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INTRODUCTION

The educational and methodical manual is developed in accordance with the requirements of the programme of the elective discipline “English language for Civil Engineers” for foreign Bachelor’s students to master in the field of training 08.03.01 Construction.

The educational resource contains three sections which correspond to three basic topics of the course outline “Standardization. Metrology. Certification”, “Construction design of buildings and structures”, and “Building services”.

Each section includes several subject parts, discussing the topics within the scope of Civil Engineering with authentic professional texts and a system of exercises aimed at developing students’ foreign language competence. The revision exercises are not only comprehensive, but also creative, allowing students to develop the skills of written and oral text creation, which are the basis of professional communication.

The materials of the aid can be widely used for classroom activities, independent work and self-tuition of senior undergraduate students, as well as for carrying out midterm academic assessment.

1. STANDARDIZATION. METROLOGY. CERTIFICATION

1.1. Understanding Building codes and regulations

Text 1

Building codes and regulations are usually understood by many citizens as a compulsory and inevitable government intervention. But would our cities really become crumbling infernos without building standards? Does the modern construction industry really need building standards? Is their value overestimated?

The answer is quite obvious: timely updated building codes and practices establish the set of standards that ensure **structural integrity** and stability of buildings and structures and, at the same time, provide public safety, health and well-being of building's occupants. Engineering success is only considered success until it fails, that's why building codes are generally renewed and updated basing on real failures to prevent analogous failures from happening again.

First of all, the notion of a building code should be explained. A building code is defined as a set of rules, standards, practices that control the design of buildings and structures, their construction and occupancy. Building codes are approved by governmental authorities or professional bodies and are specific for a particular country. Their purpose is to ensure the safety, accessibility, sustainability of buildings and structures and to protect the health, safety and welfare of occupants.

While details of standards might vary, building codes regulate the construction, remodeling, modernization and retrofitting of commercial and residential buildings. Also, building codes can help mitigate risks, prevent and avoid work-related accidents and fatalities, and also construct sustainable, green and resilient **buildings** and structures.

To emphasize the importance of building codes for the construction industry, five compelling reasons can be outlined:

– the priority is given to the safety of building's residents, occupants, builders, and the general public, including those with limited abilities;

– ensuring the minimum standards for building's structural integrity, **fire safety**, engineering systems, and other vital aspects of design and construction of buildings and structures;

– specific requirements are to be set for building materials, structural design and construction methods;

– uniformity of building codes and practices all over the world, so they can be understood by architects, engineers, general contractors, subcontractors and construction laborers engaged in the construction process;

– when building codes and practices are fully complied, a construction company can build up a trustworthy reputation within the industry, which means that customers, investors, contractors and stakeholders can place confidence in the construction projects meeting the building codes and standards, i.e. adhering to buildings regulations manifests commitment to quality, ethical responsibility, and devoted professionalism.

Moreover, building codes are supposed to minimize the risks associated with erection and operation of buildings. Various issues of the **built environments** should be addressed, such as **structural integrity** of a building, fire safety, water supply and water disposal, ventilation, electrical systems, energy efficiency, and accessibility for physically-impaired people.

Specific standards for structural design are of paramount importance since the building must withstand wind loads, earthquakes, snow loads, etc. Fire safety standards regulate the procedures of early detection, suppression, and containment of fires, whereas codes for electrical systems and plumbing are designed to prevent hazards and ensure the effective functioning of engineering systems. For example, building codes might require electrical outlets to be located in specific locations within a room or require the installation of energy efficient windows.

Accessibility codes contribute to the creation of accessible and sustainable environment, promoting inclusivity for individuals with disabilities. Specific codes also include sustainability standards

that set the requirements for water conservation, energy efficiency, **waste management**, and the usage of "green" materials.

At the stage of design, the role of building codes is to dictate height and size of building, requirements for evacuation routes, the usage of quality building materials and engineering systems.

At the stage of construction, building codes guarantee compliance with standards of safety and quality control measures. Correspondingly, when the construction project is completed, building codes set the timing for periodic inspections, maintenance, retrofitting and upgrades to provide compliance and safety.

Task 1. Read the text and specify whether the affirmation is mentioned in the text. Justify your answer.

	Affirmation	True	False	Not stated
1	Building codes are universal throughout the world and are not specific to a particular country or region			
2	Adhering to building codes and standards is not considered a legal obligation for construction companies			
3	Only architects must comply with building codes and regulations at the stage of building design			
4	Sustainability standards provide the requirements for the use of sustainable eco-friendly building materials, energy-efficiency, water conservation, and waste disposal			
5	Compliance with building codes and practices help construction companies to build up trustworthy reputation and attract new customers			

Task 2. Match the term given in Bold in the text to its definition.

1. Building code	a) the physical surroundings where people reside and work, including buildings, bridges, roads and infrastructure
2. Fire safety	b) a set of rules, standards, practices that control the design of buildings and structures, their construction and occupancy
3. Green building	c) the condition of transferring the load on the building to the soil through the various structural members as per the building codes
4. Built environment	d) a streamlined process for disposal, reduction, recycling, upcycling and prevention of waste
5. Waste management	e) the set of measures, procedures, precautions and practices aimed at fire prevention, minimizing risks of fire-related accidents, ensuring safety of occupants and property in the event of a fire breakout
6. Structural integrity	f) a building constructed by means of the environmentally responsible and resource-efficient processes throughout its life-cycle

1.2. International building code (IBC)

Task 3. In couples, read out by characters the interview with Anup Kumar Dey, an experienced Piping and Pipeline engineer and a famous blogger.

Text 2

Journalist: Anup, can you explain in simple words, who develops International Building Codes (IBC)? Is it an organization or professional body? How often do the codes need to be updated?

Anup Kumar Dey: In brief, the International Building Code is developed by the International Code Council. Since the construction industry is broadly introducing and incorporating new technologies and practices, the code is updated and published every three years.

Journalist: And what is the main purpose of IBC? Do we really need it? Or is it just another bureaucratic red-tape?

Anup Kumar Dey: Of course, we need standards. We want the building to last its useful life, not collapse during operation by any cause. IBC establishes just minimum standards for safe design

and construction of buildings. But these standards must be uniform and consistent all over the world. Moreover, they protect community at large from many hazards associated with inadequate construction and operation of buildings and structures.

Journalist: Anup, when did it all start? When was the first IBC developed?

Anup Kumar Dey: The International Code Council was established in 1994 but international building codes trace back their origin to the early 20th century. Already at that time the need for a unified set of standards was understood. There were also earlier model codes, such as the Uniform Building Codes, the Building Officials and Code Administrators International code, and others. And finally, the first edition of the IBC was published only 2000, successfully adopting all the previous practices.

Journalist: That makes sense. And nowadays, what are the key provisions of International Building Codes?

Anup Kumar Dey: In a nutshell, the key provisions of IBC comprise classification of buildings, structural design, fire and life safety, accessibility, energy efficiency, as well as building materials and methods.

Journalist: Thanks a lot for clarifying this, Anup. And the last question, probably. What are the main applications of IBC in architecture and construction?

Anup Kumar Dey: That's a very good question, thank you for asking it. Firstly, the IBC sets guidelines during design and construction phases of buildings. Secondly, architects and builders are obliged to obtain necessary building permits and approvals for implementation of construction projects. Thirdly, the IBC is needed for regulating timely building inspections, maintenance and renovation of buildings and structures. Moreover, the IBC includes provisions related to fire safety and prevention, accessibility and universal design. Finally, the codes regulate urban planning and zoning that comprise building heights, parking zones arrangement, recreation zones arrangement, etc. To sum up, the IBC ensures consistency and harmonization in building regulations across different jurisdictions. So, the codes should be read and understood by architects and engineers all over the world.

Journalist: Anup, thank you very much for your time for this interview. I hope our readers will be able to clarify some points about building codes and practices for themselves through the answers provided. Anyway, your blog is always helpful and very informative.

Task 4. Answer the questions below and discuss your opinion with your peers.

1. What building codes and standards are in place in your country and how often are they updated?
2. In your opinion, how will international codes develop in the future, in what direction? What other aspects will be included?
3. What should be the penalties for construction companies and architectural bureaus for non-compliance with building codes?
4. Give some examples of building structural failures caused by non-compliance with building standards and practices. Illustrate your answer with photos and reports, if possible.
5. What are the principal differences in building codes for residential and industrial buildings?

Text 3

A tardy, scathing report on the Grenfell Tower fire in London

The fire that tore through Grenfell Tower in London in 2017 took away 72 lives. The report released seven years after the fire on September 4th casts blame in every direction. Grenfell burned rapidly because of its **exterior cladding**, which was added during renovations in the mid-2010s. The report finds that one firm, Arconic, possessed test data showing that a type of panel could react dangerously to fire, yet continued to tell the market that it was classified as safe. An insulation firm, Celotex, "embarked on a dishonest scheme to mislead its customers", submitting materials for testing that contained additional **fire-resistant** boards.

Fire had spread through cladding on other buildings before 2017. After one tower in London caught fire in 2009, killing six people, some of its panels were tested. They burned so fiercely, while dripping flaming debris, that the testing outfit feared for its equipment. Yet regulations stayed lax. Architects and contractors assumed it was someone else's responsibility to ensure that panels were safe.

Cuts to local-authority budgets left the inspector responsible for Grenfell Tower overseeing up to 130 projects. A national **deregulation** drive made civil servants loth to propose new safety measures.

In the past seven years, the architecture firm that worked on the **refurbishment** of Grenfell Tower has closed; people have changed jobs; politicians have come and gone. It is easier for everyone to say that faults have already been fixed. This is a known drawback of slow inquiries. Soon after the Grenfell fire, the Institute for Government, a **think-tank**, argued that the "window of opportunity for change" tends to close as systems and institutions move on after a disaster.

British public inquiries were not always so exhaustive. In May 1968 one corner of Ronan Point, a new tower block in London, collapsed. An inquiry began the following day and concluded six months later. The report was just 82 pages long. It avoided casting blame, arguing it was more important "that the eyes of all may be opened in the future". The investigation led to stricter building codes in Britain and other countries and ended the era of rapidly built, **prefabricated towers**.

Still, the country now seems committed to slow, excoriating public inquiries. The office building in west London where the Grenfell Tower hearings took place is busy again, with a wide-ranging investigation into how Britain dealt with the Covid-19 pandemic. That might take even longer.

(From the Economist, September 4th, 2024 [1])

Task 5. Answer the following questions related to the text.

1. Why did the Grenfell Tower burn down so rapidly according to the report?
2. Have similar fire incidents caused by combustible exterior panels happened in London before the case?
3. In your opinion, what steps should be taken by governments to avoid similar incidents in the future?

Task 6. Match the term given in Bold in the text to its definition.

1. Exterior cladding	a) the process of upgrading, retrofitting and enhancing existing buildings to enhance their functionality, aesthetics, and value
2. Fire resistant	b) wrapping the surfaces of buildings that are in contact with air with highly protective insulation materials
3. Deregulation	c) an institution, corporation, or group of people specially gathered to study a particular subject
4. Refurbishment	d) high-rise buildings manufactured in a factory or plant and further assemble at a construction site
5. Think-tank	e) the removal or reduction of government regulations in the construction industry with the purpose to operate more freely and remove corporate restrictions
6. Prefabricated towers	f) something that can withstand the effects of fire or can be treated with chemicals to reduce the risk of fire ignition or propagation

Task 7. Do an independent research and correlate the infamous historical building and structure collapses with officially identified causes. Motivate your answer and outline the implications of these failures on the modern building codes and practices.

1. The collapse of "Galloping Gertie" bridge, 1940, Pierce County, Washington, the USA https://komonews.com/news/local/tacoma-narrows-bridge-galloping-gertie-collapse-anniversary-1940-84th-washington-state-department-transportation-pierce-county-ws-dot-puget-sound	a) Due to thermal stress, many of the building's windows became detached and fell hundreds of feet to the sidewalks below. Also, the tower swayed in the wind, so that many upper-floor occupants complained of motion sickness.
2. John Hancock Tower's falling windows. The 1970s, Boston, Massachusetts, the USA https://civildigital.com/failure-john-hancock-tower-boston-mass/	b) The bridge could collapse as a result of ground mobility after winter due to snow melting, as well as due to wear and tear of the concrete structure. Allegedly, the authorities were going to hold a tender for repairs. But neither the auction nor the repair came to the matter.