

world. Furthermore, it was the first building where Z-bar steel columns, invented by Charles L Strobel, were used.

At that time in New York Joseph Kendall Freitag published the book *Architectural Engineering*, where the basic construction & technological features of high-rise buildings and examples of main structures were presented[5]. Thus, all fundamental constructive elements, necessary for the next stage of the frame construction, were developed.

The frame method of construction, modified in the USA, began to be recognizable also in European building construction. France and England were the first European countries to have applied steel frame construction in high-rise buildings. Construction of the Trading House in Reaumur Street in Paris proved the fact that France introduced the authentic architecture.

## **THE IMPACT OF ELECTRIC VEHICLES ON THE OVERALL LEVEL OF DEVELOPMENT OF KHARKIV**

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**Abstract.** *Urban electric transport is an important sector of the national economy, which affects the general level of development of the city. In the article it is described the advantages and disadvantages of different modes of urban transport. The levels of development of transport in Kharkiv are considered. It is shown the effect of infrastructure on a general picture of the city.*

**Keywords:** *city, urban electric transport, infrastructure, underground, trolleybus, tram.*

The degree of urbanization is increasing today. Big cities do not just grow rapidly absorbing the surrounding villages. They merge with each other forming cities with lots of population. With population growth there is a need to move fast, comfortably, mobile from one area to another in the city. The implementation of these requirements is carried out by using of cars by population. Indeed, in nowadays, modern person cannot imagine his life without such vehicle as a car. But the constant use of the car leads to a negative impact on human health, nature pollution and anthropogenic environment, increasing traffic jam etc. So, an urban electric transport is alternative to cars.

Urban passenger electric transport is an important sector of the municipal economy. A modern city simply cannot exist without a well-functioning transport system. The city should be a rational complex structure of industrial zones, residential areas, public and cultural institutions, enterprises, transport, engineering equipment and energy, leisure time of people. The development of modern cities (the so-called cities-millionaires) is accompanied by an increase in their territories, the

opening of new industrial areas, migration to new outlying areas and suburbs, the destruction of residential areas from places of rest and labor. As the results it is increasing travel distances of citizens to work and home, total time of finding a person in the road, increasing the number of residents who use public transport, increasing the average number of trips by residents. So, efficient operation of urban transport is an important issue in the functioning of the big city.

At urban electric transport accounts for 60% to 75 % of all urban passenger transportation. In Kharkiv the transferring of passengers by urban electric transport is about 72% (In 2014, the subway, trams and trolleybuses were transported 438 million passengers, representing 71.9% of the total number of passengers carried in the regional center). Carriage of passengers takes place on 24 routes 224 trolley buses of different types, on 13 routes 302 trams, on 3 metro lines 322 cars (information on the state of 01.01.2015).

Urban electric transport has several advantages. The underground takes pride of place in the carrying capacity of passengers, speed of communication, accuracy and regulation of movement, the degree of road safety, and conditions of travel for users of the metro etc. Trolleybuses also have their advantages; it is primarily a small initial cost, no harmful influence on the environment. The tram has its own advantages: a relatively large capacity (less than subway, but the largest among the terrestrial forms of public transport), low transportation cost, long lifetime of rolling stock, easy to control by tram (tram train).

A number of the advantages provide the prerequisites for the rapid development of electric vehicles not only in Ukraine but in Europe.

In our days in Kharkiv trams and the tram manage going through hard times. They have exhausted two or three operational terms, the end of its depreciation period. Purchase of new rolling stock is not performed, which leads to the destruction of the functionality of the transport system of the city. A noticeable trend in reducing the number of tram routes, the number of tram unit on the lines, increasing the spacing between the movable units.

But it should be noted that some work on rectifying this problem still underway. Older rolling stock is being modernized by the introduction of new technologies in the units of the tram and its units; reconstruction of track facilities, replacing the postwar rails on modern with noiseless lining; on the ground of worn contact wires appear new; the work carried out and replacement of poles, which perfectly fit into the historical picture of the city.

Due to the increasing cost of fuel, the residents of Kharkov transplanted from cars to trams, which is an influential factor in the further development of this type of urban transport.

Trolleybuses in the Kharkiv city are in development at the level higher than the trams. Updated park depot, through the procurement of trolleybuses domestic manufacturers, their number gradually increases. The number of routes and the units on them is not reduced. Notable is only serving old equipment that no longer meets the latest standards. Still, the work in this direction is in the right direction.

Today it is impossible to imagine Kharkiv without the underground system and its comprehensive effects. So, use of the subway is convenient, fast, and comfortable. Well-developed scheme best meets the need of transporting passengers to work, or community centers. The level of development of the underground, compared with other modes of urban transport, is significantly ahead. The rolling stock is outdated, but after the overhaul and modernization of both external and internal units and units, has a decent look. The work is done in the technical re-equipment and improvement of management systems work stations. It should be noted the interiors of the stations, which affects the fusion of engineering and art. The metro ensures complete safety of trains, the appropriate level of culture of service of passengers. We are constantly searching for ways to improve the efficiency and quality of rail subway.

So, the development of the city causes increase of population, which causes the need for urban electric transport. The level of development of transport affects the overall picture of the city. Well-developed transport system that stimulates the mobility of the population, which in turn leads to equalization of rates of economic growth and investment attractiveness of different areas that are interconnected, however, the increasing educational and cultural level of society. Therefore, urban electric transport is an integral part of city life.

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## **LIGHTWEIGHT CONCRETE**

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In our time concrete is the main construction material for building. More than a thousand kinds of various concrete and a great variety of special concretes with different complexes of properties are used nowadays.

Comparative simplicity and availability of concrete producing technology, a wide possibility to use local raw materials and wastes of industry and power engineering, low energy needs for production, reasonable price and a wide possibility