts consumption by SRB are faster than those of cellulose degradation. Moreover, initial and long-term lack of easily available organic carbon for SRB is a significant problem that can entail the decrease of sulfate-reduction rates and metal removal in lignocellulose-based passive bioreactors. Pretreatment of cellulosic substrates can be a better solution in order to provide the available carbon source to anaerobic bacteria by lignin decomposition, hemicellulose solubilization, cellulose crystallinity disruption, and/or pore volume increase. In addition, through pretreatment, lignocellulosic material is decomposed to cellulobiose, and then fermented to easily available carbon to SRB. Among pretreatment approaches, biological processes are considered as the most environmentally-friendly because of their chemically free nature and low energy-consumption. Biological pretreatment also helps the increase of the accessible surface-area of substrates, as well as the counts of pre-acclimated bacteria. Several groups of cellulose degraders can decompose lignocellulosic material with different efficiencies, environmental conditions-related. Appropriate groups of cellulose degraders for lignocellulose-based passive bioreactor still need to be identified and characterized for efficient AMD treatment. Therefore, one main objective of this research project is to study comparatively the efficiency of cellulose degraders from several sources for the biological pretreatment of lignocellulosic substrate. The present article will present the current status of research on biological pretreatment of lignocellulosic substrates in passive bioreactors. New results from ongoing research will also be discussed. Single cellulosic substrate such as paper mill sludge and sawdust were analyzed in terms of metal removal efficiency and biological degradability under anaerobic conditions. Additional tests are performed with at least three sediment samples to identify the most efficient groups of cellulose degraders, as well as to evaluate their ability for biological pretreatment of cellulosic materials in order to optimize the long-term efficiency of lignocellulose-based passive bioreactors. In the conclusion, efficiency of biological pretreatment of cellulosic materials for lignocellulose-based passive bioreactor is discussed.

KEYWORDS: acid mine drainage (AMD), passive bioreactor, sulfate-reducing bacteria (SRB), biowaste, lignocellulosic substrate pretreatment

INVESTIGATION OF HYDROCARBON-DEGRADING MICROBIAL COMMUNITIES OF PETROLEUM HYDROCARBON CONTAMINATED SOILS IN HARGHITA COUNTY, ROMANIA

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ABSTRACT: Microorganisms able to degrade hydrocarbon pollutants (gasoline, and other petroleum derivatives) have been isolated from two contaminated areas (Sândominic and Bălan) by enrichment technique. The hydrocarbon degradative capacity of contaminated sites were determined using “Biometer flasks” (respiratory CO₂ production

measurement). Total counts and hydrocarbon degrading counts were determined using the MPN method. Isolated strains were tested for their capacity to degrade petroleum derivatives (such as benzene, toluene, xylene, n-dodecane and naphthalene). Those strains which showed great degradation efficiency in case of all investigated hydrocarbons were identified based upon the sequence analysis of their 16S rDNA. Based on the cumulative CO₂ production curves it is evident that in the contaminated soil samples there is an increased activity of hydrocarbon degrading microorganisms. During our study we isolated 30 bacterial strains which showed fast growth on at least one of the compounds tested. So far we have identified four strains which could be applicable in bioaugmentation processes. Strains R22 and R31 were identified as *Rhodococcus erythropolis*; R26 as *Micrococcus luteus*, R27 as *Bacillus cereus* and strain R12 as *Bacillus subtilis*.

KEYWORDS: petroleum hydrocarbon contamination, bioremediation, hydrocarbon degrading bacteria, 16S rDNA sequences

DETERMINATION OF DISTRIBUTION COEFFICIENTS IN THE NETWORK AIR VENTILATION WITH A DIAGONAL

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ABSTRACT: The paper comprises two parts, one theoretical and some numerical application. In the theoretical part will be analyzed the distribution of air flow (Q) on the branches of the ventilation system. For analytical solving, the ventilation network in Fig.1 is intersected with the isobar through nodes.

The parts between the modules are called isobar ventilation. The analytical relations established between the modules will permit the determining the flow value Z , and then having the sense of the air flow on the branches of the network we will determine the air flow X , Y and T .

The next step include the flow values on the branches of the network to verify that the sum of these flows is equal to the total flow (Q). The main goal of this paper is the analytical calculation of distribution coefficients and of the air flow through their total aerodynamic resistance with a diagonal grid.

KEYWORDS: air resistance, modul of ventilation, distribution coefficient of air, Hardy-Cross Method

MICRO-CLIMATIC RESEARCH REGARDING THE USE OF AN ECOLOGICAL HEATING TECHNOLOGY

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ABSTRACT: The paper presents the results obtained in the frame of an applicative research contract upon the use of ecological biogenetic heating technology of far-infrared kind, with the purpose of using it in Romania in different domains of activity.

In the climatic conditions of our country we proposed and performed a measurement program in the following fields: the adaptability at the climatic specifics (the temperature and the air humidity), microbial loading of air, effects over plants in laboratory, effects produced in a greenhouse environment and effects produced by the technology in a combination between greenhouse and field environment, effects over pets (hamsters and canaries), prolusions over general health and comfort status of human being.

The following observations where made: monitoring of microclimate, phonological and biometrical measurements have been taken periodically, general monitoring of the greenhouse regarded as artificial ecosystem, photographic recordings of growth and development stages, prevailing and editing a data base with different electronic devices for vegetable species like tomatoes, sweet peppers, egg plants, cucumbers, cabbage, turnip cabbage, onion and flower species.

KEYWORDS: far-infrared technology, growth of plants, environment

RESEARCH REGARDING METAL CONTENTS OF SOIL FROM ROMPLUMB BAIA MARE, IN ORDER TO ESTABLISH THE REMEDIAL TECHNIQUES

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ABSTRACT: The processing activities of lead - zinc rich concentrates carried over the 150 years of the company ROMPLUMB activity, led to pollution of great-sized surfaces of terrain and adversely affected the environment. Problems generated by soil contamination with different pollutant substances have recently interested more and more researchers worldwide. In the case of Romplumb's company area, the pollution occurred due to gaseous emissions generated by ore processing activities.

In this paper are presented preliminary results obtained from investigating pollution degree by heavy metals content in soil inside Romplumb. Soil sampling procedures from the three areas within the company premises were conducted according to STAS 7184/1-75. From each sampling point were extracted three samples, on a depth interval of 0-10 cm and 10-20 cm. By determining the heavy metals concentration on the two depth intervals gives a relevant historical pollution of the studied area.

The heavy metals concentration from Romplumb Baia Mare premises was analyzed in the Research Institute for Analytical Instrumentation, ICIA – Cluj-Napoca. The soluble microelements extracted from soil in royal water were determined by atomic emission spectrometry in inductively coupled plasma (ICP-AES), using SpectroFlame FMD 07 spectrometer.

The analyses performed established that the soil of the studied area is polluted with Cu, Pb, Zn, Cd, Mn. The concentrations of these elements in the 0-20 cm depth interval are higher than the normal values, exceeding the alert threshold and the limits of the intervention threshold in the majority of the experiments. For example, the value of lead is excessively high and is exceeding the maximum admitted limit 90 times.

In conclusion these soils require remediation that can be achieved by various methods, one should be bioleaching which is a biological treatment method involving the use of microorganisms to promote dissolution and extracting heavy metals from contaminated soils.

KEYWORDS: heavy metals, polluted soil, remediation

OBTAINING OF PULP FROM ANNUAL PLANTS BY ENVIRONMENTAL PROCEDURE WITH POM

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ABSTRACT: One of the major problems of the contemporaneous industry is pollution with dramatic consequences on the environment, especially on the ecosystem and not for last, regarding life quality and health of the peoples within the affected areas. Because, starting with 2007 Romania it is European Union member, we must adapt more and more to the requests, rules and regulations of European Union, including in ecological domain – which are very tight.

Our recent researches are focused in obtaining of the new catalysts to selective oxidation of lignin, in more smooth conditions. These catalysts are part of a special POM class, easy to synthesize in aqueous solutions, stable in a large pH range. The reaction mechanism of lignin oxidation it is totally different using POM than the classic one – where POM it is capable to extract one electron per reaction cycle.

The new procedure of pulp bleaching by catalytic oxidation has advantage in comparing to the classical technology used at the moment. These advantages are from several points of view such as technological, economical and ecological, as the following:

- The oxidation technology with POM it is more simple and comfortable to use than the classical one
- The new technology allows the bleaching of pulp with higher lignin content than the classical one
- POM bleaching do not use toxic or corrosive substances as Cl₂ or ClO₂

- This bleaching is ecological and friendly environmental, because do not produce wastes
- This bleaching is economical from energetically point of view because it can obtain high brightness degrees in two or three stages only.

KEY WORDS: polioxometalates, bleaching, lignin, pulp, environmental protection

EFFECT OF SOME ENVIRONMENTAL FACTORS ON SELECTED BACTERIA ISOLATED FOR MICROBIAL INOCULANTS

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ABSTRACT: The use of microbial inoculants in order to decrease the amount of chemical fertilizers represents an important action in sustainable agriculture. Several plant rhizosphere bacteria have the capacity to improve the nutrient availability through nitrogen fixing, insoluble phosphate mobilization, and siderophore production and to promote plant growth due to plant hormone production.

The biofertilizers based on living bacteria have to exert their beneficial traits on plants in the bulk soil environment. Therefore the selected strains have to be tolerant against the changes in the environmental factors.

In order to archive the main aim of our study to develop biofertilizers, the tolerance of some symbiotic nitrogen fixing bacteria and inorganic phosphate solubilizing bacteria against pesticides, pH and temperature were assayed. The pesticides tested belonged to the insecticide, fungicide and bactericide classes.

The studied rhizobia were isolated from the rhizosphere soil and nodules of leguminous plants as *Trifolium medium* L., *Onobrychis montana* ssp. *transilvanica* Simk., *Trifolium pannonicum* L., *Vicia cracca* L. and *Trifolium alpestre* L.

KEYWORDS: pesticide, pH, temperature tolerance, rhizobia, biofertilizer

ISOLATION AND CHARACTERIZATION OF ANTAGONISTIC BACTERIA ASSOCIATED WITH BRYOPHYTES FROM BORSÁROS RAISED BOG (ROMANIA)

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ABSTRACT: Deleterious microorganisms were always problem in agriculture. Thus the objective of sustainable agriculture is to reduce the amount of chemical pesticides by developing biopreparates based on antagonistic bacteria (Muleta et al 2007). The main aim of our study is the isolation and selection of on antagonistic soil bacteria in order to develop a new biopesticide formulation.

Antagonistic bacteria in soil are able to control the activity of plant pathogens using different mechanisms: secretion of metabolic substances (e.g. siderophores, antibiotics), controlling the proliferation and/or through competitive exclusion of the plant pathogens (Glick and Bashan 1997, Muleta et al 2007). Several bacterial strains are considered to be antagonistic, belonging to the following genera: *Pseudomonas* sp., *Azospirillum* sp., *Enterobacter* sp., *Bacillus* sp., *Burkholderia* sp., *Rhodococcus* sp. (Joseph et al. 2007, Romero et al. 2004).

The bryophytes are land plants that usually colonize habitats with variable conditions, habitats with nutrient poor lands. Their life cycle involves between a diploid and a haploid gametophyte generation (Opelt and Berg 2004). Bryophytes are unique host plants for bacteria because of their antimicrobial properties. In this study we isolated bryophyte associated antagonistic bacteria from the Borsáros raised bog natural reserve (located in Harghita County, Romania). Bryophyte associated bacteria may be used in biotechnological applications, and also these bacteria are important to

displace the plant pathogens (fungal and bacterial pathogens). The isolated bacterial strains, in order to be used as bacterial inoculants, were analyzed and characterized for their microbial properties.

KEYWORDS: bryophytes, soil bacteria, antagonistic bacteria

CONSIDERATIONS ON ACID MINE DRAINAGE TREATMENT WITH ZEOLITIC VOLCANIC TUFF

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ABSTRACT: In this paper the utilization of porous materials (zeolitic volcanic tuffs) in treatment of acid mine drainage (AMD) polluted by heavy metals derived from adit Larga de Sus (Zlatna) was proposed.

The Larga de Sus mining perimeter analyzed in this paper is located in Zlatna Depression. Sedimentary bed series is composed of crystalline schists in substratum, followed by Jurassic and Cretaceous deposits. Hydrothermal mineralization is present as veins, stocks, breccia bodies and lenses. Mineralogical paragenesis consists of metallic sulphides, sulphur halides, native gold and gangue.

During the exploitation activities of copper ore, the water drained from the mine had strongly acid character and the chemical indicators heavy metals were constantly exceeded. Currently the water is strongly acidic (pH = 2.44) and presents specific ochre colour. In aerial conditions from this water a white precipitate is deposited, while in underwater conditions the residue is green. 8 water samples from upstream (I₁) and downstream from the mine (I₂, T₁, T₂, A₁ and A₂) as well from AMD drain pipe (L) and collection tank (B) were collected and analysed.

The impact on the environment exercised by the opening, operation and closure of the adit Larga de Sus is complex, causing the acute pollution of soil and water (Trâmpoiele Brook and Ruzina (known to locals as Bloria) Brook). The required treatment of this water is imposed by national and international law. Due to high ionic exchange capacity for metals from aqueous solutions, the zeolitic volcanic tuffs are porous materials suitable for mine water treatment.

KEYWORDS: mine water, heavy metal pollution, Zlatna, zeolitic volcanic tuff

ECOLOGICAL SYSTEMS TO PRODUCE ELECTRICAL POWER. DESIGN OF THE FOUNDATION SYSTEMS FOR WIND POWER PLANTS

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ABSTRACT: During the past years wind power plants projects have become very important in Romania. The most important verification for those foundations is at serviceability limit state (SLS), considering the height of the superstructure and the technological conditions which impose limit displacements and settlements. The value of the displacements is calculated for dynamic conditions, due to wind or earthquake.

The paper will present the particularities of the wind power plants foundations design, according to SR EN 1997-1-2006, but also considerations about the reinforcement the concrete utilized for the foundation.

KEYWORDS: wind power plants, foundation design, dynamic loads

ISSUES ON ENERGY PERFORMANCE OF BUILDINGS AND APARTMENTS IN ROMANIA

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ABSTRACT: *The paper presents comparative results obtained by determining the energy performance of residential buildings and of apartments that compose it. The study presented was conducted on a block of flats made of big prefabricated panels, a constructive solution often used to achieve an important number of buildings in Romania between 1960-1989. Considerations regarding the determination of the energy performance individually on each apartment and globally throughout the building will be presented. The paper will try to show the degree of accuracy of the Romanian methodology of thermal energetic analysis individually on an apartment of a residential building compared with overall building energy analysis.*

KEYWORDS: *energy economics, heat transfer, energy certification, thermal protection*

COMPUTATIONAL MODELS USED IN GEOTECHNICAL ENGINEERING FOR ENVIRONMENTAL PROTECTION

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ABSTRACT: *The paper presents some of the computational models underlying the geotechnical design and the geotechnical works for environmental protection.*

The paper presents the main models, ways they can be used in environmental protection engineering problems. The main computational models approached are: Mohr-Coulomb model, which relies on a line defined by the Coulomb failure stress and the stress circles of Mohr. The field of failure is given by the cohesion and internal friction angle. The Mohr-Coulomb criterion is based on the assumption that the phenomenon of macroscopic plastic yielding is, essentially, the result of frictional sliding between material particles.

Drucker-Prager model is a smooth approximation to the Mohr-Coulomb law. The Drucker-Prager criterion states that plastic yielding begins when the invariant of the deviatoric stress and the hydrostatic stress reach a critical combination. Represented in the principal stress space, the yield locus of this criterion is a circular cone whose axis is the hydrostatic line.

Two of the most common approximations used are obtained by making the yield surfaces of the Drucker-Prager and Mohr-Coulomb criteria coincident either at the outer or inner edges of the Mohr-Coulomb surface.

Another model approached is Hardening soil model. Hardening Soil model is an advanced model for simulating the behavior of different types of soil. This model captures a very tractable manner on the basis of two stiffness parameters. Hardening is characterized by a dependence of yield stress level upon the history of plastic straining to which the body has been subjected. These models are also used for slope stability.

KEYWORDS: *computational models, geotechnical design, environmental protection*

THE USAGE OF RECYCLED AGGREGATE FOR THE PRODUCTION OF SELF COMPACTING CONCRETE

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ABSTRACT: *This paper presents more studies on the feasible use of recycled aggregate for production of self compacting concrete. The principal followed aspects are the fresh and hardened properties of self compacting concrete produced using: coarse aggregate obtained by demolition of structural elements, fine aggregate (rejected fly*

ash, glass or rubberized aggregates from the car's tires). It also revealed the influence of each aggregate to properties of SCC.

KEYWORDS: Self-compacting concrete; recycled aggregate, fresh properties, hardened properties

STUDY ON THE GENERATION OF SURFACES TO BE USED IN CONSTRUCTIONS WITH THE BIRKHOFF-TYPE INTERPOLATION

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ABSTRACT: In this article we use the unvaried Birkhoff interpolation to construct the surfaces on ellipse. The surfaces match given ellipses. We study the parabolic points of these surfaces. These surfaces can be used in civil engineering or in Computer Aided Geometric Design (CAGD).

KEY WORDS: surfaces, Birkhoff interpolation, parabolic points

DISTORTION STIFFNESS OF BEAMS IN THE CASE OF MONOLITHIC REINFORCED CONCRETE COUPLED WALLS

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ABSTRACT: In the calculation of monolithic reinforced concrete coupled walls by the simplified method of the equivalent frame, the distortion stiffness of the coupling beams (k) is that of ordinary frame beams, corrected in order to take into consideration the fact that only a portion of the beam is deformable and to take into account the distortions produced by the shearing force through the μ coefficient. The calculation relation does not take into account the degrees of rigid fixing of the beam to the adjacent walls (wall piers).

This study proposes the use of a correction factor μ_1 , in order to introduce in the calculation the influence of the degrees of rigid fixing of the beam at the two ends. The study also presents an example of calculation considering different values of the degrees of rigid fixing, which indicates the cases in which the correction coefficient μ_1 should be introduced, as well as the cases in which small shear walls can be neglected.

KEYWORDS: distortion, coupling beams, shear walls.

BEHAVIOUR OF SYMMETRIC FLAT-SLAB CONNECTIONS WITH OPENINGS IN THE CONTROL PERIMETER

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ABSTRACT: Flat slabs are known to be advantageous architectural systems when it comes to usage and their applicability. On the other hand, from engineering point of view when a proper structural design is implied several difficulties might occur. It is known that flat slab-column connections develop complex structural behavior in normal stress conditions. When those premises are changed, it becomes harder to size the overall behaviour. One of these modified premises could be the geometrical configuration the connection. It is assumed that the shear stresses developed due to the action of internal forces are uniformly distributed inside of the control perimeter. When the control perimeter suffers a geometrical modification, the response is different. This paper studies the behaviour of a large scale flat slab with opening in the control perimeter.

KEY-WORDS: reinforced concrete, punching, flat slab connection, failure analysis, shear behaviour

INFLUENCE OF SHEAR SPAN TO DEPTH RATIO ON THE BEHAVIOR OF REINFORCED HIGH STRENGTH CONCRETE BEAMS

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ABSTRACT: High strength concrete has, in recent years, been the focus of significant interest within the world's civil engineering community. Ever taller buildings and ever greater spans are sought in today's competitive market; as such an increase in the compressive strength of concrete is necessary. Although recent design codes provide classes of concrete up to C90/105, it is to be noted that above a characteristic compressive strength of 50MPa, the stress block is modified and, as such, the applicability of equations used for the design of concrete elements below this strength, that have been tried and tested over the years, come into question when used for compressive strengths over 50MPa. Of particular interest is the behavior of high strength concrete elements subjected to shear, because of the brittle failure that can occur, proper understanding of this behavior is necessary in order to accurately predict bearing capacity and amount of shear reinforcement needed to ensure ductile failure.

This paper presents experimental research regarding the behavior of reinforced high strength concrete beams subjected to shear. The class of concrete studied is C80/95.

The experimental research is focused on the influence that the shear span to depth ratio ($a/d = 1.8$ and 1.5) and the transversal reinforcement coefficient ($\rho_{sw} = 0.00456; 0.00304; 0.0028$) have on the behavior of reinforced high strength concrete beams subjected to shear forces. Experimental results are compared to design values obtained in accordance with, SR EN 1992-1-1:2004 (Eurocode 2), code provisions.

The elements behaved very well in shear, and showed an important contribution of the high strength concrete in resisting shear stresses.

KEYWORDS: High strength concrete, shear, beams, shear span to depth ratio.

BOUNDARY LINES CONSTRUCTION FOR PLATFORMS AND ROADS

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ABSTRACT: The paper presents the graphical method of representing, in the projections with elevations, for land surfaces that are occupied by fill slopes and cut slopes of platforms and roads.

In first part, the paper presents the principles of representing geometric elements in projection with elevation such as the point, the line and the plane.

For a better way to understand the content of paper is presented the principle of intersection between topographic surface and an oblique plane that is in connection with the type of representing the slope of embankment for roads and platforms.

The paper presents also the graphical construction method for boundary lines of platforms and roads in layout and sections. Are presented also the surfaces that are affected by embankments for platforms with rectangular outline, platforms with circular outline portions, roads in alignment or curved having horizontal surface (landing) or with slope.

KEY WORDS: projections with elevations, boundary line, platforms, embankment, (earth) fill, (earth) cut.

STABILITY CALCULATION MODELS USED IN DEEP EXCAVATIONS

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ABSTRACT: “(For)... problems of soil-structure interaction, analyses should use stress-strain relationships for ground and structural materials and stress states in the ground that are sufficiently representative, for the limit state considered, to give a safe result” (Eurocode 7). A constitutive model is a system of hypothetical principles that represent the character of a phenomenon and from which predictions can be made. Recently, many new constitutive laws have been developed and implemented in commercial finite element programs. The aim is to understand how the constitutive models of the earth work. This paper gives some thoughts about the most important constitutive models: Mohr-Coulomb model, Hardening Soil Model, Hardening Soil Model with small strains (HSsmall) and Drucker-Prager model. Conclusions: Mohr-Coulomb model is used for a simple and quickly analyse. Other constitutive models which are based on FEM can be used succesfully in problems of soil-structure interaction

KEYWORDS: soil models, Mohr-coulomb, Hardening Soil Model, Hssmall, Drucker-Prager model

MODULUS OF ELASTICITY FOR HIGH STRENGTH CONCRETE

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ABSTRACT: High Strength Concrete has been in recent years the object of intensive study due to its numerous advantages over Normal Strength Concrete. Contrary to other Special Concretes such as Ultra High Performance Concrete or Reactive Powder Concrete, High Strength Concrete is becoming increasingly more available to contractors and thus more common to jobs all over the world.

The need to provide clear guidance to contractors for full potential achievement of this new-standard-becoming-material is therefore, more than ever, mandatory.

This study will provide an extended coverage on the relationships for the Static Modulus of Elasticity, as defined by current code provisions or previous studies by other authorss, in view of a particular research for C60 and C80 grade concretes.

KEYWORDS: modulus of elasticity, high strength concrete, research

LONG TERM BEHAVIOR OF HIGH-STRENGTH AND HIGH-PERFORMANCE CONCRETE

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ABSTRACT: The phenomenon of creep is influenced by many factors such as the properties of the aggregates, water/cement ratio on the concrete mixture, curing condition of the specimens, the size of specimens, temperature and relative humidity of the environment, stress/strength ratio of concrete and age of concrete at loading.

Creep of concrete is highly sensitive to the magnitude of sustained stress applied (Tadros et al, 2002). For instance, a specimen loaded to 80 percent of its ultimate strength experiences creep about three times greater than similar specimen loaded to 40 percent. Micro cracking at the aggregate-paste interface becomes more significant at higher stresses. Delayed failure may occur at sustained stresses above 75 percent of the compressive strength (Bazant and Baweja, 1995). The creep strain is proportional to the stress level, up to a certain proportional limit. The limit is about 65

percent of ultimate for high strength concrete and 45 percent of ultimate for normal strength concrete and low strength concrete.

An important factor affecting creep is the concrete age when a sustained load is applied. Specimens loaded after one day of curing typically have twice the specific creep of specimens loaded after 28 days.

Experimental research were undertaken under research grant code 59 CNCSIS "Economic implications and environmental protection to achieve the use of HPCs to building structures. Studies and research. Feasibility studies" and under the grant type A, code 1552 CNCSIS, "Green concrete. Environmental ecology", grant Director Prof. Dr. Ing. Cornelia Măgureanu within a period of one year.

This paper explores aspects regarding strain analysis under the action of long-term loads (creep) and a study regarding concrete shrinkage.

The present paper focuses on the behavior of high performance concrete of grade C80 to long-term service loads. The variable parameter analyzed was the influence of stress/strength ratio of concrete ($\sigma/f_{c,cyl}=0,175$ and $\sigma/f_{c,cyl}=0,20$) upon long-term deformations.

The specimens were kept in constant conditions of temperature and relative humidity ($t=20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $\text{RH} = 60\% \pm 5\%$) in a climatic room.

Rheological deformations were tracked until the age of 180 days.

KEYWORDS: High strength concrete, creep, shrinkage.

ECOLOGICAL SOLUTIONS FOR SLOPE STABILIZATION IN CUT SECTIONS ON TRANSYLVANIAN MOTORWAY

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ABSTRACT: The presented slope protection works (slope protection with geosynthetical materials, reinforced soil - „Terramesh” system and hydraulic seeding) have the role to protect, support and consolidate the slopes, resulted from the necessary excavation and limit the motorway reservation. The ground conditions are being analyzed for the motorway alignment, as well as the causes for slope sliding and the applied remedial solutions.

KEY WORDS: slope, „Green Terramesh” type reinforced earth, slope protection with anchored mesh

ASPECTS REGARDING THE BEHAVIOR OF ELEMENTS MADE OF UHPC SUBJECTED TO SHEAR ACTION

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ABSTRACT: The addition of steel fibers in a reinforced concrete beam is known to increase its shear strength and, if sufficient fibers are added, a brittle shear failure can be suppressed in favor of more ductile behavior. The increased shear strength and ductility of fiber-reinforced beams stems from the post cracking tensile strength of fiber-reinforced concrete. This residual strength also tends to reduce crack sizes and spacing. The use of steel fibers is particularly attractive for ultra high strength concrete which can be relatively brittle without fibers, or if conventional stirrups can be eliminated reducing reinforcement congestion.

In the last decade UHPC are increasingly used to perform the requirements of sustainability slender structures and seismic behavior. This paper presents the behavior of the elements made of ultra high strength concrete to shear action. We studied two types of mixtures: with and without hybrid steel fibers. Fibers used have the following geometrical characteristics $Lf_1/d_1=6/0,175$ and $Lf_2/d_2=25/0,4$.

The concrete class studied is C160, established for a medium compressive strength of $f_c=180\text{N/mm}^2$.

The elements were testing with a shear span depth ratio $a/d=1.0$.

KEYWORDS: concrete, ultra high performance, steel fibers, etc.

ASPECTS REGARDING STRUCTURES MADE FROM ULTRA HIGH PERFORMANCE CONCRETE

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ABSTRACT: *Ultra-high performance concrete (UHPC) is a new class of concrete that has been developed in recent decades. When compared with high performance concrete (HPC), UHPC tends to exhibit superior properties in terms of strength, durability, and long-term stability.*

Many researchers around the world have developed concretes that can be classified as UHPC. Although there are differences among types of UHPC, there are also many overall similarities. UHPC tends to have the following properties: compressive strength that is greater than 150 megapascals (MPa), internal fiber reinforcement to increase elastic behavior, and a high binder content with special aggregates. Furthermore, UHPC tends to have a very low water content and can achieve sufficient rheological properties through a combination of optimized granular packing and the addition of high-range water reducing admixtures.

Characterization of the material behaviors of UHPC has progressed to such an extent that the full-scale structural use of this concrete is on the horizon. To date, UHPC has been used in the construction of two public highway bridges, numerous pedestrian bridges, and a wide variety of other projects. Research and observations to date indicate that UHPC has the potential to expand the use of concrete into new forms that have been previously impossible.

KEYWORDS: *concrete; high performance; steel fibers; crack; mixes; behavior; bridges*