Министерство науки и высшего образования Российской Федерации

Федеральное государственное бюджетное образовательное учреждение высшего образования
Санкт-Петербургский горный университет

Кафедра иностранных языков

ДЕЛОВОЙ ИНОСТРАННЫЙ ЯЗЫК

АРХИТЕКТУРА ЗДАНИЙ И СООРУЖЕНИЙ, ГРАДОСТРОИТЕЛЬСТВО И ПОДЗЕМНАЯ УРБАНИСТИКА

Методические указания к практическим занятиям для студентов магистратуры направления 07.04.01

ENGLISH FOR SPECIFIC PURPOSES

ARCHITECTURE OF BUILDINGS AND CONSTRUCTIONS, URBAN PLANNING AND SUBTERRANEAN URBANISM

САНКТ-ПЕТЕРБУРГ
2019

УДК 811.111 (073)

ДЕЛОВОЙ ИНОСТРАННЫЙ ЯЗЫК. Архитектура зданий и сооружений, градостроительство и подземная урбанистика. Методические указания к практическим занятиям / Санкт-Петербургский горный университет. Сост.: *Е.А. Бугреева, Е.А. Варлакова*. СПб, 2019. 35 с.

На материале аутентичных текстов, в которых освещаются основные аспекты современного развития архитектуры зданий и сооружений, градостроительства и подземной урбанистики, магистранты смогут овладеть необходимыми навыками для решения коммуникативных задач в профессиональной деятельности, а также подготовиться к зачету по дисциплине «Деловой иностранный язык».

Предназначены для студентов магистратуры направления подготовки 07.04.01 «Архитектура» (направленность программы «Архитектура зданий и сооружений, градостроительство и подземная урбанистика») и согласованы с программой по иностранному языку для студентов неязыковых вузов.

Научный редактор доц. *С.А. Свешникова*

Рецензент канд. филол. наук *Н.М. Малеева* (Санкт-Петербургский государственный экономический университет)

ПРЕДИСЛОВИЕ

Данные методические указания предназначены для проведения практических занятий по английскому языку со студентами магистратуры по направлению подготовки 07.04.01 «Архитектура. Архитектура зданий и сооружений, градостроительная и подземная урбанистика». Методические указания составлены в соответствии с учебной программой по дисциплине «Деловой иностранный язык» для формирования иноязычной профессиональной компетенции будущих магистров. В методические указания включены аутентичные тексты, в которых освещаются основные аспекты современного развития архитектуры зданий и сооружений, градостроительства и подземной урбанистики.

Использование предложенного комплекса упражнений способствует формированию у будущих магистров навыков перевода с английского языка на русский публицистических и технических текстов, совершенствованию навыков говорения, просмотрового, ознакомительного, изучающего и поискового чтения, а также развитию умений реферировать аутентичные тексты на английском языке. Особое внимание уделяется формированию активного словарного запаса, который включает наиболее употребительные слова и выражения по теме «Contemporary architecture».

UNIT 1.
ARCHITECTURAL STYLES
(THE LATE 20th TO EARLY 21st CENTURY)

Text 1

Task 1. Discuss in groups: Which architectural styles do you know and what are their distinctive features?

Task 2. Translate the words into Russian: *brick walls, plastered interiors, digital, copper piping, snaking ducts, concrete, steel, corrugated metal, panellised housing.*

Task 3. Read and translate the text. Pay attention to the words in bold.

HIGH TECH AS THE STYLE OF GLOBALISATION

Architects are in love with the aesthetic of industry. Perhaps because architecture, with its **brick walls**, **wooden floors** and **plastered interiors**, can seem so immutably old-fashioned, designers have fetishised the raw aesthetic of grain silos and factories in which form really is dictated by function. This love affair, which is about a century old, is as passionate today as it ever was. Walk into a cool café or a hip hotel lobby and you'll be confronted with industrial fittings from metal factory lampshades to exposed **ductwork and copper piping**. The irony, of course, is that this is all nostalgia. What once went under the label "High Tech" is now absurdly low tech, a throwback to Victorian engineering and long-outsourced industry. It looks almost unimaginably quaint when we know that the real high-tech is **digital** and insubstantial, data carried in cabling which is, of course, concealed. In architecture High Tech is usually associated with the 1970s and '80s, with blockbusters such as the Pompidou Centre (Rogers & Piano 1977), the Hong Kong & Shanghai Bank HQ (Foster + Partners 1986) and the Lloyd's Building (Rogers 1986). It was characterised by the celebration of industrial components: **huge structural elements** made very visible: **snaking ducts**; **escalators criss-crossing the interiors**; **steel and glass**

roofs evoking the great station sheds of the 19th century. The argument went that **the classical portico** of the museum or **the impenetrable concrete** Brutalist boxes that had replaced them were symbols of an elitist, exclusive culture and applying the language of industry would make these buildings part of the workers' world; transparent, adaptable, determinedly unhierarchical. The result was that this supposedly hyper-modern architecture appeared sentimental, embodying a nostalgia for a defunct world.

The world's airports, malls and conference centres, the hubs and the anonymous non-places of contemporary executive life, remain recognisably High Tech. Think of a restaurant in Heathrow's Terminal 5. Beneath a canopy of Day-Glo High-Tech superstructure, you'll find exposed ductwork and spun metal faux-factory lampshades, while in the kitchen you see the actual, stripped-down engineering, **concrete block and stainless steel**. Layer upon layer of industrial-themed design. Prouvé worked with **sheet steel and corrugated metal** to make demountable houses for the French colonies and cheap and easily built schools for postwar reconstruction. In the US, architect George Fred Keck built his prescient "Crystal House" at Chicago's Century of Progress fair in 1934 using an exoskeleton of steel **trusses**, while Charles and Ray Eames's house for themselves in Los Angeles (1949) used I-beams, corrugated steel and X-bracing borrowed from the industrial architecture of California.

The roots of High-Tech architecture were, as we can see, notably domestic and lay in the transfer of the techniques of mass production to the production of mass housing. It was a huge aesthetic and intellectual success and a massive commercial failure, at least until the introduction of **panellised housing** in the 1960s, a moment which came with its own issues. Perhaps High Tech was part of a particularly British neurosis about modernity, a nostalgia for that spectacular collision of the industrial revolution, innovations in transport, structural invention and a creativity which came not from the arts but from industry. High Tech was a way of delegating the aesthetics of architecture to its engineering and avoiding the difficult questions of style and appearance, history and context. The sheds containing the servers processing data, blockchain transactions, and

mining bitcoin, with their corrugated steel walls, perforated trusses, endless cabling, grid ceilings and industrial racking are refined High Tech. Look at the inside of Google's Douglas County, Georgia, data centre: the bright colours of its piping pure Pompidou. The contents and the container have finally come together to express an ideal, a post human architecture of digital industry. High-Tech architecture is not only still with us, it has become, once again, the architecture of the future.

https://www.ft.com

Task 4. Answer the questions:

1. Why High Tech is called the style of globalization?
2. What kind of interior design is typical for High Tech?
3. What kind of buildings are built mostly in High Tech in 21st century?

Task 5.Match the words in bold from the article with their meanings:

1. _____ a system of ducts, as in the building, used to circulate air for heating, cooling, or ventilation.
2. _____ a substance made of clay molded into blocks and fired in a kiln, used in building, pavement, etc.
3. _____ moving in crossing lines.
4. _____that resists staining, rusting, etc.
5. _____ galvanized to give added strength in construction.
6. _____ a porch or covered walk, consisting of a roof supported by columns, often at the entrance or across the front of a building.
7. _____a rigid framework of beams, girders, struts, bars, etc. for supporting a roof, bridge, etc.
8. _____ that cannot be penetrated or passed through.

Text 2

Task 1. Translate the words into Russian. Use a dictionary: *biotechnology, to resemble, response, to achieve, virtual reality, demand, to produce, to provide, convenience, efficiently.*

Task 2. Read and translate the following text:

WHAT IS BIO-TECH?

Bio-tech is a movement in architecture where the design and construction resembles form in the wild nature. It has started since 21st century and still is developing rapidly. Bio-tech architecture combines global technologies with local responses to site and social conditions. It does not prescribe what a building should look like, but how it should behave. Bio-tech architecture uses smart technologies to achieve a dynamic, interactive relationship between a building, its users and the environment. Bio-tech architecture is self-organizing. It is not a fixed or final product, but is more like a biological organism which continuously learns about itself and its surroundings, adapting to changing conditions and improving its own performance.

The heart of the Bio-tech design process is the virtual prototype, which is both a design and communications medium. Used together with rapid prototyping and associated virtual reality technologies, Bio-tech architecture actively encourages full and open participation in design. The surging demand for industrial and environmental biotechnology solutions has created the need for startups, growing companies, and educational centers to begin thinking about biotechnology architecture as a way to service their direct needs. The biotechnology architects understand the importance of both building functionality and physical appearance. Modern expert designers ensure that the biotech architecture produced for your project meets every need and provides every required convenience smoothly and efficiently. Whether you prefer to pursue traditional building infrastructure or wish to explore the possibilities of cutting-edge biotechnology architecture options such as solar energy.

http://www.chrisabel.com

Task 3. Say if the following statements are True or False:

1. Bio-tech design resembles forms in the wild nature.
2. Bio-tech architecture doesn't tend to interact with the environment.
3. Bio-tech design process excludes the use of the virtual reality technologies.

Task 4. Prepare a small report with the example(s) of the buildings in Bio-tech by the following scheme:

A) Name of the architect
B) Name of the construction
C) Function of the building
D) Represented distinctive features of the style

Text 3

Task 1. Say these words correctly. Use the proper word stress: *structure, geometry, exhibition, to construct, functionally, inevitable, misconception, asymmetry, to develop, unpredictable.*

Task 2. Match the words and phrases with their Russian equivalents:

to defy	сохранять
perception	утрата
to demolish	пренебрегать
irregular	подающий надежды
to neglect	сносить
up-and-coming	нарушающий правила
to maintain	игнорировать
a loss	восприятие

Task 3. Read and translate the text. Make up a glossary (a list of words) for the text:

DECONSTRUCTIVISM ARCHITECTURAL MOVEMENT

If we define "deconstructivism", it literally translates to the breaking down, or demolishing of a constructed structure, whether it being for structural reasons or just an act of rebellion. It is perhaps for this reason that many misunderstand the Deconstructivist movement. Deconstructivism is, in fact, not a new architecture style, nor is it anavant-garde movement against architecture or society. It does not

follow “rules” or acquire specific aesthetics, nor is it a rebellion against a social dilemma. It is the unleashing of infinite possibilities of playing around with forms and volumes.

During the First World War, Russian avant-gardists, known as Russian Constructivists, broke the rules of classical architecture and composition and presented a series of drawings that defied the “geometric norms” at the time. Their critical point of view and experimentation with forms disturbed the traditional perception of architecture and opened people’s eyes on the endless possibilities of breaking architecture rules. Post war, the country was undergoing radical changes and revolutions, and the impact of these revolutions on architecture was inevitable. Architecture was seen as a high form of art, influencing and being influenced by society, and so, social revolution = architecture revolution. Geometry, whether in art or architecture, became irregular.

In parallel to the Russian Constructivist movement, the Modern Movement was paving its way. Perhaps it was the timing of both movements that forced people to blindly choose Modernism. The World War has just ended and people were desperate for the stability and refinement they so missed; Russian Constructivism didn’t stand a chance. Ornamentation was stripped off, only to leave people with clean-cut, elegant yet naked functionality.

Misconceptions surrounding deconstructivism may be the result of the terminology itself. The word translates to the act of demolishing, or tearing apart an existing structure, implying an act of rebellion. Deconstructivism was not really an impactful architecture movement or an artistic style that took the world by storm and altered architecture as we know it. It was a mélange of Russian Constructivism and Modernism, with a little bit of influence from Post-modernism, Expressionism, and Cubism.

The term first appeared in the 1980’s, as an idea developed by French philosopher Jacques Derrida. Derrida, a friend of Peter Eisenman, developed the idea of fragmenting a building and exploring the asymmetry of geometry (inspired by Russian Constructivism), while maintaining the core functionality of the space (inspired by Modernism). The style gained more attention during MOMA’s 1988Deconstructivist

Architecture exhibition, organized by Mark Wigley, which featured works done by Zaha Hadid,Peter Eisenman, Daniel Libeskind, amongst many others. Back then, Deconstructivism was not considered an established movement or a style such as Cubism or Modernism. Johnson and Wigleysaw the similarities in the architects' approach to design, and combined them under one roof.

Following Derrida's theories and the "avant-gardist" approach of Russian Constructivism, architects began exploring spaces and volumes. The style was characterised by a loss of symmetry or continuity. It was architecture on steroids. Design rules were broken and "form follows function" was neglected, but somehow, the refinement and elegance of modernism remained. The structure's skin was manipulated and altered into unpredictable geometric forms, but the building's function was preserved. Basically, architects began having fun, and instead of asking themselves whether the design was practical or not, the main question was: Why not?

However, most architects have rejected the label of being "Deconstructivists", distancing themselves from any sort of movement. Bernard Tschumi believed that "calling the work of these architects a 'movement' or a new 'style' was out of context and showed a lack of understanding to their ideas", claiming that the style was merely a move against postmodernism. Unfortunately for them, the term resonated with the public, and their works have been referred to as "deconstructivist" ever since. In fact, their Deconstructivist approach to design created some of the world's most iconic and award-winning structures to date, influencing hundreds of up-and-coming architects.

By Dima Stouhi
https://www.archdaily.com

Task 4. Work in pairs. Make a list of the main characteristics of the described style.

Task 5. Prepare a presentation about the other styles mentioned in the text (Constuctivism, Modernism, Post-modernism, Expressionism, Cubism).

UNIT 2.
MODERN ARCHITECTS AND THEIR MASTERPIECES

Text 1
CHARACTERISTICS OF ZAHA HADID ARCHITECTURE

Task 1. Read the text and insert the missing words from the box into the gaps.

Cutting-edge	beacon	innovative	to completion	lasting
indelible	concrete	curves	interior	contemporary

Born in Baghdad and trained in London, legendary architect Zaha Hadid made an (1)……. mark on 21st-century architecture. Following the Postmodern architectural boom led by Frank Gehry, Hadid was one of a group of (2)…… architects who opened a new age of architecture marked with technological and artistic influences.

Already recognized as a talent while studying at the Architectural Association School of Architecture—former professor Rem Koolhaas described her as "a planet in her own orbit"—her more than 30-year career helped to shape the way society thinks about (3)…….. architecture. As a rare female in a male-dominated industry, and the first woman to win the prestigious Pritzker Architecture Prize, Hadid served as a (4)……. for creatives from different backgrounds, proving that you didn't need to be a white male to make a statement in architecture.

Her untimely passing in 2016 left unfinished projects, many of which are now being brought (5)…….by Zaha Hadid Architects, the firm she began in 1980, just a few years after finishing her studies. Carrying on her work, we are able to see the physical realization of Hadid's creative mind. Not just limited to architecture, her work in (6)…….. design, fashion, industrial design (including yachts), and fine art reminds us of what a well-rounded artist she truly was. The scope and breadth of this creativity has left a (7)…….. legacy that continues to influence creatives in all fields, even today.

Known as the "queen of (8)……," Zaha Hadid's architecture isn't easily grouped with one particular architectural style. It was a purposeful choice, as Hadid preferred not to limit her practice to a specific movement. She is well-known for her use of geometric shapes to create dynamic, fluid structures. Certainly, much of her influence stems from her love of abstract painting and drawing. It's well-documented that she was particularly fond of avant-garde Russian painters such as Kazimir Malevich and even re-interpreted Vladimir Tatlin's *Monument to the Third International* for an exhibition at the Guggenheim.

How do these abstract forms seep into her design process? In Zaha Hadid's paintings there is a key window into understanding her architecture. Working particularly with (9)…….. and glass, Hadid took these industrial materials and bent them into forms that subtly recall natural shapes. By deconstructing these forms, she was able to present (10)……..work that also evokes human emotion.

By Jessica Stewart
https://mymodernmet.com/zaha-hadid-architecture

Task 2. Explain why Zaha Hadid is called the "queen of curves".

Task 3. Which words in the text mean the same as the ones given below: *having high status; the latest or most advanced; slightly; remarkable and famous; modern; impact or effect; ineffaceable?*

Text 2

Task 1. Read the words and their translation – they will help you to understand the text:

surrounding - близлежащий	*landscape* - ландшафт
fiberglass - стекловолокно	*a cantilever* - консоль
surface - поверхность	*a ramp* - рампа
glass fibre reinforced concrete - железобетон	*fluidity* - текучесть

Task 2. What materials are used to build a house? Name as many as you can.

Task 3. Read and translate the following text:

HEYDAR ALIYEV CENTER

A. Zaha Hadid Architects firm was appointed as design architects of the **Heydar Aliyev Center** following a competition in 2007. The Center was designed to become the primary building for the national cultural programs and events. The design of the Heydar Aliyev Center establishes a continuous, fluid relationship between its surrounding plaza and the building interior. The plaza, as the ground surface; accessible to all as part of Baku urban fabric, rises to envelop an equally public interior space and define a sequence of event spaces dedicated to the collective celebration of contemporary and traditional Azeri culture. Elaborate formations such as undulations, bifurcations, folds, and inflections modify this plaza surface into an architectural landscape that performs a multitude of functions: welcoming, embracing, and directing visitors through different levels of the interior.

B. With its light appearance, the Heydar Aliyev Cultural Centre gives the sense of being all form, with no structure, but its forms hide extreme engineering. A double-layered spatial structure which is very flexible is the principal support for the double curve that travels smoothly along the top and bottom of the outer shell, hiding the structural frame and highlighting the surface, rather than the structure, as if the building were all effect and no cause. The Heydar Aliyev Cultural Centre represents a fluid form which emerges from the folding of the natural

landscape of the countryside and from the wrapping of the individual functions of the interior. All the functions, together with the inputs, are represented as folds in a single, continuous exterior surface. Cultural Centre gives the impression of the lightness of a handkerchief waving in free-fall.

C. Numerous studies were carried out on the surface geometry to rationalize the panels while maintaining continuity throughout the building and landscape. The seams promote a greater understanding of the project's scale. They emphasize the continual transformation and implied motion of its fluid geometry, offering a pragmatic solution to practical construction issues such as manufacturing, handling, transportation and assembly; and answering technical concerns such as accommodating movement due to deflection, external loads, temperature change, seismic activity and wind loading.

D. One of the most critical yet challenging elements of the project was the architectural development of the building skin. Ambitions to achieve a surface so continuous that it appears homogenous, required a broad range of different functions, construction logics and technical systems had to be brought together and integrated into the building envelope. The Heydar Aliyev Center principally consists of two collaborating systems: a concrete structure combined with a space frame system. In order to achieve large-scale column-free spaces that allow the visitor to experience the fluidity of the interior, vertical structural elements are absorbed by the envelope and curtain wall system. The particular surface geometry fosters unconventional structural solutions, such as the introduction of curved 'boot columns' to achieve the inverse peel of the surface from the ground to the West of the building, and the 'dovetail' tapering of the cantilever beams that support the building envelope to the East of the site.

E. The building, whose smooth, distorted grid-work of polyester-reinforced fibreglass panels do not have visible connections, appears less "as built" and more "as landed". These seams were derived from a process of rationalizing the complex geometry, usage, and aesthetics of the project. Glass Fibre Reinforced Concrete (GFRC) and Glass Fibre Reinforced Polyester (GFRP) were chosen as ideal cladding materials, as

they allow for the powerful plasticity of the building's design while responding to very different functional demands related to a variety of situations: plaza, transitional zones and envelope. In the construction, they used 121,000m³ of reinforced concrete, 194,000 formworks and 19,000 tonnes of steel molds.

F. To emphasize the continuous relationship between the building exterior and interior, the lighting of the Heydar Aliyev Center has been very carefully considered. During the day, the building reflects the light, constantly altering its appearance according to the time and the perspective. The use of semi-reflective windows allows the interior to be perceived without revealing the trajectory of the spaces. By night, the building is gradually transformed by the illumination which flows from the interior, which develops the formal composition to reveal its contents and maintain the fluidity between the interior and exterior.

G. The project is destined to play an integral role in the intellectual life of the city, houses a conference centre with auditorium and meeting rooms, a library, a museum, a restaurant and parking. The interior of the centre is characterised by continuous surfaces which twist to transform the walls into ceilings and slopes. The floors transform into ramps and walls, rotating on soffits and ceilings, to later continue twisting and advancing out of sight, forming endless white landscapes. The floors are descended via connecting ramps and create a continuous path of circulation. The library and museum are also connected by a ramp which travels across the ground floor of the library to the first floor of the museum. The library is also connected to the Conference Hall by a bridge which "flies" over the entrance hall.

Adapted from https://en.wikiarquitectura.com and https://www.archdaily.com

Task 3. Choose the most appropriate title to the A-G paragraphs.

1) Materials; 2) Interior; 3) Location; 4) Lighting; 5) Geometry; 6) Structure; 7) Concept

Task 4. Find the English equivalents in the text: *интерьер здания; неразрывность здания и ландшафта; ограждающие конструкции;*

консольные балки; основное здание; коллективное празднование; волнистости, бифуркации, складки и перегибы; изогнутая решетчатая конструкция; внешняя поверхность.

Text 3

Task 1.Translate the words into Russian: *uniqueness; a quest; recognition; to gain; a stance; world-wide; yielded buildings; to infuse.*

Task 2. Read and translate the text. Use a dictionary:

JEAN NOUVEL

Jean NOUVEL was born in Fumel, France in 1945.After he enrolled at the Ecole des Beaux-Arts in Bordeaux, Jean Nouvel ranked first in the entrance examination of the Ecole Nationale Supérieure des Beaux-Arts in Paris in 1966 and obtained his degree in 1972. Assistant to the architect Claude Parent and inspired by urban planner and essayist Paul Virilio, he started his first architecture practice in 1970. Soon afterwards, he became a founding member of the *Mars 1976* movement whose purpose was to oppose corporatism in architecture. He also co-founded the *Labor Union of French Architects* in marked opposition to the existing national *Board of Architects*. His strong stances and somewhat provocative opinions on contemporary architecture in the urban context together with his unfailing ability to inject a sense of originality into all the projects he undertakes have formed his international reputation. Jean Nouvel's work does not result from considerations of style or ideology, but from a quest to create a unique concept for a singular combination of people, place and time. His contextual approach and ability to infuse a genuine uniqueness into all the projects he undertakes have consistently yielded buildings that transform their environments and indelibly mark the cities in which they are built, like the *Lyon Opera House* (Lyon – 1993), the *Galeries Lafayette* (Berlin – 1996), the *Agbar Tower* (Barcelona – 2005), the extension of the *Queen Sofia Arts Center* (Madrid – 2005), the *Quai Branly Museum* (Paris – 2006), the *Guthrie Theater* (Minneapolis – 2006), the *40 Mercer* luxury

residences (New York – 2008), the *Doha Tower* offices (Doha – 2011), the mixed use high-rise building *One Central Park* (Sydney – 2014), the residential, the *Philharmonie de Paris*(Paris – 2015), the *Louvre Abu Dhabi* (2017).

His works have gained world-wide recognition through numerous prestigious French and International prizes and rewards. In 1989 The Arab World Institute in Paris was awarded the Aga-Khan Prize because of its role as "*a successful bridge between French and Arab cultures*". In 2000 Jean Nouvel received the *Golden Lion* of the Venice Biennale. In 2001 he received the Gold Medal of the Royal Institute of British Architects (RIBA). He was appointed Doctor Honoris Causa of the Royal College of Art in London in 2002 and he was the recipient of the prestigious Pritzker Prize in 2008.

http://www.jeannouvel.com

Task 3. Answer the questions:

1. What inspired Jean Nouvel to his architecture work?
2. What is his reputation famous for?
3. What is Jean Nouvel's ideology?
4. What are the most remarkable buildings designed by Jean Nouvel?
5. Which prizes has Jean Nouvel gained?

Text 4

Task 1. Match the words from column A to the words from column B to form word combinations. Translate them.

A	B
reinforced	louvers
glass	cantilever
permanent	stairwells
emergency	slabs
suspended	concrete
concrete	pressure

Task 2. Read the text and make one question about each paragraph. Ask you partner.

THE AGBAR TOWER

The Agbar Tower is 142-meter tower for the headquarters of the company Aguas de Barcelona (AGBAR), the municipal water company, built in 1999-2005. This is not a tower, a skyscraper, in the American sense. It is a more an emergence, rising singularly in the center of a generally calm city. This tower is a fluid mass that bursts through the ground like a geyser under permanent, calculated pressure. The surface of the building evokes water: smooth and continuous, shimmering and transparent, its materials reveal themselves in nuanced shades of color and light. It is architecture of the earth without the heaviness of stone, like a distant echo of old Catalan formal obsessions carried by a mysterious wind off the Monserrat. The ambiguities of material and light make the Agbar tower resonate against Barcelona's skyline day and night, like a distant mirage, marking the entry into the diagonal avenue from the Plaça de les Glorias. This singular object has become the new symbol of Barcelona the international city.

Structure The reinforced-concrete structure, crowned by a glass and steel dome, has a multi-colored facade of aluminum panels, behind glass louvers, in 25 different colours. There are 4,400 windows and 56,619 transparent and translucent glass plates. The louvers are tilted at different angles calculated to deflect the direct sun light. Elliptical in plan the 31 floors are without internal columns, the perimetric structure and the central concrete core, containing the services and emergency stairswells, are the important elements of the building. Six lift shafts rise up inside the outer walls.4,500 yellow, blue, pink and red lights, placed over the facade, illuminate the tower at night.

The tower is composed of two central one dense concrete modules, and other peripheral. These two oval cylinder with central

elliptical shape and perimeter, not concentric and crowned by a dome of glass and steel. The tower is not, in fact, circular floor, but slightly elliptical. From the ground floor to the 18th floor the building is completely straight, from the 19th floor to 26 drops gradually to 26 section where concrete is interrupted and continues glass dome with metal frame. Latest 6 floors consist of post-tensioned concrete slabs, are suspended cantilever. These two modules are joined together by radial beams perforated steel to increase the flexibility of services.

Offices properties The offices provide completely free of columns surfaces. Ceiling Height is 2.60m. Raised floor encapsulated with 15cm height free and finished in galvanized steel, supporting 1.500kg/m2 overload. False ceiling plate making galvanized soundproof interior and concealed. Luminaires recessed ceiling lighting and direct traffic areas and elevator lobbies. Emergency lighting. Centralized fire detection system. Voice-data wiring and electrical boxes installed under the floor and perimeter facade socket.

Underground Floors The 4 underground floors are distributed as follows: 2 floors house the auditorium for 316 people and services such as goods receipt, storage or files. The other two underground floors are for parking. Structurally, the building corresponds to a model of the core and outer perimeter which transmit bearing loads of free plants span.

Materials The concrete is covered with aluminum plates that give color to the whole, with a faded area of 16,000 m². The panes of glass have different inclinations and opacities that play of light, depending on the time of day and season, with lacquered aluminum sheets that cover the concrete. The form of ” bullet ” of the cylinder is formed by two concentric cylinders of oval not plant until the plant reaches 26 outer ring, this plant from a lightweight glass and steel dome rises.

Respect to the environment The building has temperature sensors in the outside regulating the opening and closing of the glass blinds of the facade, reducing the consumption of energy required for air conditioning. In order to reduce energy consumption and achieve natural ventilation have been designed 4,500 windows, plus ventilation, allow the use of natural light. Air circulation is regulated through the dome with

double glazing. In its construction have not used materials containing formaldehyde, asbestos or lead in paints. Formation of a cavity between the two skins covering the building reduce overheating, favoring ventilation. Through a computer system is optimized travel lifts, avoiding unnecessary consumption. Free of chlorofluorocarbons refrigerants materials are used to avoid damaging the ozone layer. The groundwater are used for cleaning floors and ornamentation.

Adapted from https://en.wikiarquitectura.com

Task 3. Retell the text. Use your questions as a plan.

Task 4. Fill in the gaps with an appropriate word from the box.

dome	galvanized	panels	louvers
consumption	peripheral	elliptical	beams

1. The …… or curvy shape building suffers less from the wind pressure.
2. To resist loads the construction is joined by radial steel ……..
3. The ceiling is reinforced with a cantilever and …….. slabs.
4. In order to reduce energy ……. and achieve natural ventilation 4500 windows have been designed.
5. The central section of the building is crowned by a ……. of glass and steel.
6. The structure of the building contains some central modules and some …… details.
7. The walls of the building are covered by colorful aluminum ……
8. The …….. at different angles are considered to deflect the direct sun light.

Text 5

Task 1.Answer the following questions:

1. How do you understand a phrase: “both energy efficient and socially responsible architecture”? Do you know any examples of such architecture?
2. What does an abbreviation ETFE mean? Give more information.

Task 2. Read and translate the text.

NORMAN FOSTER

Pritzker Prize-winning architect Norman Foster (born in 1935, Manchester, England) is famous for futuristic designs — like Apple Headquarters in Cupertino, California — that explore technological shapes and social ideas. His "big tent" civic center constructed with the modern plastic ETFE even made the Guinness Book of World Records for being the world's tallest tensile structure, yet it was built for the comfort and enjoyment of the Kazakhstan public. In addition to winning the most prestigious award for architecture, the Pritzker Prize, Foster has been knighted and granted the rank of baron by Queen Elizabeth II.

He graduated from Manchester University School of Architecture in 1961 and went on to earn a Master's Degree at Yale on a Henry Fellowship. Returning to his native United Kingdom, Foster co-founded the successful "Team 4" architectural firm in 1963. His own firm was founded in London in 1967.

Foster Associates firm became known for "high tech" design that explored technological shapes and ideas. In his work, Foster often uses off-site manufactured parts and the repetition of modular elements. Foster's design was a very early example of architecture that could be both energy efficient and socially responsible, to be used as a template for what is possible in an urban environment. Internationally, attention was paid to Foster's high-tech skyscraper for the Hongkong and Shanghai Banking Corporation (HSBC) in Hong Kong, built between 1979 and 1986, and then the Century Tower built between 1987 and 1991 in Bunkyo-ku, Tokyo, Japan. Asian successes were followed by the 53-story tallest building in Europe, the ecology-minded Commerzbank Tower, built from 1991 to 1997 in Frankfurt, Germany.

In 1999 Norman Foster received architecture's most prestigious award, the Pritzker Architecture Prize, and also was honored by Queen Elizabeth II naming him Lord Foster of Thames Bank. The Pritzker jury cited his "steadfast devotion to the principles of architecture as an art form, for his contributions in defining an architecture with high technological standards, and for his appreciation of the human values

involved in producing consistently well-designed projects" as their reasons for his becoming a Pritzker Laureate.

Throughout the years, Foster and Partners has continued to create office towers that explore the "environmentally sensitive, uplifting workplace" begun by Commerzbank in Germany and the Willis Building in Britain. Additional office towers include the Torre Bankia (Torres Repsol), Cuatro Torres Business Area in Madrid, Spain (2009), the Hearst Tower in New York City (2006), the Swiss Re in London (2004), and The Bow in Calgary, Canada (2013).

Other interests of the Foster group have been the transportation sector , including the 2008 Terminal T3 in Beijing, China and Spaceport America in New Mexico, the U.S. in 2014 — and building with Ethylene Tetrafluoroethylene, creating plastic buildings like the 2010 Khan Shatyr Entertainment Center in Astana, Kazakhstan and the 2013 SSE Hydro in Glasgow, Scotland. The most recognizable Foster design is the 2004 office tower for Swiss Re at 30 St Mary Axe in London. Locally called "The Gherkin," the missile-shaped building is a case study for computer-aided design and energy and environmental design.

Throughout his career, Norman Foster has chosen projects to be used by different population groups - the residential housing project Albion Riverside in 2003; the futuristic modified sphere of London City Hall, a public building in 2002; and the 2015 rail station enclosure called Crossrail Place Roof Garden at Canary Wharf, which incorporates a rooftop park beneath ETFE plastic cushions. Whatever project completed for whatever user community, the designs of Norman Foster will always be first class.

By Jackie Craven
https://www.thoughtco.com

Task 3.Correct wrong information in the following statements:

1. Norman Foster is famous as a constructivism architect.
2. Foster has been knighted and granted the rank of duke by Queen Elizabeth II.
3. Foster's design was one of the latest example of architecture that could be both energy efficient and socially responsible.

4. Norman Foster received architecture's most prestigious award, the Pritzker, in 2009.
5. Foster's projects are mostly public buildings.

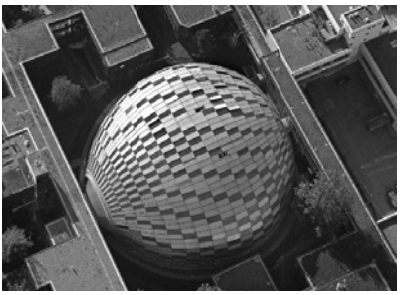
Text 6

Task 1. Match the words from column A to their synonyms from column B. Translate them.

A	B
envelope	false
translucent	actual, recent
artificial	diffuse
spacious	cover
current	roomy
scattered	semitransparent

Task 2. Work in pairs (Student A and Student B). Student A reads Part 1 and Student B reads Part 2.

PHILOLOGY LIBRARY OF THE FREE UNIVERSITY BERLIN



PART 1. The creation of the Free University in 1945 marked the rebirth of liberal education in Berlin after the war, and has since played a central role in the intellectual life of the city. Today, with over 39,000 students, is the largest of the three universities in the city.

The architectural firm Foster & Partners was commissioned to design and build the new library of Philology at the Free University of Berlin, basing their design on efficiency, light, air and easy access. Lord Foster won the architectural competition with a design featuring **a filigree roof** curved steel and glass in a large courtyard of the original building on campus. However, this concept underwent several revisions in the planning process and led to a

building with a steel structure spanning five large open floor plans, including one underground. Construction of the library began in July 2001. Because there were some interruptions budget problems and in early 2004 completed structural steel, installation of metal panels and glass items. It was completed in 2005.

Cupola Studio Concept In addition to providing various academic resources, highlights the characteristic architecture of the new Philological Library, designed by architect Lord Norman Foster. Because it resembles the shape of a brain, the building was called "The Brain of Berlin." The building **envelope shape** combines the notion of "wall" and "ceiling". The **glazing** is used selectively to provide natural light and views. The shading and natural ventilation help to manage temperature and daylight. The outer skin is of aluminum panels with openings **staggered glass**, an inner membrane of **translucent fiberglass** filters sunlight.

The aim in the design of systems of this library construction was a building that could be largely naturally ventilated and tempered gently. Also identified the use of daylight to ensure visual comfort and reduce energy consumption for artificial lighting. These concepts were developed using advanced planning tools, such as CFD (Computational Fluid Dynamics) analysis, dynamic and thermal simulations, and simulation calculations daylight. A transparent spherical building retains its own microclimate.

According to the metaphor of "brain" that has earned the building its shape, the white inner skin can be identified with the brain membrane, while the space between the inner and outer skin serves as an air chamber for natural ventilation the building. The skull covers a compact building with five levels which are nearly the same plane, but are smaller in size on the upper floors. Once again, like a brain, is clearly divided into right hemisphere and the left hemisphere. The division between the two lobes of the brain is especially evident in the top three levels, receding into galleries surrounding **the atrium** of the entrance area of the library on the first floor. This allows the visitor to experience the library, despite its compact size, as a large building, clearly structured. A central opening in

the basement, lower than in the atrium on the first floor, there also creates a feeling of spaciousness.

PART 2. New Construction Firstly, the facade was designed by Jean Prouvé, in the late 90s. The new facades remained faithful to Prouvé plans, even when changed some details needed to meet the current technical and environmental requirements. Their roofs were adapted to become **parkland**. The floor of the library building is a distorted circle where glass and steel rise and deform to accommodate the largest possible area without creating a dominant impact on this area of the city where the building is low. The new building blends between the historic structures, like a giant metal bubble. Its character combines powerful aspect of Richard Buckminster Fuller´s geodesic domes with the latest developments in sustainable structures. An inner membrane translucent fiberglass filters sunlight and creates an atmosphere of concentration, while the scattered window openings create changing patterns of light and shadow, with a view of the sky and momentary flashes of sunlight.

Structure The structure is dome-shaped oval on a plant. The new library occupies a space created from the union of six of the courtyards of the university. Its four floors have natural ventilation, a chamber bubble that is coated aluminum and glass panels and supported on a tubular steel structure with a radial geometry. **The lattice structure** is spatially curved cover using Vierendeel girders. Analysis of the dynamic loads (wind) were performed with a model 3D stick. The outer glass cover and inside translucent textile membrane forming the ecological recovery volume. The structure consists of a double-skin facade that uses wind and sun to provide natural ventilation for most of the year. Ventilation ducts integrated into the raised floor of the building, a concrete core with radiant heating and cooling systems improve occupant comfort. The basement is double-walled and is used to preheat the ventilation air through contact with the ground.

Materials A double skin layer supported by a steel structure of large concrete structure enclosing the five levels of the library. The outer shell consists of panels of light metal, aluminum, ventilation elements and double glass panes occupying about 40% of the surface of the dome.

The internal cavity generates a kind of solar engine, which drives the natural ventilation system. Inner membrane made of a fiberglass fabric transparent filters sunlight and produces an atmosphere facilitates concentration. In turn, isolated openings in construction, 8% of window elements, allow to short glimpses into heaven and freely let some sunlight, allowing regulate the flow of air through its fins. Water pipes pass through the concrete core of the building and are used for heating and cooling, combined with the natural elements. The concrete also serves as a heat accumulator economical. This sophisticated energy saving system has been used before by Lord Foster in Reichstag.

Adapted from: https://en.wikiarquitectura.com

Task 3. Student A retells their part to Student B, then change.

Task 4. Give definitions to the following words: *filigree, glazing, staggered, the atrium, parkland, lobe.*

UNIT 3
SUSTAINABLE ARCHITECTURE

Text 1

Task 1. Answer the questions.

1. What do you know about sustainable architecture?
2. Will sustainable architecture dominate in the 21st century? Why?

Task 2. Before reading the text, translate the following words and expressions from English into Russian: *environmental impact, development space, detrimental, passive architectural strategies, arrangement, sizing, ratio, height, width, urban planning, cost-effective, heating, a well-insulated building, ventilation capacity, indoor air, stale air, to harness the energy of the sun, photovoltaic cells, thermal mass, awning, shutters, heat gain, artificial cooling, surface area.*

Task 3. Read and translate the text about sustainable architecture. Pay special attention to the words printed in bold.

Sustainable architecture is architecture that seeks to minimize the negative **environmental impact** of buildings by efficiency and moderation in the use of materials, energy, and development space and the ecosystem at large. Sustainable architecture uses a conscious approach to energy and **ecological conservation** in the design of the built environment.

The idea of sustainability, or **ecological design**, is to ensure that our use of presently available resources does not end up having **detrimental** effects to our collective well-being or making it impossible to obtain resources for other applications in the long run.

Numerous **passive architectural strategies** have been developed over time. Examples of such strategies include the **arrangement** of rooms or the **sizing** and orientation of windows in a building, and the orientation of facades and streets or the **ratio** between building **heights** and street **widths** for **urban planning**.

An important and **cost-effective** element of an efficient **heating, ventilating, and air conditioning** (HVAC) system is a **well-insulated building**. A more efficient building requires less **heat generating** or **dissipating power**, but may require more **ventilation capacity** to expel **polluted indoor air**.

Significant amounts of energy are flushed out of buildings in the water, air and compost streams. Off the shelf, **on-site energy recycling technologies** can effectively recapture energy from waste hot water and **stale air** and transfer that energy into incoming fresh cold water or fresh air. Recapture of energy for uses other than gardening from compost leaving buildings requires centralized anaerobic digesters.

Site and building orientation have some major effects on a building's HVAC efficiency. **Passive solar building design** allows buildings **to harness the energy of the sun** efficiently without the use of any active solar mechanisms such as **photovoltaic cells** or solar hot water panels. Typically, passive solar building designs incorporate materials with high **thermal mass** that retain heat effectively and strong insulation that works to prevent heat escape. Low energy designs also requires the

use of solar shading, by means of **awnings**, blinds or **shutters**, to relieve the solar **heat gain** in summer and to reduce the need for **artificial cooling**. In addition, low energy buildings typically have a very low surface area to volume ratio to minimize heat loss.

https://en.wikipedia.org

Task 4. Try to explain the following expressions in English: *sustainable architecture, environmental impact, development space, ecological design, urban planning, HVAC, ventilation capacity, passive solar building design, photovoltaic cells, thermal mass.*

Task 5. Translate the following words and expressions from Russian into English: *экологически устойчивая архитектура, экологический дизайн, оптимизация размеров, соотношение, градостроительство, рентабельный, тепловыделяющий, мощность, здание с системой солнечного отопления, использовать солнечную энергию, фотогальванический элемент, теплоемкость, площадь поверхности.*

Text 2

Task 1. Translate the following words from English into Russian: *facet, story, pane, surface, glare, base, tenant, lighthouse; urban, outdoor, elevated, sheathed, tilted, angular, gemlike, high-performance, communal; to flood, to sidestep, to carve, to map, to sculpt, to frame.*

Task 2. Pay special attention to the following terms: low-reflectivity glass**;** optimized geometry**;** heat gain**;** curtain wall, светопрозрачный фасад (ограждающая конструкция из системных профилей, заполненная стеклопакетами из различных видов стекла.

Task 3. Read the text. Pay special attention to the words printed in bold.

The High Line Gets a Gemlike Neighbor

A 12-story office building known as the Solar Carve Tower tries its best not to throw shade.

The taller the building, the more likely it is **to throw shade**. This problem is of particular note when your neighbor is New York City's High Line.

But the designers of 40 Tenth Avenue in Manhattan's Meatpacking District managed to prevent **pools** of darkness from **flooding** the High Line next to it by **sidestepping** the sun. The commercial tower's glass **curtain wall** recedes and breaks into **eye-catching facets** on the north and south sides, allowing concentrations of solar rays to find their way to the **elevated** park and nearby streets.

Studio Gang, the Chicago-based architecture firm, designed the 139,000-square-foot building using a strategy it describes as **"solar carving."** The architects **mapped** the sun's annual course to determine which parts of the nearly finished 12-story tower **to slice away** and **sheathed portions** of those sections in **tilted angular panes of glass**.

Multiple benefits will accrue from this **gemlike surface** to those inside and outside the building, said Weston Walker, the design principal of Studio Gang's New York office. Coupled with **high-performance, low-reflectivity glass**, the **optimized geometry** will **minimize heat gain and reduce glare** for drivers on the West Side Highway, which runs alongside the building. It will also **discourage migratory birds from striking**. The **sculpting** "creates visual noise that makes it easier for the birds to detect the building and fly around it," Mr. Walker said.

Inside, the facets will **frame** dynamic views of the Hudson River and **add interesting bumps to office or amenity spaces**.

The building has been designed with minimum **ceiling heights** of almost 16 feet and **outdoor space** on **every floor but one**. An 8,000-square-foot second-floor terrace will sit alongside the High Line, and there will be a 10,000-square-foot **communal roof deck**.

By Julie Lasky The New York Times
https://www.nytimes.com

Task 4. Try to explain the meaning of the following terms in English: *curtain wall, low-reflectivity glass, heat gain, amenity spaces.*

Task 5. Watch the video about curtain walls on YouTube: https://www.youtube.com/watch?v=U3FncqV_BRg. Use the subtitles if you find the task difficult. Retell the text. Discuss the advantages and disadvantages of different curtain wall systems.

UNIT 4
SUBTERRANEAN ARCHITECTURE

Text 1

Task 1. Answer the questions.

1. What do you know about subterranean architecture?
2. Can you give any examples of subterranean structures?

Task 2. Before reading the text, translate the following words and expressions from English into Russian: *dwelling, counterpart, advancement, insulator, soundproofing, moisture, benefit; safe, secure, effortlessly, jarring, meticulous, reliant; to erect, to blend.*

Task 3. Pay special attention to the following expressions: earth-friendly housing, cave structures, elevational houses, earth berm properties, culvert, energy requirements, subterranean property, prone to earthquakes, to lay a foundation, construction costs, interior architecture.

Task 4. Read the text about the advantages and disadvantages of subterranean architecture. Translate the text. Use a dictionary.

What are the advantages and disadvantages of this ancient building technique in the modern world?

Pros

- In areas prone to extreme weather conditions, subterranean architecture is safer and more secure than traditional, flat sided architecture.

- Subterranean architecture can be built in places that traditional architecture simply cannot, like in steep hillsides.
- Soil is a brilliant natural **insulator**, keeping houses warm during winter and cool during the summer, thus reducing the **energy requirements** for a subterranean property. In general, a subterranean property will cost 80-95% less than a traditional house to heat and cool.
- Surrounding a property with earth acts as natural **soundproofing**, ensuring a quiet inside and privacy from the outside.
- Subterranean properties **blend** effortlessly into their natural surroundings, making them superb for conservation areas or areas of outstanding natural beauty.
- Underground properties are ideal for areas **prone to earthquakes**.
- Because there is no need **to lay a foundation**, the **construction costs** for underground properties are dramatically reduced. This is also a benefit to construction time, which is cut.

Cons

- Significant care has to be taken during and after construction of the property to keep out **moisture**, which may increase costs.
- The psychological shift required for those moving to a subterranean property can sometimes be **jarring**.
- Ensuring good ventilation and light can be difficult in subterranean architecture, and requires a careful touch.
- **Interior architecture** requires special consideration, as many walls will be rounded or otherwise nonstandard.
- Flood planning must be **meticulous**.

Posted by Robin Dwiar
http://www.internationaldesigngroup.co.uk

Task 5. Try to explain the meaning of the following expressions in English: *culvert, energy requirements, prone to earthquakes, to lay a foundation, construction costs, interior architecture.*

Text 2

Task 1. Before reading the text, translate the words and expressions from English into Russian: *opening, extension, volume, void, utility*

room, potentiality, sustainability; impressive, subterranean, ingenious, rolling, congested, aesthetically, cone-shaped, glazed; to house, to qualify, to be covered in, to plunge, to comprise, to reinforce, to host; planning regulations, subterranean (underground) architecture, concrete structure, skylights, natural light.

Task 2. Read the texts about some of the best examples of subterranean architecture.

Joanneum Museum extension and refurbishment

This 2012 **extension** to Austria's Joanneum Museum added a conference hall, reading areas and an archive to the existing museum complex, which **comprises** a regional library, an art gallery and a natural history museum. **Conical openings** surrounded by **glass puncture** the ground above the **subterranean extension** bringing daylight into the underground rooms. Visitors enter the building by an outdoor elevator into the **cone-shaped volumes**.

Hanna Arendt School

The underground sections of this school in Bolzano, Italy were added to an existing school complex. The school needed more space, but expansion above ground was not an option.

The four underground floors were built after an initial **stabilisation of the area** with **micro poles** and a **reinforced concrete structure**. The rooms **are distributed around the central void**; starting from the top the first two floors **host** classrooms; the third floor hosts the workshops and the last one is a utility room.

Naturally, light was one of **the major issues** of the project. **Glazed** surfaces, large **skylights** and glass walls of the rooms help flood **the internal spaces** with **natural light**.

http://www.designcurial.com

Tirpitz Museum

Bjarke Ingels has transformed a German WWII **bunker** into a new cultural complex that includes galleries and exhibitions dedicated to the Atlantic Wall and the Danish coast. The museum is formed as a series of **precise cuts** in the dunes, and its **delicate forms** are built from **concrete, steel, glass and wood** to contrast the **monolithic** concrete bunker. Each of the four underground galleries is filled with light, thanks to glass walls that **rise six metres high**.

https://www.azuremagazine.com

Task 3. Try to explain the meaning of the following terms in English: *planning regulations, subterranean architecture, concrete structure, skylight, internal spaces, natural light.*

Task 4. Translate the words and expressions from Russian into English: *отверстие, пристройка, вместимость, полость, впечатляющий, подземный, перегруженный, конической формы, застекленный; проектировать, вмещать, погружать, укреплять.*

Task 5. Watch the video about 10 incredible underground projects on YouTube: https://www.youtube.com/watch?v=L8jU67dOH7k Try to write down the text. Use the subtitles if you find the task difficult. Which underground development do you think is the most interesting? Why?

БИБЛИОГРАФИЧЕСКИЙ СПИСОК

1. Sustainable Urban Planning: Tipping the Balance./ Robert Riddell. – Blackwell Publishing, 2004. – 335 p.
2. Webster's New World College Dictionary, Fourth edition. / Michael Agnes. – N.Y.: Macmillan, 1999. – 1716 p.

INTERNET LINKS

1. The World's Largest Architecture Encyclopedia [Электронный ресурс]. Режим доступа: https://en.wikiarquitectura.com
2. Arch Daily [Электронный ресурс]. Режим доступа: https://www.archdaily.com/
3. The New York Times [Электронный ресурс]. Режим доступа: https://www.nytimes.com/2018/12/27/realestate/the-high-line-gets-a-gemlike-neighbor.html
4. Financial Times [Электронный ресурс]. Режим доступа: https://www.ft.com/content/92d5063a-277d-11e8-9274-2b13fccdc744
5. Azure [Электронный ресурс]. Режим доступа: https://www.azuremagazine.com/article/underground-architecture/
6. Designcurial [Электронный ресурс]. Режим доступа: http://www.designcurial.com/News/underground-architecture---six-of-the-best-4344887
7. International Design Group [Электронный ресурс]. Режим доступа: http://www.internationaldesigngroup.co.uk/pros-cons-subterranean-architecture
8. Zaha Hadid's Legacy and Her Top 10 Architectural Masterpieces [Электронный ресурс]. Режим доступа: https://mymodernmet.com/zaha-hadid-architecture/
9. Jean Nouvel [Электронный ресурс]. Режим доступа: http://www.jeannouvel.com/en/jean-nouvel/
10. Biography of Norman Foster, High-Tech Architect [Электронный ресурс]. Режим доступа: https://www.thoughtco.com/norman-foster-high-tech-architect-177845

CONTENTS

ДЕЛОВОЙ ИНОСТРАННЫЙ ЯЗЫК

АРХИТЕКТУРА ЗДАНИЙ И СООРУЖЕНИЙ, ГРАДОСТРОИТЕЛЬСТВО И ПОДЗЕМНАЯ УРБАНИСТИКА

Методические указания к практическим занятиям для студентов магистратуры направления 07.04.01

ENGLISH FOR SPECIFIC PURPOSES

ARCHITECTURE OF BUILDINGS AND CONSTRUCTIONS, URBAN PLANNING AND SUBTERRANEAN URBANISM

Сост.: *Е.А. Бугреева ,Е.А. Варлакова*

Печатается с оригинал-макета, подготовленного кафедрой иностранных языков

Ответственный за выпуск *Е.А. Бугреева*

Лицензия ИД № 06517 от 09.01.2002

Подписано к печати 08.04.2019. Формат 60×84/16.
Усл. печ. л. 2,0. Усл.кр.-отт. 2,0. Уч.-изд.л. 1,8. Тираж 50 экз. Заказ 323. С 119.

Санкт-Петербургский горный университет
РИЦ Санкт-Петербургского горного университета
Адрес университета и РИЦ: 199106 Санкт-Петербург, 21-я линия, 2