The quality of the design project documentation in terms of technical expertise in Lithuania

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Key words

quality; examination; design; documentation

Abstract

In this paper general situation in civil engineering design documentation is reviewed. Some characteristic mistakes in design are presented.

Using their experience in engineering examination of real structural designs, authors discuss statistical data of the latest years. An attempt to improve engineering solutions using analysis of inaccuracies in design documentation and suggestion of new methods for its development, instead of creation of new theories and methods of structural analysis, is made. Such an approach in engineering is less popular as time and recourses for its implementation are required. Nevertheless, this method of solution for the problem of technical product quality and qualification of specialists is more correct.

Finally, conclusions about quality as well as conditions for designers and recommendations for development of national design codes are made.

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Climate system: the transition from a sanitary to physiological norms

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Key words

indoor climate; indoor air quality; requirements; regulations; standards; CEN; ASHRAE

Abstract

In the previous article we discussed how the decision the fundamental problem effects on of the application (commercial) side of the same problem. In this paper, we will continue to consider the relationship between fundamental and applied parts of the task of ensuring indoor air quality.

The basis for the standards and requirements for ventilation systems (CEN, 1998; ASHRAE, 2004) is a method, building on the response of the human senses to the air of varying quality (sensory response). P. Ole Fanger notes that the common statement tells that the sensor measurements are preferable to chemical measurements. In practice, this "philosophy" of standards defines the low quality of the air that displeased more people than expected, which is documented in many studies in the real conditions, in buildings built under these standards all around the world.

Thus, in the standards and requirements for ventilation systems physiology of human is replaced by his feelings, a scientific approach to solving the problem of indoor air quality – by a solution of the subject objective.

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Building Information Model (BIM)

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Key words

building information model; designing; computer program; building visualization

Abstract

One of the most interesting topics in the field of automated design is a concept known as the "building information model." Since the beginning of the computer-aided design application it became possible to draw in three dimensional space, using real models of objects that contain the complete technical information, which is necessary for the whole system calculation and the unique identification of objects. This allows us to solve problems related to control the changes in the drawings.

But during the life cycle of a building information can be changed, supplemented, and to unite. To realize this idea it is necessary to create unified standard for storing and sharing such information, which is independent from specific software and contains all the necessary and sufficient information to ensure the building's life cycle. The aim of BIM is the creation of a unified base for the such standard.

In this paper details the functions and tasks of BIM, and shows the existing alternative standards, which realize the BIM at the moment.

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Strengthening of building structures using carbon composite materials

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Key words

Carbon composite materials; strengthening of building structures; reinforcing; new technologies.

Abstract

Currently, the question of ensuring the reliability of various building structures both at the stage of their construction and during operation is very urgent. There are a lot of different ways and constructive methods of structures strengthening. At the same time, traditional ways of concrete structures strengthening with steel reinforcement are such expensive, time consuming and in some cases require to interrupt the building operation. As an alternative, it is proposed to use composite materials based on high-strength carbon fibers.

The authors consider the properties, advantages, disadvantages and the methods of application of these materials. This article presents results of a technical survey carried out in a public building in 2009. In this building the CFRP was used to strengthen concrete slabs, resting on the crossbar consoles. The calculation of the strength is adduced and the section selection is made. The authors demonstrate their conclusions about the feasibility of using carbon composite materials.

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Features of water purification from Vuoksa river during the summer period

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Key words

water purification; coagulation treatment by aluminum sulfate; coagulant; water parameters; drinking water quality; batcher; two batchers scheme

Abstract

Purification of water from the river Vuoksi of the Karelian Isthmus of Russia to drinking water quality is important and serious problem.

Fluctuations in the composition of these waters in the summer, not only related to the hydrometeorological situation, but with increasing human influence on the ecosystem of the river Vuoksi greatly complicate usually adopted for such waters coagulation treatment.

The instability of such indicators of these waters, as alkalinity, permanganate oxidation and content of hydrocarbons led to the application in the standard scheme of the coagulation treatment by aluminum sulfate, the second correction batcher solution of alkali.

Such approach has allowed to ensure optimum coagulation, however, demanded constant monitoring the water parameters, which is associated with considerable costs.

The scheme of two batchers made it possible to use a aluminum oxychloride as a coagulant, which did not give satisfactory coagulation in these conditions without adjustment.

Treatment plant has also been supplemented by sorption filters (activated carbon and natural zeolite), which allowed to eliminate odors and flavors, as well as impurities Fe2 +, Mn2 + and Zn2 +, admitted to the source water from corroding steel (Zn) pipeline in significant amounts (0.6 - 3.6 mg / L), which were not eliminated by conventional coagulation scheme.

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Numerical simulation of the influence of soil core on the bearing capacity of pipe pile

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Key words

pile; bearing capacity; calculation methods; soft grounds; effectiveness of the piles

Abstract

The cost of the foundation can be up to 20-30% of the total building cost. Reducing consumption of materials and quality selection of the required characteristics of the pile can reduce both the estimated cost and time of work.

In terms of compact construction and the high land prices the most relevant is high-rise building. But it is hard to build in soft ground conditions (for example, in St. Petersburg). The situation is complicated by insufficiently explored methods of selection and design of piles (especially steel-tube piles) for specific cases of construction, as well as by the absence of regulatory documents related to the high-performance technology.

The article considers the clarification methods for calculating the bearing capacity of tubular steel piles. An additional contribution of soil core to the overall bearing capacity due to accounting an effect of its "natural" self-locking in the cavity of the steel pipe is considered.

The conclusions about the effectiveness of the piles, depending on different initial parameters are made.

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Nonlinear equations of ribbed shells balance taking into account the different properties of material

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Key words

ribbed shells; deformation energy; dynamic loads; Lagrange variational principle; variational principle of Hamilton-Ostrogradskii; boundary conditions; nonlinear equations

Abstract

In previous works isotropic and orthotropic shells of general form, under the influence of static and dynamic mechanical loads in conditions of elastic, nonlinear elastic and viscoelastic properties of the material development were considered.

It was assumed that the envelope contained a certain way along the contour can be supported by ribs, spaced along the coordinate lines (directed along the lines of curvature) from the inside (by the concavity in the case of convex hulls).

In this paper on the basis of variational principle of Hamilton-Ostrogradskii the total energy functional of deformation ribbed shells of general form under dynamic loads (action) is obtained and, under certain assumptions from the stationarity conditions the equations of motion (with appropriate boundary and initial conditions) for the shallow ribbed shells are derived. On the basis of Lagrange variational principle, the total energy functional of general form ribbed shells deformation under static load (the difference between potential energy and the work of external forces) is obtained and the general equation equilibrium of ribbed shells, as well as the natural boundary conditions from the condition of Lagrange functional stationarity are derived.

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Nonlinear equations of ribbed shells motion taking into account the different properties of the material. II

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Key words

ribbed shells; deformation energy; dynamic loads; d'Alembert-Euler equations; boundary conditions; nonlinear equations

Abstract

It is known that in the process of deformation of shells depending on the level and duration of external influences may appear different properties of the material of construction: elasticity, plasticity, creep, etc. The manifestation of plasticity or creep leads to irreversible consequences. To design is an obviously strong and stable construction, it is necessary to exclude the possibility of manifestation of these properties.

That is why urgent and important tasks are the development of better models of deformation of ribbed shells and corresponding algorithms for research and analysis of the strength and stability of ribbed shells taking into account the different material properties.

In [1] we were actually obtained the equilibrium equations of elastic isotropic shallow shells [which are an integral part of the dynamics (movement) of these shells from the perspective of German-known principle of d'Alembert-Euler equations] with allowance for geometric nonlinearity, the discrete location of the edges, their width, the shear and torsional stiffness, as well as the effect of transverse shear and rotational inertia.

This paper presents the generalization, development and analysis of mathematical models proposed by the author in the case of shells of general form and taking into account the different properties of the material under static (both short-and long-term) stress.

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Nanomodified magnesian schungite protective concrete

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Key words

radiation exposure; non-ionizing radiation; radiation protection; magnesian-schungite; radiation-shielding materials; magnesia cement; magnesium-schungite nanostructured concrete

Abstract

Currently, there is increasing demand for building materials with low permeability to the radioactive gas radon and materials that have protective properties against radiation exposure and non-ionizing radiation. Formulations have been developed and now special building flooring and plaster radiation protective mixtures are commercially available.

With the acceleration the pace of development of nuclear energy safe utilization of liquid and solid radioactive waste is a vital task for the survival of humanity. With the use of innovative magnesian barite and magnesian schungite composites opportunities to solidify LRW and solid radioactive waste monolithing are expanded. Magnesium-schungite nanostructured concrete exceed heavy concrete on Portland cement by gamma radiation and strength characteristics reducing multiplicity. Formulations are protected by a patent for an invention.

The paper shows a clear advantage of magnesia cement (compared with Portland cement) in terms of specific mass energy parameters Em and Wm. The data demonstrates that the magnesia cement is characterized by higher parameters of maximum frequency of oscillation of the atoms vm, which, apparently, is the key to explaining the increased protection (shielding) properties of materials based on magnesia cement mixed with shungite of gamma radiation and exposure to radiofrequency electromagnetic radiation the range.

Magnesium-schungite radiation-shielding materials are approved by Rospotrebnadzor for use for collective protection to reduce the income of radon in indoor air, gamma and x-ray production, residential, public and administrative buildings, as well as in food, pharmaceutical, medical and child care.

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Soundproofing panel with a maximum soundproofing ability

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Key words

sound insulation; soundproofing; coefficient of sound transmission; sound protection panel

Abstract

The aim of our development is increasing the sound insulation abilities to maximum possible value. Soundproofing panel with a maximum soundproofing ability, protected by patent to Russia, pertains to technical protection facility against noise spreading by sound insulation that is to anti-noise panel.

The most efficient is using such panels as filler structure for so named reverberated cameras, where it is necessary to provide frequentative reflection of the sound (that means big coefficient of the reflection and small coefficient of the sound transmission through filler structure).

The technical result of the development is full minimization of coefficient of sound transmission through internal cavity, that leads to provision maximum possible soundproofing ability. Besides, expansion of the structured sound is prevented by the special design with the noncontact attachment point.

Anti-noise panel with maximum sound insulation ability today is the most efficient soundproofing facility among such devices.

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Reconstruction of St. Petersburg roofs based on light steel thin-walled structures and de-icing system

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Key words

roof structure; icicle; exploitation reliability; durability; design solution; light steel thin-walled structure

Abstract

Insecurity of applied coatings and low service lives of St. Petersburg roofs generate the development of new technological solutions. Necessity of roof protection from the ice dams is a special factor in selecting technological solutions of the roof structure.

The aim is selection of an optimal design solution for the roof and the device against the ice based on the parameters of efficiency and effectiveness. After completion of research as a design of the roof system was chosen light steel thin-walled structures (LSTC). As the device against the ice is proposed a constructive adaptation of drainage, which includes the transfer of the gutter from the roof edge closer to Snow barriers. Herewith downspouts must finish in the system and urban runoff.

Efficiency of this method is confirmed by mathematical calculations and trial operation of such existing systems in the Nordic countries. The combination of the device against the ice with modern technology LSTC solve the problem of icicles, and generally can guarantee continuous and reliable operation of the roof.

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