THE STATE RESEARCH INSTITUTE OF BUILDING CONSTRUCTION (NIISK)

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«SCIENTIFIC, TECHNICAL AND INNOVATION DEVELOPMENT OF UKRAINIAN BUILDING SECTOR»

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INFLUENCE OF SCIENTIFIC AND TECHNICAL ACTIVITY ON PROGRESS OF CONSTRUCTION ENGINEERING

During last years the scientific and technical directions ensuring the further development of construction engineering and scientific potential are formed in Ukraine. More then 40 specialized research organizations, design Institutes and Universities are forming this scientific potential.
INFLUENCE OF SCIENTIFIC AND TECHNICAL ACTIVITY ON PROGRESS OF CONSTRUCTION ENGINEERING

Ukrainian law “About scientific and technical activity" says that a science is the determining factor for progress of society, increase of his members prosperity, their spiritual and intellectual advance.
SCIENTIFIC AND TECHNICAL POTENTIAL OF UKRAINIAN BUILDING SECTOR

• The system of Basic organizations on scientific and technical activity in different construction areas is created in Ministry of Regional Development Construction and Housing and Communal Services of Ukraine.

• The main tasks of Basic organization are ensuring of scientific-technical, experimental, normative-methodical and information support for specified direction of scientific-technical activity.
State Enterprise «Research Institute of building constructions» (NIISK) is one of oldest research centers of Ukrainian building sector. It was established in November 1943 for contributing to the implementation of the program of reconstruction of destroyed building objects in most short term and find the most efficient designs, saving building materials, replacement more scarce materials for less scarce one.
Nowadays

• Nowadays Research Institute of Building Construction is large research center of Ukraine. It is well-known in Ukraine and abroad as well. Institute works are awarded with international prizes and premiums.

• Institute presents the Ukrainian construction sector in some international organizations: fib (International Federation of Concrete) - since 1998, UEAtc (The European Union of Agreement) - since 2008.

• Also, Institute has a membership in different public organizations.

• More then 400 specialists including 8 Dr, 56 PhD and 300 specialists with university education are working for Institute today.

• Institute has branches and laboratories in some regions of Ukraine: Dnipropetrovsk, Zaporizhzhia, Odesa, Poltava and Rivne. In addition to the scientific departments there are Design department and Experimental base which can develop the projects and technologies for the new structural decisions and to product the structures for experimental construction.
Institute issues the following editions:

- the scientific collection «Building structures»
  (2-3 collections per year);

- scientific journal «Geotechnical world»
  (4 journals per year);

- scientific journal «Science and construction» (4 journals per year)
Post-graduation courses

- The post-graduate course and Specialized scientific council for defending of the dissertations on candidate degree on specialty:
  - Building structures, buildings and facility;
  - Bases and foundations;
  - Construction materials and products

are functioning in Institute.
Construction thermal physics and energy saving Laboratory carries out the following tests:

1) Air-penetration and water-penetration of the windows
2) Determination of term for effective operation and calculation heat conductivity of the heat-insulating materials
Laboratorial and test base are equipped with relevant test equipment. All laboratories are accredited according to ISO/IEC 17025:2006 requirements for testing of the construction materials, products and structures.

Institute has certified system for quality management meeting to ISO 9001-2001 requirements and the lead specialists have the qualification certificates which give rights for the works (services) on creation of the building structures.
NIISK is a basic organizations on 11 scientific directions:

- Normalization, Standardization;
- Building structures;
- Aseismic construction and protection against vibrations;
- Geotechnical problems of construction;
- Reliability, safety and protection of the buildings and facilities;
- Methods for research, and test of the building structures and materials;
- Energy effectiveness of the buildings and facilities;
- Building acoustic and protection against noise;
- Economics of the building structures and pricing in scientific activity in construction engineering;
- High qualification scientific personnel training (post graduation course).

Construction projects

- NSC «Olympic», Kyiv
- Energy effective retrofitting of the residential buildings
- Uspenskiy cathedral of the Kievan-Pechersk Laura
- Kahovskaya hydroplant
- Residential complex with multi-store parking in Kyiv
- Вантовый мост через Днепр
Strategic directions of NIISK’s activity

1 Development of system of technical regulation in construction engineering;

Strategic purpose 1 – European integration of the construction sector
GENERAL CHARACTERISTIC OF NORMATIVE BASAE FOR CONSTRUCTION ENGINEERING

NATIONAL LEVEL DOCUMENTS

2013

- State construction norms of Ukraine: 23%
- State construction norms accepted before 1992: 5%
- Harmonized national standards of Ukraine (DSTU EN): 12%
- National standards of Ukraine (DSTU): 60%

2015 (planned)

- State construction norms of Ukraine: 10%
- Harmonized national standards of Ukraine (DSTU EN): 37%
- National standards of Ukraine (DSTU): 53%
COMPARISON OF NATIONAL AND EUROPEAN SYSTEMS OF TECHNICAL REGULATION IN CONSTRUCTION ENGINEERING

Technical Regulations for construction products, buildings and facilities
Ukrainian Cabinet Decree № 1764 dated on 20/12/2006

Explanatory documents
6 DBN concerning to basic requirements, they are approved by Ministry orders in 2008

Standards of a category for designing of building structures
European codes DBN and DSTU - H

Management directives
13 DSTU – H (harmonized with European management directives) approved by Ministry orders in 2007-2008

European harmonized standards of B and Bh category Standards for construction products Regulation specifications

European technical agreements Technical Certificates for confirmation of suitability
Today there are 58 European Codes (category A standards A) their publication is completed in 2007.

**EUROPEAN CODES SYSTEM**

- **EN Bases of structures design**
  - **EN 1991 Loads and actions**
    - EN 1992 Reinforced concrete structures
    - EN 1993 Metal structures
    - EN 1994 Steel-reinforced concrete structures
    - EN 1995 Timber structures
    - EN 1996 Masonry structures
    - EN 1997 Geotechnical design
    - EN 1998 Design of aseismic structures

58 standards of European Codes totally

- number of separate standards
### System of acting Norms and Standards concerning to buildings energy effectiveness

<table>
<thead>
<tr>
<th>Standards for methods of calculation assessment of the energy indexes</th>
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<tbody>
<tr>
<td>DSTU-Н Б А.2.2-5:2007 (energy Certificate)</td>
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<tr>
<td>DSTU Б В EN 7730:2012 (ergonomics of heat mediums)</td>
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<tr>
<td>DSTU Б В EN 15261:2012 (calculation of micro-climate parameters)</td>
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<tr>
<td>DSTU Б В EN 13790:2012 (calculation of energy consumption)</td>
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<tr>
<td>ДСТУ Б В EN 15603:2013 (energy rating)</td>
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<tr>
<td>DSTU Б В EN 15217:2012 (energy certification)</td>
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<tr>
<td>DSTU Б В EN 13790:2012 (calculation of energy consumption)</td>
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In frames of coordination of the procedures for approval of the Ukrainian construction products with procedures of European Organization of Technical Agreement (EOTA) taking into account the provisions of the guide documents 89/106/EU and EU Regulations 305/2011 - a work on issuing of the following Codes harmonized with UEAtc documents is completed:

5 EOTA GD – guide documents;
5 ETAG – guides on European technical agreement.

Strategic directions of NIISK’s activity

Strategic purpose 2 – Upgrading of technological safety in construction engineering
Construction of the objects in complex natural-climatic and industrial conditions

- Projects of construction in conditions of compact planning
- Projects of construction in seismic regions
- Projects of construction in complex engineering-geological conditions
- Projects on maintenance, restoration and retrofitting of the historical and architectural memorials

Projects of construction in conditions of compact planning
SEISMIC DANGER IN UKRAINE

- **120,000 km²** of Ukrainian territory (~ 20%) are seismically dangerous;

- Earthquake intensity is **6-9 points** according to Ukrainian Code ДСТУ Б В.1.-1-28:2010

- **10,9 millions** of population (11.3%) live in seismic territories:
  - in 6-point zone - 7.98 millions (15.5%),
  - in 7-point zone - 2.23 millions (4.3%),
  - in 8-9 point zone - 0.79 million (1.5%).
Damages after earthquake in Crimea in 1927

I-Todor cap, “Swallow’s nest”, 1927

Yalta, Elisavetinskaya str.
Problems of construction in seismic dangerous regions

Projects of construction in complex climatic and industrial conditions

Recreation residential complex in Odessa

Residential building in Yalta

“Almazny” building of International Children’s Center “Artek"

Residential building in Simferopol

Multi-channel monitoring system

Earthquake isolation systems
Construction projects in complex engineering-geological conditions

Dangerous slope in construction site

Dneprovskaya hydro plant

Kahovskaya hydro plant

Cable-braced bridge over Dnieper

"Shahter" stadium in Donetsk

Engineering protection of buildings and facilities against underflooding

Administrative-residential complex in Kyiv
Construction problems in condition of compact planning

Residential complex with multi-storey parking in Kyiv
3. Conversation of the Chernobyl NPP “Shelter” object in ecologically safe system in accordance with International project «Shelter Implementation Plan».

Strategic purpose 3 - Erection of the New Safe Confinement over “Shelter” object.
Erection of the New Safe Confinement over “Shelter” Object.

1986

Stabilizing of western zone

2008

Stabilizing zones of « SO »
Erection of the New Safe Confinement over “Shelter” Object.

2004

Span 257m
Length 150m
Height 110m
Weight 25,000t
Cranes 4 at 50t
Life 100yrs

2014, November
4. Strategic task is ensuring of comfort and functionality for the buildings and facilities in Ukraine on base of ensuring of their energy effectiveness

Sufficient decreasing of energy consumption in buildings (from 150-300 kWt•h/m²•year up to 15-45 kWt•h/m²•year. It permits to decrease:

* the CO2 release by 40% and to improve the ecological situation;
* water consumption by 30% and to improve the habitation of population when increase of construction cost is not more then by 4-5% 
* by means of development and implementation of:
* - the technical solutions according to standards of passive buildings and “green” construction,
* modern management means,
* effective control and optimization of all building systems works.
Joint projects in Ukraine

- Implementation of the technologies, structures, products for improvement of the construction objects safety
- Joints realization of the scientific programs
- Organization of modern construction productions in Ukraine
- Joint work for prosperity of our companies