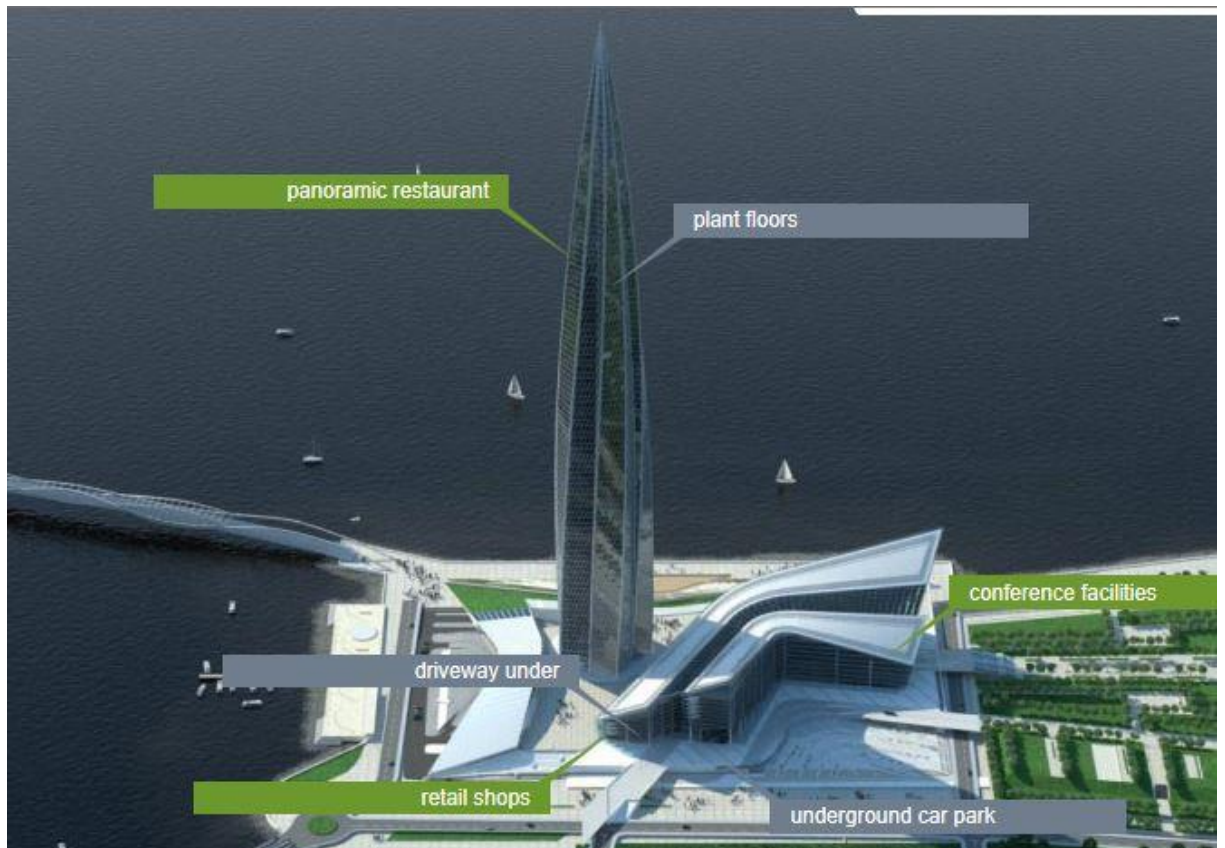


# LAKHTA TOWER PETERSBURG

In January 2017, the St Petersburg skyscraper overtook the Spanish Torre de Cristal, towering 250 meters over Madrid. In early April, the Tower surpassed the German Commerzbank Tower (259 m) and came into the category of supertall skyscrapers. On the Space Exploration Day on April 12, it left behind The Shard in London (306 m). On October 2017, it reached the mark over 374 meters.

827 days is the time it took Lakhta Center from the commencement of its stage-by-stage construction to become the highest building on the European continent.

All altitudes of European skyscrapers are provided as architectural elevation marks according to Emporis. The comparison is made only with buildings; such constructions as TV tower masts are in a separate construction category.



This is how Lakhta Center will look like in 2018, a multifunctional public and business complex, which core will be the HQ of Gazprom Neft company and its subsidiaries.

Over half of the areas will be occupied by public functions: a scientific and educational complex, a children's center for amusing science, a planetarium, exhibition halls, a health center, a multifunctional hall for congresses, conferences, theater performances, musical and costume shows, a cinema center and a sports center, an open amphitheater and a few more public services including a bank branch, retail shops, restaurants, cafés, etc.

## WHAT IS LAKHTA CENTER



### Conceptually

Lakhta Center is the northernmost skyscraper in the world, built on the shore of the Gulf of Finland in St Petersburg. It embodies the aesthetics of the cold Baltic expanses of water. The Tower resembles an ice ridge, and the neighbouring multifunctional building resembles a split iceberg. The natural spire form of the Tower symbolizes the power of water, and its special glass facade makes the skyscraper change colour depending on the position of the sun, thus creating an impression of a living object.

### Architecturally

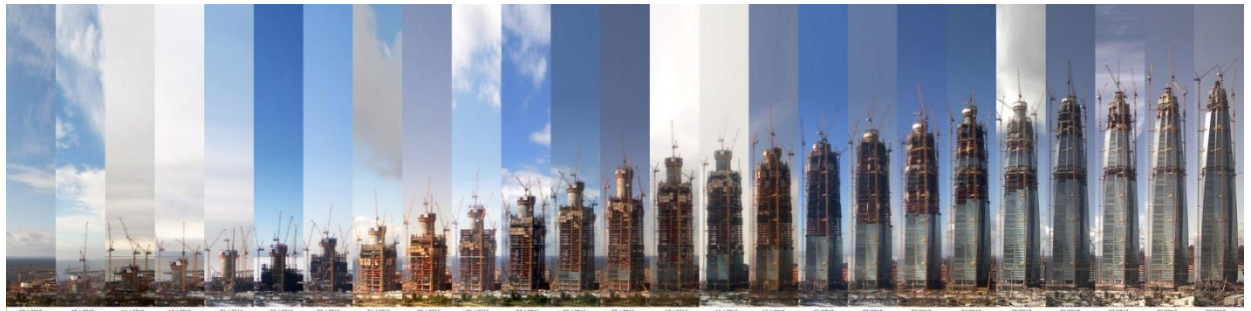


The complex consists of four pieces of real estate with a total area of more than 400 000 sq. m:

A 87-storey skyscraper twisted at 90 degrees from its base to peak. It takes the second position among the world's top helical skyscrapers next to the Shanghai Tower. A multifunctional multiple-elevation building resembling a boomerang divided in two blocks by a longitudinal atrium. Facade length is 260 m, which is greater than that of the Hermitage.

The Arch is a separate building forming an entrance to the complex. It features unique longspan unsupported trusses whose length by convergence point is 98 m. The Stylobate hides the parking, the warehouses, and the logistics passages.

Construction period: from 2012 till 2018.



Executive Director Zaha Hadid Architects Christos Passos: "A megaproject like that is a challenge for all of us, not only for the Russians, the Chinese, the Americans, or the English. The difficulty is that we must find solutions where everyone can participate... I like the approach they [Lakhta Center and Moscow-City, - note] take. I like it that they look for opportunities and apply innovative approaches, including their work with materials, construction techniques, and management systems. Bold new projects give people the opportunity to learn and avoid standard tasks and solutions. It is very important. It is an incentive to grow."

## FUNCTIONALLY

The complex combines the headquarters of Gazprom Group and public spaces among which there is the highest observation deck in Europe at the level of 360 m, a planetarium in the shape of a balloon with a full spherical sky panorama and the possibility to demonstrate 10,000,000 stars, an open atrium on the shore of the Gulf of Finland, a scientific and educational centre, and other facilities.

General Director of Lakhta Center, Elena Ilyukhina: "We are creating a completely new kind of environment that will offer everything: contemporary education, art projects, memorable events, conceptual art objects, in other words, a lot more than the standard set of auxiliary services that come with office space. We want to create an environment where everyone can find something for their taste, whether a high school student, a tourist, a pensioner, an office clerk on a weekday, or a visitor at weekends. And it is this socially significant function that is the main goal and mission of the project. Public spaces are going to occupy roughly a third of the floor area, but in terms of impact we expect them to account for about 70% of the influence the complex will have on public life".



Head of Spanish architectural bureau EMBT, member of last year's Pritzker Architecture Prize jury, Benedetta Tagliabue: "This project is not only about creating a huge, gigantic and recognizable building, which is an obvious goal, but it is also about having an impact. The purpose is to give people a chance to come to the Lakhta Center and find things they cannot find in other places. If you build a tall building, you can give people something... Public spaces is a great opportunity to repay our debt to society".



In urban development context

The Lakhta Center is located 9 km from the historic centre of the city, being a new point of attraction for business and social life in St Petersburg.

Senior Executive Vice President of Samsung C&T, Ahmad Abdelrazak: "An important feature of Lakhta Center is its location outside the historical center of the city. This can serve as a catalyst for the creation of a city that can compete with Singapore, Hong Kong ...; which can be rational, can become a city of reason, a city of light, a city that can function and operate as efficiently as possible, as well as a center for building technologies".

Today, residential and commercial real estate, social and sport infrastructure facilities are being designed and built on the adjacent territories.

Executive Director of Lakhta Center, Alexander Bobkov: "We hope that the Lakhta Center will become a new landmark and a new height of St Petersburg of the 21st

century. That it will become a city landmark like the Peter-and-Paul Fortress was in the 18th century or St Isaac's Cathedral in the 19th century”.

This year, St. Petersburg for the third time in a row receives the prestigious international award World Travel Awards. The city is recognized as the best tourist destination in Europe.

Writer Yevgeny Vodolazkin: "Every city, even a city like St Petersburg, must develop. The main thing is that this takes place not in the historic centre, but next to it. Expanding in space, the city seems to deepen in time, simultaneously demonstrating different epochs. Yes, the Lakhta Center is visible from the city even now, but not as a dominant thing, but as "one of its spires”.

### **ACHIEVEMENTS OF LAKHTA CENTER BUILDERS**

The Lakhta Center, a supertall skyscraper weighing more than 670 thousand tonnes, is being built on the most complex, 3rd category ground. The volume of research support for the project is unprecedented. The engineering and technical survey was conducted starting from 2011 with the participation of 13 companies, including ARUP and Inforceproject Design Bureau, under the scientific supervision of academician V. I. Travush, one of the Designers of the Ostankino TV Tower in Moscow. The geotechnicians alone drilled 40 km of extension wells up to 150 m deep, which is three times the depths that had been previously studied in St Petersburg.

### **SPRING 2015**



The bottom slab of the box shaped foundation

### **SPRING 2014**





Four spherical panoramas show the most interesting places on the zero cycle of construction site work.

## SUMMER 2013



Panorama can be viewed as a [Flash-file](#) (best option) or [via zoom.it](#) (without Flash)

The piles under the skyscraper reach the diameter of 2 meters and are the widest in the world.

The box foundation of the Tower includes three slabs. The lower one, 3,600 mm thick with a volume of 19,624 m<sup>3</sup>, was poured in without interruption for 49 hours from the excavation pit level on March 1, 2015. The concrete pouring operation was recorded in the Guinness Book of World Records.

The skyscraper supporting columns are tilted 2.89° to give the helical shape to the Tower and are made of composite materials, representing a steel core 1.5 \* 1.5 m, encased in high-strength concrete B80. This solution, first applied in the Russian high-rise construction, allowed to reduce the time of column construction by 40 per cent and the cost by half.

Lakhta Center Chief Engineer Sergei Nikiforov: "We use all the advantages of metal. They are speed and convenience of erection. And we take all the positive feature of concrete, such as resistance to fire load. Moreover, we provide the same creep and shrinkage of the core and the outer perimeter, since the columns are in concrete environment. This means that the shrinkage is roughly the same both around the perimeter and inside, which helps to reduce internal tension arising in steel structures. This is a very good solution, and it has been calculated by several design complexes. As a result, all the technical parameters that we designed, all the goals and objectives were met successfully".

The skyscraper facades are glazed with cold-formed glass, and the total glazing volume of the complex is 130,000 m<sup>2</sup>, which is the largest in the world.

Innovative research is being carried out specially for the skyscraper, a unique system of facade maintenance has been created, and the Construction Management Plan is in its final stage.

The Lakhta Center has been certified according to LEED (Gold).

Artist, sculptor and experimenter Andrei Bartenev about the construction: "Of course, I was incredibly inspired by the Lakhta Center. I think this ambition is comparable with the first ambition when the Dnieper Hydroelectric Station was built under the electrification plan. This is a new electrification. Completely. This reminds me of Vera Mukhina. Because this is a project that has life instinct and challenge. This is a transforming challenge of the avant-garde constructionist era, that is now reincarnated in the Lakhta Center".

## Architectural concept



Lakhta Center architectural concept will be created based on the project which was previously designed to be constructed on Okhta promontory in Krasnogvardeysky district. The project will be significantly revised and adjusted to the new location and site layout. As assessed on a preliminary basis the costs for the adjustment of the project of the business center which was approved earlier in Lakhta will be not more than 30-50% of the cost of the design and approval of the new project. Furthermore the existing project of the business complex has passed through all state authorities which acknowledged its compliance with the relevant standards and requirements which will accelerate the construction of the new center by 2 years and significantly reduce the costs of the design and approval of the new project.

The project of a business center with a high-rise landmark and base buildings was selected as a result of an international architectural contest conducted by the investor in 2006. The winner of the contest was RMJM company which proposed a project complying with the requested functions of the future headquarters of a large energy company and concordant with the architectural traditions of Petersburg.

Petersburg was created as a city of horizontals. A flat lowland dictated buildings

relatively even in height, and in some spots accentuated with high-rise ensembles. The spire of the Peter and Paul Fortress, the Admiralty, the dome of the St. Isaac's Cathedral are city forming landmarks with architectural ensembles around them.

The role of the high-rise building envisaged in the concept of a business center is played in the creation of an architectural accent of a business center which will be constructed on the former industrial and un-built areas. Without competing with the traditional city's landmarks due to the remoteness from the historic buildings, the high-rise ensemble on the coast of the Gulf of Finland will be a city forming element and a draw of attraction for a new development project and business in a new developing district of the city.

The main architectural motives of Petersburg are reflected in the concept of a business center. It is a theme of a lonely spire in the horizontal landscape, and leaning base buildings symbolizing the ship hull, and maritime theme of wave-like bearing structures. An organic form of the building symbolizes the power of water, the flow of space, openness and lightness. The effect of free fall and maximum blending of the future complex with the environment will be emphasized by the glass of a special type, owing to this glass the tower will change its colors creating a feeling of a living being.

At present the architectural concept is being revised which will enable to insert the buildings of the future business complex into new surroundings on the coast of the Gulf of Finland. Young Russian architects will be involved in the work related to some parts of the project including the embankment and berths.

## Smart Facade



Unique façade structures and bent window units 2.8m x 4.2m weighing about 740kg will be used in the tower. Such a quantity of unique façade glass will be used in a tower for the first time.

It is this glazing structure will allows pointing out a smooth shape of the tower.

Air space between the façade glazing layers provide at the same time heat insulation and natural ventilation which reduces heating and air conditioning costs.



Special systems will maintain an optimal temperature and moisture mode. Natural ventilation is designed in the tower which became possible when double skin facades are used in certain areas of the building.

- The tower has outer and inner curtain walls. The area of the outer walls is 73,237.05 sq.m. The area of the inner walls is 25,415.5 sq.m. In total for the whole building 98,652.55 sq.m. of walls.
- The total area of the tower glazing is 72,500 sq.m.
- The façade structure weighs 210 kg/m<sup>2</sup>.
- A window unit weighs 740kg.
- The geometry of the skyscraper changes throughout the 462m height. The tower expands, tapers and twists. Because of these changes a lot of difference elements are required which change at each level.
- A parallelogram is selected as a glazing element. Glass is cold-bent.
- The number of façade elements is 16,505.
- The number of difference elements is 11,615. It means that 7 out of 10 (71%) elements from glass and steel vary in shape and dimensions.
- The analysis demonstrates that almost all the modules of external curtain walls vary (in relation to the geometry, degree of angle, etc.)
- In total there are 21 Tower façade types and dimensions.
- The pinnacle of the tower 140m tall has a meshed roof.
- Cladding: glass and stainless steel mesh pulled on the cage from diagonal imposts and horizontal girders.
- The total area of the facades of the Multifunctional Building is 60,000 sq.m., media facades 5,000 sq.m.

## Entrance Arch Structure



An arch (borrowed from Latin Arcus, an arc, a bend) is a curvilinear overhead cover of a wall opening or space between two columns. Originally arches appeared in the second millennium BC in the architecture of Ancient East, in particular in Mesopotamia where the construction of brick-built structures achieved a high level. Arches in the architecture of Ancient Rome were widely widespread too.

This element is actively used in modern architecture.

The main entrance in Lakhta Center Mixed-use complex is designed as an arch. The height of the arch is almost 24m. The length is 98m. It is not a classic arch, it is rather a structure of a complicated arched shape. The roof projection on a horizontal plane is

of a curvilinear crescent trapezoid shape.

Structurally the arch is located in the stylobat part which is separated from the tower and multifunctional building. The stylobat is a reinforced concrete monolith cage comprising columns, beams, floor slabs, and walls. In plan it has a shape of a rectangular dimensioned 77mx135m.

Lakhta Center entrance arch is a large span metal structure. A cross frame system bears bearing loading.

The facility refers to a higher building criticality level in accordance with the provisions of the Regulation on Safety of Buildings and Facilities and GOST R 54257-2010.

The material of the main superstructure is concrete B35, W6, F75.

The substructure is from waterproof concrete (W10).

The concrete of the main substructure is concrete B35, W10, F100.

Steel is of strength grade C345 according to GOST 27772-88 and according to group 1 according to table 50 SNiP II-23-81.

Reinforcement A240, A500C according to GOST R 52544-2006.

**Reinforcement of reinforced concrete elements:**

- foundation slab – the main reinforcement Ø16 A500C spacing 200, additional reinforcement Ø25 A500C spacing 100;
- floor slab at elevation -0,150 – the main reinforcement Ø16 A500C spacing 200, additional reinforcement Ø25 A500C spacing 200;
- foundation under the arch - Ø12 A500C spacing 300x300, shear reinforcement mesh;
- columns up to 8 Ø28 A500C, transverse reinforcement Ø10 spacing 150, 300;
- walls, vertical and horizontal reinforcement Ø16 A500C spacing 200;
- beams – upper 5 Ø32 A500C, lower 5 Ø32 A500C.

## Facade Cleaning System



A unique system of hoisting mechanisms is tailor-made for Lakhta Center Tower to maintain (clean and current repair) of glazed facades which will successfully operate

on the building of a twisted and convex shape.

Building maintenance unit is designed separately for each “leaf”.

A smart snow removal system is designed, PETD impulse method will be applied.

The total area of the facades is over 130,000 sq.m. of glass which should be maintained clean and the elements of the structures should be repaired, if necessary.

Up to elevation of 369m a Building Maintenance Unit operates comprising carriages, a platform, rails along the arris of the building. Rubber rollers prevent from damaging the façade.

The entire system ascends from the ground level. Two people can be on one platform. There are three safety steps, i.e. the main rope, a backup rope, a lock system.

The top of the pinnacle will be maintained by industrial climbers. They use electric traction hoists.

North and South Blocks of the Complex have fairly complicated inclined facades. To maintain them the following will be involved: two portable cranes with boom outreach 4.37m, six cranes with boom outreach over ten meters, the atrium inside other two cranes with boom outreach 12,5m.

To maintain the arch facades skylifts will be used with a maximum operating boom outreach 18m.

Cradle fixation points will be provided throughout the façade with a negative gradient. A cradle can be fixed and heaved alongside the façade as it goes up or down.

An overall time of glass cleaning in the tower is 94 days. The crew comprises 20 workers.

The cleaning of the facades of two blocks takes 119 days outside and 104 days inside. The crew comprises 20 workers.

## Multifunctional Transformable Hall



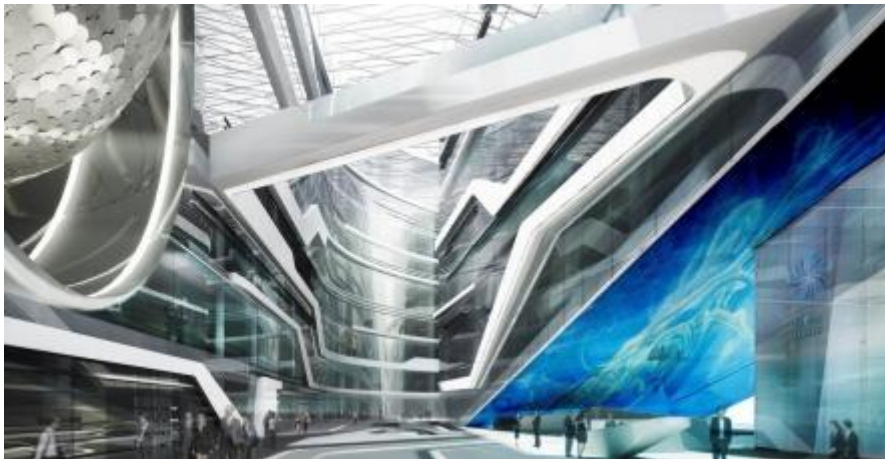
The maximum capacity of the hall is 494 seats. It will be the first transformable hall in Saint Petersburg.



A large hall will be transformable into two smaller halls. Concerts, theater performances, ice shows, fashion shows, conferences, etc. can be arranged here. For each event the hall can be completely transformed. Seating layout, stage sizes and configuration can be transformed. A roll-out ice arena can appear which will be used as a free skating rink when no events are held.

The multifunctional conference hall will make up a shortage of high quality venues to house business events and undoubtedly facilitate to developing tourism in our city.

## **Exclusiva Design**



Exclusiva Design is an Italian luxury design company with significant experience in the realization of turnkey interior design projects.

Our name fully expresses our corporate vision: exclusive intended as unique, as the final objective of lengthy periods of research, creating a one of a kind product, a symbol of elegance, class, elevated quality, and taste.

Exclusiva Design offers a full range of services, from concept design to the realization of each single part of any project.

Created in 2008 as the unification of different though complementary professional skills and personalities, today it is a solid business, a wholly Italian reality that has quickly established itself as a point of reference for luxury design.

A taste for all things beautiful, a precise characteristic of the Italian way of life, together with an attention to detail, make Exclusiva Design an example of excellence. We guarantee our clients the possibility to see their dreams come true, in a unique style and based on an exclusive approach.

We are the ideal support for grafting the competencies of a wide range of disciplines linked to the world of luxury design into a common passion for creativity, innovation and experimentation.

### **MISSION**

Exclusiva Design's mission is to transform the dream of a "custom made world" into

reality: creating the spaces of luxury, where beauty, excellence and function each play their own role, in perfect harmony.

Our distinctive, unique approach is a guarantee of elegance and style. These are the characteristics of a method that holds true to a single guiding principle: the search for beauty, with highly skilled attention to detail applied each phase of the creative process, considered as the hallmark of excellence Made in Italy.

Web: <http://www.exclusivadesign.com/>

## Renaissance Construction



Renaissance Construction is a renowned world leader in the construction sphere.

Renaissance Construction is an international construction company set up by Turkish engineer Erman Ilicak in 1993 in Saint Petersburg. So far the company has completed over 500 projects of the total area over 15 mln sq.m.

Renaissance Construction is specialized in design and construction of shopping malls and business centers, multifunctional complexes, hotels, heavy industry facilities, residential buildings, energy and infrastructure facilities.

A strong engineering potential, extensive experience and high quality of services, minimization of any adverse impact on environment and enhancement of environmental protection actions; these are what the company's clients appreciate this company for. The clients are the Russian Academy of Sciences, Saint Petersburg and Kazan State Universities, Lukoil, Baltika Brewery company, Baltoneksimbank, Promstroybank, IKEA, Merloni, Wrigley, Yarpivo, Baltic Beverages Holding, Carlsberg, Nestle, Procter & Gamble, Ford, Shell, Neste, Stollwerck, Pratt & Wrigley, Venio, Unilever, Knauf, Kraft Foods, Campina, Ramboll, Marazzi, Bericap, Intel, Troplast, Avon, Pfeleiderer, Renau, Auchan, OBI, Leroy Merlin, etc.

Renaissance Construction operates in over ten countries on three continents: Russia, Turkey, Turkmenistan, Austria, Switzerland, Belarus, Lybia, Irak, Qatar, Azerbaijan, Gabon and a few other countries. Over 35,000 people are employed in the company.

At present the Renaissance construction order portfolio accounts for about 7 billion dollars.

Since 2006 Renaissance Construction has ranked on the list of 225 largest international contractors (Top 225 International Contractors) according to a recognized American edition of Engineering News Record (ENR). In 2014 it was ranked 53rd on the Engineering News Record Top 250 International Contractors list.

Company's website: <http://www.rencons.com>

## CURRENT STATUS OF CONSTRUCTION

All concrete works have been completed in the skyscraper, the composite columns and floors are erected. Starting from the 83th storey, underspire columns are being installed, which are steel tubes of a large diameter. The Tower spire is being erected. The structure's height is 117 m; its mass is 2,000 tonnes.

The installation of the multifunctional building steel superstructure is completed. The building has reached its design elevations: the maximum height of the facility is 85 meters, and storey difference is from 7 to 17 storeys.

The glazing of the facades of the multifunctional building and the Tower is under way. More than 80 per cent of outer glass units are installed.

The work of laying MEP systems in the complex is also under way. All life support systems are being installed simultaneously: ventilation, water supply system, heat supply system, sewage, fire extinguishing system, automatic data collection, and vertical transportation.

Office elevators from 1 to 52 floors of the Tower are installed and functioning; these are the lower-and middle-zone elevator groups. The completed vertical transportation system will be able to carry 1,280 people at the same time.

In September, the builders began to install the main entrance arch of the Lakhta Center, which is the fourth and final facility of the complex, along with the Stylobate, the MFB and the Lakhta Center Tower. The first arch truss of the four trusses has been installed, which is the load-bearing structural element of the building.

The construction of the entire complex will be completed in 2018. The first facilities will be opened in the summer of 2019.

Divisional leader Hakan Hatipoglu "Renaissance Construction" JSC: «Lakhta Center will be the tallest skyscraper in Europe. The level of complexity of the design is second to none. The building structure goes up to the sky by exhibiting various geometrical movements, such as inclining, bending and twisting. This results in a



prominent architecture which requires state of the art construction technology. The team are enthusiastic about creating an iconic building».

