PREFACE
(To the issue of new architectural and construction paradigm)

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It was in 1914 that architect Antonio Sant'Elia displayed 16 architectural fantasies themed “New City – the City-Machine” at an exhibition in Milan. His ‘dynamic’ drawings remind us of the fantastic etching series by Giovanni Piranesi. In the 1930s architect Jakov Chernichov in the USSR created a number of ‘melodies of constructivism’ called the Architectural Fantasies. The list of examples of vertical tower-like structures and simple load-carrying constructions may be continued. However no scaled figure can be seen in any of these images. There is a clear explanation why. Projective constructive fantasy of modern masters of architecture does not simply provide an impulse for the real creativity; it influences the style of practical architecture, drawing main lines for transformation of the world around us, leaving the current time and technological development far behind.


However in the early third millennium man-made technosphere has become comparable to biosphere, and manufactured technomass is comparable to Earth’s biomass. Such activity has led to credible threat of destruction to natural balance in the biosphere, whereby the ecological problems have acquired global measure. Ecological excesses of civilization have now started to convert directly into economic, social and demographic consequences. They have generated tendencies towards decreasing efficiency of global economy, growing poverty, decline in human health, etc.

In the beginning of the 21st century the architects go on creating the future. In the new economic order, where strategies for creation of new values play a significant part, innovative thinking is required. The need for a new architectural and construction paradigm has arisen which should allow to create and make good use of innovative technology and thus save the scarce and mostly non-renewable natural resources. That is exactly the task the European Community aims to address, making it their mission to decrease energy consumption and gas emission by 20% by the year 2020 compared to 1990, as well as to achieve level of consumption of renewable energy as high as 20% of total power consumption.

The new architectural and construction paradigm appears impossible without the smart engineering solutions which are designed to support intellectual, the so called ‘green’ projects. We are talking about creation of the new construction sector based on effective use of materials and consumption of energy resources. Development of this sector means transition from construction of buildings as resource gobblers towards creation of buildings as smart consumers, and in some cases (incl. green constructions, energy -efficient landscaping low-energy houses, freshomes and passive houses) as their generators and storages.

In a word, the time has come for most every building to become an ecologically pure environment for living according to Kisho Kurokawa. The new ‘green’ buildings will become more comfortable and safe for people, like bird’s nests keeping the birds safe and comfortable, or like Kazuhiro Yajima’s tea house, representing harmonious entwinement of both traditional and modern motives with tender approach to the surrounding natural landscape. Optimal living environment, individual requirements to the premises depending on the purpose of the latter, etc. – all that shall eventually lead to reduction of construction and maintenance costs.

However the unfolding intellectualization of buildings shall not be viewed as just the economic appeal. Some time ago a well-known American economist, the Nobel Prize winner, Mr. M. Porter pointed out, that the major and worst ever mistake often made by the innovators and strategists in the economics is their struggle with competitors in the same niche. Copying your rival’s actions is the worst ever choice you can make (the company’s primary target shall lie in high investment capital profitability ratio, whereas simple growth of the company, i.e. market share gain, increase in revenue, gain in sales, etc. shall be its secondary aim, that shall be addressed after the first and major target is reached).

Hence the authors of the digest raise the question of development of individual requirements for design of buildings and structures, construction materials and the construction process itself, study of parameters aimed at achieving minimum possible combined costs. Most essentially the architecture and construction shall provide
a wide range of possibilities for innovation. Ineffective costly technologies associated with destruction of the
environment are incompatible with the new standards of design and construction.

There is a belief that correctly designed and equipped building can maintain its investment value for a
much longer period compared to that of a building failing to meet the requirements of tomorrow. However the
authors of the digest take a further step: End consumer shall be furnished with maximum comfort while the
costs are kept to a minimum. Here the idea of development of scientifically reliable information on construction
materials, temperature, humidity and illumination levels, composition of supplied natural gas, speed of
ventilation airflows, noise and electromagnetic emission, current state of the environment, etc. All these factors
are viewed in relation to the certain type of buildings and structures (even including construction of nuclear
facilities, newest types of road intersections, etc.).

It was as early as the late 18th century that Thomas Malthus wrote his book “An Essay on the Principle
of Population: As It Affects the Future Improvement of Society” (1798) making an attempt to provide quality
substantiation of population size development. He provided mathematical definition of the following principle:
The geometrically growing population shall overtake the linear growth of production of consumer resources.

Over a hundred years long Malthus’s calculations were taken skeptically, however in the second half of
the 20th century his assumptions did draw public scrutiny. World population growth has acquired the character of
demographic explosion. And that now represents a key problem to global ecology. Having assumed material
well-being as their major goal in life and not having produced the mechanisms for non-violent limitation to the
number of population, the people rapidly destroy the natural environment which they are unable to live without.
As it turns out, growth of population and industrial progress have their objective range of growth. The only
option for adequate development may be population stabilization and industrial output.

One thing is clear: Economic growth as it is cannot solve even the smallest amount of problems our
society is facing, for depletion of resources component of the economy may result from keeping to the existing
industrial conditions.

Secondly, the currently prevailing technologies and social relations threaten to lead to an ecological
catastrophe.

Thirdly, serious threat is incurred by social stratification. Rising inequality of incomes results in
poverty. The Global Wealth Report drawn by Credit Suisse bank in 2012 evaluates the Gini coefficient (showing
the degree of inequality in distribution of incomes) for Russia at 84 %, which is the maximum value among all
the largest countries of the world.

Thus another direction of research done by the authors of the digest is addressed to finding alternative
models for stable economic development based on balanced scientific and technical progress taking into account
the predicted estimates of industrial growth limit. As a result, saving of labor, alteration of contents, conditions
and organization of labor shall become an essential feature revealing humanitarian essence of scientific and
technical progress, enhancing the understanding of the person's place and role in the production process.

This digest includes six topics. The first section entitled “Architecture, Urban Planning, Restoration” features interpretation of architectural problems. Articles:

Andrej Vajtens and Sergej Mitjagin
The Role of the City Architects in the Urban Development of Saint Petersburg-Leningrad in 1870–1980 Years

Lidija Kondrat'eva and Sergej Volkov
Minimizing the Residential Indoor Spaces for Comfort Living

Jurij Kurbatov and Vasilij Gorjanov
The Fate of the Creative Legacy in the Modern Architecture in Russia (On the Example of Architectural Trends
in Saint Petersburg)

Leonid Lavrov and Sergey Semencov
Globalization in Architecture: Three Examples from Saint Petersburg

Svetozar Zavarichin and Vladimir Lisovskij
Conceptualism as a Phenomenon of European Architecture in XX Century

Valerij Nefëdov and Margarita Štiglic
European Trends of Industrial Territories Transformation and Their Manifestation in Saint Petersburg

The theme “Construction Materials and Technologies” constitutes the next part of research, where
the following articles are found:
Antonina Judina and Vladimir Verstov
On Efficient Use of Electric Treatment Methods in the Technology of Concrete Work

Jurij Pucharenko and Valerij Morozov
A Structural Model and Strength Predicting of the Fiber-Reinforced Concrete

Jurij Tichonov and Vsevolod Inchik
Fire-Retarding Compositions on Gypsum Binders with the Use of Mineral High-Porous Aggregates and Fiber Fillers

Leonid Kolchedancev and Boris Petrakov
Grouting of Precast-Monolithic Building Joints with Heated Concrete Mix

Rašid Mangušev and Rustam Usmanov
Influence of Seismic Impacts on Foundation Beds Composed of Weak Soils

Sergej Boletin and Aleksandr Birjukov
Time Management in Drafting Probability Schedules for Construction Work

The “Applied Researches into the Construction Mechanics and Structures” section includes the following articles:

Aleksej Petrov and Aleksandr Chernych
Estimation of Operational Serviceability of Constructions with Regard to the Faults Arising During Erection

Anatolij Veselov and Vjacheslav Belov
Mechanics of Corroded Flexible Reinforced-Concrete Elements

Grigorij Belyj and Evgenij Serov
Particular Features and Approximate Estimation of Steel Structures Service Life in Buildings and Facilities

Jurij Rutman and Lidija Kondrat’eva
Calculation of Parameters of Buildings in Seismic Insulation System with Non-Linear Characteristics

Valerij Morozov and Jurij Pucharenko
Nuclear Reactor Shells of Heavy Ferrocement

Vjacheslav Charlab and Viktor Ulitin
On the Building of Resolving Equations of the Linear Creep Theory for Systems Calculated Based on Deformed Condition

Vladimir Karpov and Aleksandr Maslennikov
Methods for Solving Non-Linear Tasks for Calculating Construction Structures

One more theme – “Design and Operation of Overland Machines for Transportation and Production” – is provided in the following articles:

Elena Oleichenko and Viktor Dobromirov
Model of the Projected Development of Road Safety in Megapolis (On the Example of Saint Petersburg)

Jurij Kotikov and Valerij Lakinskij
Method for Investigating Variants for Modernization of the Road Network Section in the GIS Environment

Pavel Kravchenko and Alexandr Kapustin
Method for Developing Classifications of Vehicles' Automated Power Systems Based on Their Generalized Mathematical Structural Models
Sergej Repin and Sergej Estjakov
Theoretical Study on the Stressed State of the Disc-Shaped Cohesive Bulk Material

Sergej Volkov and Petr Druzhinin
Variation of Mechanical Properties of Structural Components of Hoisting-and-Conveying and Construction Machinery under Dynamic Stresses

Valerij Gordienko and Oleg Buryšev
Investigation of Influence by the Cold Plastic Deformation of Metals on Magnetic Intensity of Scattering

Vladimir Lozhkin, Olga Lozhkina and Aleksej Usakov

“Applied Studies in the Engineering Ecology” section represents the following articles:

Alexander Shkarovskij and Anatolij Volikov
Influence of Gas Quality on Efficiency of Its Use

Gari Pozin and Vera Ulijaševa
Convergence of Numerical Modeling of Heat-Air-Exchange Processes in a Ventilated Room

Jurij Feofanov
Fish Farm Recirculating Water Treatment by Reactors with Fixed Biocenosis

Ljudmila Cvetkova and Michail Alekseev
The Effluents from St. Petersburg Influence the Environment Condition of the Baltic Sea or Not

Tamara Dačjuk and Aleksandr Grimitilin
Aeration of Industrial Buildings

Victor Puchkal and Boris Jurmanov
Stochastic Model of the Thermal Regime and Heat Consumption of Residential Buildings for Heating

Victor Vasil’ev, Nikolaj Lapšev and Jurij Stolbichin
Microbiological Corrosion of Underground Sewage Facilities of Saint Petersburg

And finally one more important topic – “Construction Economics and Management” – is discussed in the following articles:

Aleksandr Petrov and Irina Drozdova
Organizational-Economic Mechanism of Energy Resources Saving Control in Municipal Housing Economy

Anatolij Asaul and Sergej Ivanov
Structure of Transactional Costs of Business Entities in Construction

Evgenij Smirnov and Igor Fedoseev
Principles for Construction Cost Assessment During Preparation for Tender

Evgenija Guzhva and Vadim Košcheev
Development of Entrepreneurial Culture in Process of Business Integration

Jurij Panibratov and Arkadij Larionov
Steady Development of Construction Organization of Housing Profile

Svetlana Eršova and Ksenija Malinina
Investment Management During Creation of Comfortable Environment in a Megapolis

Veronika Asaul and Rudolf Faltinskij
Improvement of Entrepreneur Entities’ Competitiveness through Innovative Behaviour