

## CONCERNING THE CONCEPT OF LIGHT-COLOUR ARRANGEMENT OF THE URBAN ENVIRONMENT IN THE CENTRAL PART OF TYUMEN

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### ABSTRACT

The article provides a comprehensive analysis of outdoor lighting in the central part of Tyumen (with consideration of conducted field observations) and prospects of its development on the basis of the general plan of illumination of the central part of the city being under design. Main provisions of this general plan as well as methodological principles and assessment criteria of design solutions illustrated by photographs, schemes and visualisations of the illuminated objects are described.

**Keywords:** light-colour arrangement of the urban environment, light design, general plan of illumination, light “framework” and “fabric” of the light arrangement structure of the city

Tyumen is the administrative centre of a large region in Western Siberia, one of the cities rich in historical and architectural heritage, culture and landscape. The ancient centre of Tyumen, the first Russian city in Siberia founded in 1586 upon the confluence of two rivers Tura and Tyumenka [1], is marked with a square (where the Lenin and the Republic streets cross) with a monument to founders of the city. In 1601, the first Trans-Urals post coach station was built in the city, and in 1843, the first steamship in Siberia was heaved off. In 1941–1945, the sarcophagus with the body of V.I. Lenin was kept in Tyumen. Since 1953, it is the oil and gas industry capital of Siberia. By the end of the 18<sup>th</sup> cen-

tury, about 3 thousand people resided in Tyumen [2] and nowadays the population of this rapidly growing city numbers 770 thousand people. It was established as a trading centre crossed by numerous trading routes. Its contemporary development is performed both in free peripheral territories and by infill development of established low-rise districts, often with associated problems of historical and architectural heritage preservation.

It is the only capital of a constituent entity of the Russian Federation where the governor liquidated the position of chief architect of the city, however in 2017, Tyumen was the first in the contest of Russian cities in nomination of the Best Russian City for Residence.

There are several universities in the city including the Federal Tyumen Industrial University (TIU) formed in 2016 by merging the Architecture and Construction University (TyumGASU) and Tyumen State Oil and Gas University (TGNGU). In 2012, the Architecture and Design Institute (ARHID) was founded, it united two sub-departments of TyumGASU: Architecture and Architectural Environment Design. As part of its educational, research and international activities, it implements a number of projects aiming at development of architectural environment and preservation of the historical and cultural heritage of the city and the region; since 2003, it also holds the Zolotaya ArkhIdeya International Youth Architectural and Art Festival which includes creative contests for children and young



Fig. 1. Scheme of compliance of the illuminance level of the Lenin st. with norms of SP 52.13330.2016 based on the report of instrumental observation of priority objects of urban environment (August 2017)

people and scientific conferences. The student projects of ARHID take high prize place in international architecture and design contests every year. Many of its graduates successfully work not only in Tyumen but also in other regions of Russia and abroad.

Since 2016, ARHID (being a part of TIU) has been developing the strategic concept project “Architectural Image of the Region” which aims at forming of an innovative, comfortable and investment-attractive image of the region located in harsh Siberian climatic conditions, increase of the role of architecture as an integral and distinguished part of its history and culture, adaptation of the historically established environment for contemporary reality with preservation of valuable heritage. One of the sections of the project is “Development of the Colour and Light Image of the Region and Central Part of Tyumen”, and its light design, colouristic and land improvement aspects are being developed in cooperation with MARHI (SA). The list of the studied towns includes also Tobolsk, Salekhard, and Yalutorovsk.

As part of the project, comprehensive pre-design study was performed, priority territories and objects were defined, and their hierarchy and problems were identified. The “tourist” streets where visitors start sightseeing were selected in the first instance. The roads from the airport, the bus station and the railroad station intersect in the central part of the city and coincide with its historical development structure. They include the Lenin st. (Spasskaya before the October Revolution) which crosses a number of public areas and links Yamskaya st. (leading to the Roshchino International Airport) with Pervomayskaya st. (leading to the Privokzalnaya square). The street (with length of 2.5 km and remaining sites of architectural, historical and cultural heritage) is the main ensemble of the city. Pre-

viously there were the temples of four religious denominations in it, namely the Archangel Michael and Spasskaya churches, the St. Josef Roman Catholic temple, Muslim mosque and a synagogue, some of them are lost.

The main goal of the Light Design section of the project is “development of the concept and methodology of light and colour arrangement of the urban environment with consideration of regional distinctions and with efficient use of energy-saving technologies with comprehensive solving of design problems of outdoor illumination and architectural colouristic.”

In 2017, with participation of educators and students of TIU, visual and instrumental field observations with photographing of daytime and nighttime situations and measurement of existing light engineering parameters of illumination were performed in pedestrian areas of the central part of Tyumen (Fig. 1) and on facades of architectural objects located in guest streets, squares and parks of the historical centre. The obtained picture was rather variegated and contrast: the measured levels of horizontal illuminance  $E_h$  and non-uniformity of its distribution over surfaces of pavements, lanes and alleys were lower than the standard values in some areas (twice as little) or, less frequently, exceeded them (fivefold), just as the values of luminance of illuminated facades of selected buildings and structures did (Fig. 2).

On the basis of the observations, the analysis of the state of light environment in the centre of Tyumen and the quality of architectural illumination of outstanding objects was performed, and common disadvantages of the existing light environment were found: in particular, non-uniform, insufficient or excessive illumination distorting facade plastics, dazzling pedestrians, etc. [3] At the same time, the

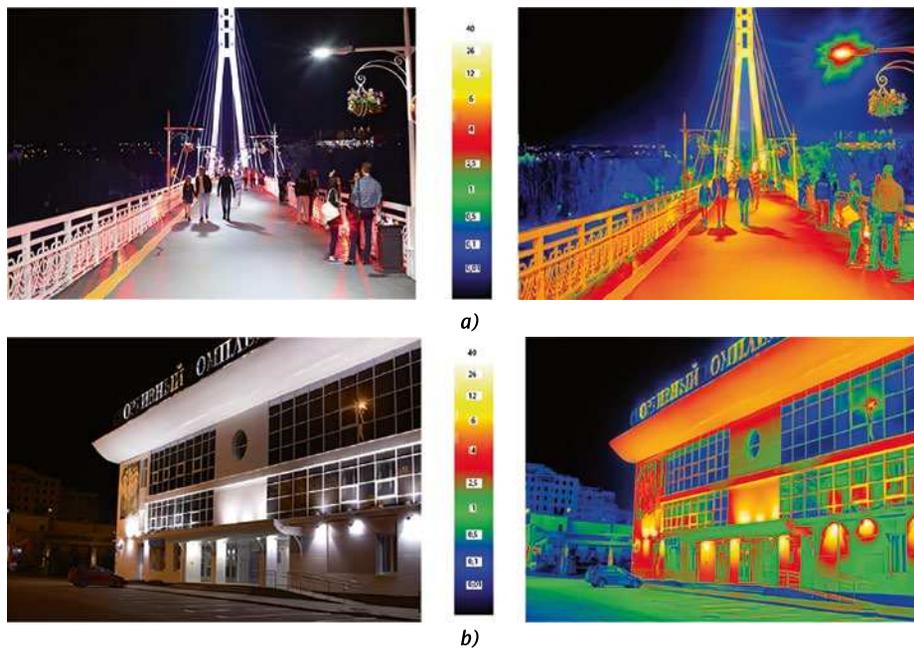


Fig. 2. Night-time photographs of the illuminated objects with facade luminance distribution presented in pseudo-colours: *a* – dynamic illumination of the pedestrian cable Bridge of Lovers across the river Tura at the intersection of Lenin st. and Republic st.; *b* – main facade of the Central Sports Complex

domination of yellow light of high-pressure sodium lamps (HPSL) traditional for many cities (not only Russian ones) still remains in outdoor lighting including pedestrian areas. Lighting devices (LD) with discharge and LED sources of white light are still of low proportion (which is rising year by year but without visible system of sequence and priority). Outdoor lighting installations (LI) are mostly characterised by archaic aerial power lines, primitive design (with some exceptions) of light post luminaires including retro luminaires with inefficient LDC.

There are hundreds of buildings and structures equipped with facade architectural lighting (AL) installations and electrical advertising of different quality in the city ranging from classic Soviet monumental palaces of the Government of Tyumen region (Fig. 3, *a*) and Regional Duma (Fig. 3, *b*) with “modest” and not tectonic enough local and spotty lighting to small private objects equipped with rope light. In short, virtually the whole range of light engineering methods and light-and-composition techniques is used which is not always appropriate for historical buildings in terms of art (Fig. 4, *a* and *b*) but creates rather decorative “pointillistic” effect on modern glass facades (Fig. 4, *c*) or symbolic coloured image of buildings (Fig. 4, *d*).

Singleness and variety of urban AL objects which are in a varying degree typical for all Rus-

sian cities and towns including Moscow do not allow us to say that there are harmonious urban light ensembles formed in Tyumen which are of significance for the city and the region. For example: colour and dynamic lighting of the pedestrian ca-



Fig. 3. Architectural lighting of the main facade of the building of the Tyumen region government at Lenin square (*a*) and the building of Tyumen regional Duma (*b*)



Fig. 4. House of G.T. Molodykh (a) and House of M.A. Bryukhanov (b) are the examples of stone buildings of the second half of the 19<sup>th</sup> century – early 20<sup>th</sup> century with commercial premises on the first floor (Pervomayskaya st.) illuminated by advertising lighting alien to the nature of historical architecture; Tyumen Infection Pathology Research Institute (c); Sberbank building in green light (d)

ble bridge across the Tura river is well-perceived at a distance but not nearby where the glare effect caused by non-accurate installation and aiming of LD are obvious; varying chromaticity of the facade lighting of TyumGASU (building of TIU (Tyumen Industrial University) – ex-Kolokolnikov college) does not fully comply with the status of neoclassical building of early 20<sup>th</sup> century (Fig. 5). However, existing AL of a number of objects deserves appreciation, for instance: traditionally floodlighting white AL of Krestovozdvizhenskaya and Spasskaya churches (Fig. 6); combined light AL of the Drama Theatre (Fig. 7, a) and colour lighting of Orion shopping centre (Fig. 7, b). However, unfortunately, the main historical and architectural dominants of the central part of the city, the Svyato-Troitsky monastery and Voznesensko-Georgievskaya church, are still not illuminated.

The functioning mode of LI of some of the above listed objects is unpredictable (sometimes they work, sometimes not), adjustment number of operating LDs, and chromaticity of LSs in a united group of LDs are unbalanced. These are defects of work of operation services which to a certain extent are peculiar not only to the Russian practice of urban light design.

On the basis of the materials of field observations and contemporary light design ideas and meth-

odology, the concept of the general plan of illumination of the central part of Tyumen is being developed<sup>1</sup>; it can serve as a strategic systematising and regulating document for the existing and prospective reconstruction of the outdoor illumination of the city as part of the general land improvement works. It solves three groups of interrelated and the most significant urban light problems: light-planning, light-spatial and visual-artistic ones [4]. The light-planning problems of light-and-colour zoning of the territory are based on the classification of the general plan elements (per A.E. Gutnov) as “urbanised” areas (transport and pedestrian streets and squares), “natural” areas (woodlands and watercourses), “structure” and inter-route “fabric” (residential areas). Creation of differences in levels and chromaticity of illumination of “structure” and “fabric” elements visible during night time with consideration of their town-planning hierarchy is the main tool for solving of this problem, mostly by means of utility outdoor illumination with different scale and design in transport and pedestrian areas providing the required level and quality of lighting. And while the quantitative characteristics (luminance

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Fig. 5. Dynamic colour lighting of the Bridge of Lovers (a) and the historical building of TyumGASU TIU (b)

and illuminance of road surface, semi-cylindrical illumination in some pedestrian areas) and their distribution are regulated by standards, selection of chromaticity of illumination in different areas is an issue of concern due to introduction of LED-based LDs and expected end of operation of HPSL in the city, which, to some extent, leads to loss of one of the tools of light-and-colour zoning of urban space. The concept specifies stage-by-stage replacement of yellow light of HPSL-based LDs in outdoor illumina-

tion with white light of LED-based LDs with different  $T_{cp}$  in different areas (white light is used primarily in central “guest” streets and squares).

For solving of the problem of light and spatial arrangement of the urban environment, all three groups of LIs are forecast: utility, architectural and informational lighting. Special attention is paid to lighting of pedestrian areas [5]. Due to lighting of the ground and facades of objects forming it, the light environment of the city obtains three-dimen-



Fig. 6. Floodlight illumination of architectural monuments of the 18<sup>th</sup> century: Krestovozdvizhenskaya (a) and Spasskaya (b) churches



Fig. 7. “Classic” illumination of the Tyumen Drama Theatre (a) and modern colour illumination of the Orion shopping centre (b)

sionality. Its optical structure is an intermittent and continuous system of areas with different scale, designation and hierarchic level modulated by light, with specific rhythm, discrete and heterogenic light engineering parameters in which, in turn, the hierarchic system of light ensembles and dominants, which dominates in the light composition of the city and is very important for it, should be distinctive. Light modulation is performed on the basis of conceptual light-and-colour zoning by selecting corresponding means and modes of illumination of the ground surface and objects forming the light environment in specific situational spaces and light architectural ensembles which are radically different from daytime ensembles in terms of visual characteristics.

Evening perception of the light ensembles and dominants is calculated at far, medium and close distances, for this purposes the concept specifies the tourist view points of light panoramas and deep light perspective views, though basically flat and low-rise Tyumen development does not give many reasons for it so far.

The conceptual visual and artistic problem consists of visible finding and creative interpretation of expressive features and distinctions of the architectural shape of objects and ensembles, creation of their original light images using the principles of as-

sociative resemblance to daytime images or creation of an alternative “counter-image” [4].

As the field observations showed, the best examples of AL of the objects in the centre of Tyumen, including that of architectural monuments, follow the former principles while a lot of the others are variably compromise and controversial.

So, in the general plan of illumination of central Tyumen, the “urbanised” and “natural” light structures (Fig. 8, a) and the residential areas forming the development “fabric” of the city may be identified. The hierarchy of the light ensembles of the city and night-time dominants with consideration of already established situation and prospects of development of centre is forecast (Fig. 8, b).

Inevitable modernisation of LIs of the “urbanised structure”, i.e. the transport and pedestrian streets and squares, is already begun by replacing discharge lamps LDs with LED-based LDs. So the design of LI elements and chromaticity of outdoor illumination are changed, aerial power lines are replaced with modern underground cable lines (unfortunately, not everywhere), etc. According to the concept, it is necessary to solve the problems of light-and-colour zoning of urban areas (primarily transport and pedestrian zoning) clearer using the available means: different levels, chromaticity, techniques and modes of illumination operation, design

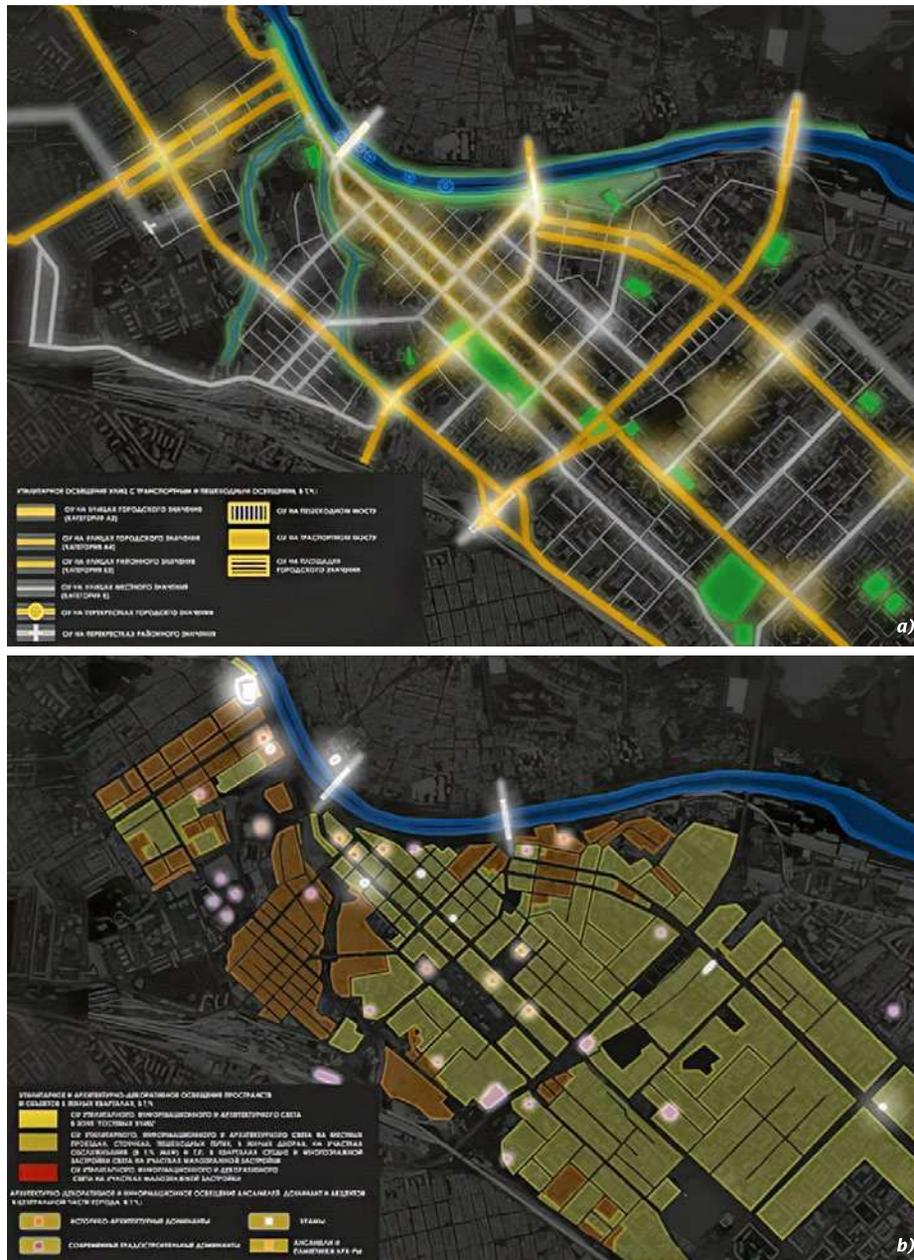


Fig. 8. General Plan of illumination of the central part of Tyumen: *a* is the the urbanised and natural “light structures”; *b* is the “light fabric” and the system of lighting dominants

and scale of LIs. These parameters are presented in the legend and explanatory note to the general plan of illumination.

Similar measures are specified for the “natural structures” and the residential “fabric” of the city. When looking at the general plan of illumination, it becomes clear that there is obvious deficiency of woodlands as the main elements of the “natural” structure in the central part of Tyumen: only the Tura river with the improved embankment on a high right bank forms its reliable “trunk” which requires a developing natural “canopy” in the residential “fabric”.

By morphology, the elements of “fabric” in the central part of the city are categorised as follows: the quarters with dominating contemporary high-rise buildings and predominantly low-rise development with consideration of its historical value. It is crucially important to select and provide such light-and-colour parameters and design of LIs in all internal areas so that the created environment is intimate, human-scaled, visually comfortable and safe, and provides positive emotions.

The French call this quality “*ambiance*”, i.e. pleasant atmosphere, or, as a synonym, “favourable psychological climate”, which is extremely



Fig. 9. Computer visualisations of the fragments of night-time light environment in sketch projects of Lenin st. improvement

important in residential areas during long autumn and winter evenings in Siberian climate. The important social task of yard spaces and recreational environment, and, in the first place, of outdoor illumination is to make residents (children with parents, grand-fathers and grand-mothers) to go out to communicate and have some rest after a working day. To solve these tasks, not only the utility lighting installations dominating in urban illumination (in terms of the number of lighting points, power consumption, etc.) should be used but also other groups of architectural and informational lighting.

Unlike the city streets and squares where conceptual recommendations may be followed not from scratch but mostly by stage-by-stage reconstruction of existing LIs, improvement and lighting of residential areas which in many cases does not comply with contemporary standards requires taking drastic measures. That is why the authorial team of TIU with participation of educators, architects, and students alongside with general conceptual design performs more detailed and attentive sketch designing of comprehensive landscaping, including lighting and colouristic, of the fragments of urban environment in the centre of the city at the streets Lenin, Republic, and etc.

The visual characteristics of the fragments of light environment and light ensembles provided

by different techniques and means of architectural lighting of facades of buildings, structures and urban landscape objects are forecast in sketch computer visualisations of development and perspective views in pedestrian perception scale (Fig. 9).

A specific light design problem is AL of one- and two-floor historical buildings, frequently wooden and with original decoration, where use of local illumination by means of LDs mounted on facades seems to be not appropriate enough. It means that original solutions of LDs should be found at the following stages. Different styles and heights of development in many streets with existing spatial “gaps” also complicate the use of “classic” light-ensemble techniques, which becomes evident during development of lighting “tapes” at both sides of streets. That is why the ideas of comprehensive reconstruction of the architectural environment with extensive use of small forms, including original lighting forms, and increasing volume of deficient landscaping to fill these “gaps”, seem prospective and are supported by the authorities in Tyumen.

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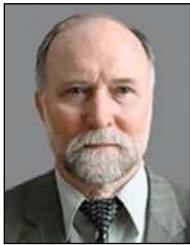
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