already represented their own electric micro cars concepts.

As an example of non-fossil fuels, English town Milton-Keynes, 70 miles from London, which becomes the place of the pilot launch of the first 8 electric buses. Transport will run on the route with total length of more than 24 kilometers. A peculiarity of innovative transport is that it will be used all day, buses will not have to go to the station for charging, because they will charge wirelessly via surface induction coils built in the road. Three reels will be used for bus charging, two of them will be located on the final stop of the route, and the third one will be on the middle of the route. The government of Milton-Keynes believes that the project will decrease the amount of emissions in the city. This, in turn, will reduce air pollution.

One of the most exciting innovations in transport is an unmanned vehicle which was firstly presented to the public at the beginning of the last century. Nowadays, creating an unmanned vehicle has moved far ahead, due to the rapid development of computer technologies, improvement of various kinds of sensors, position sensors and acceleration of the process. Major automakers have already submitted a modified version of serial models, which are automatically controlled under certain conditions (usually during driving on the highway). Such cars can independently rearrange the rows, perform overtaking at speeds of 100 km/h and emergency braking.

The role and need for transportation engineering will grow in the 21st century. A growing and more affluent population will increase demands for travel and improved transportation facilities and services. There will be a need for environmentally sensitive and creative designs, ingenious management and operating strategies. There will be a need to achieve community consensus in making these a reality. Transportation engineers should be well positioned to meet these challenges. Transportation engineering in particular must provide an integrated approach that includes planning, statistics, economics, finance, public policy, operations, and management. It must provide a sense of physical, environmental, and political reality.

References

1. Kumares C. Sinha; Darcy Bullock; Chris T. Hendrickson; Herbert S. Levinson; Richard W. Lyles; A. Essam Radwan; and Zongzhi Li. Development of Transportation Engineering Research, Education, and Practice in a Changing Civil Engineering World / American Society of Civil Engineers: Journal of transportation engineering, 2002 – 350p.

2. Chase, M. J., and Hensen, P. J. Traffic control systems—Past,present, and future. J. Transp. Eng.,1990 - 717p.

ON HIGH-RISE BUILDINGS WITH STEEL-CONCRETE COMPOSITE FRAME

KATERYNA TOPORKOVA, post-graduate student
O.M. Beketov National University of Urban Economy in Kharkiv

In recent years frames application is of vital concern within architectural and construction system of high-rise buildings both in Ukraine and abroad. In particular,

steel-concrete composite frame (SCCF) construction has gained wide acceptance in building high-rise structures owing to its advantages over steel and concrete construction. These systems have been mainly recognized worldwide due to the wide possibilities of space-planning solutions they offer (e.g., simplicity of manufacture and installation of structures, a wide range of application of system of unification and typification of the main structural elements). However, such systems are still a relatively new concept for construction industry in Ukraine.

Since complicated frame system of steel and concrete can provide efficient and cost-effective solutions for construction of the majority of high-rise buildings in our country, the search for these systems rational solutions is of urgent value. The greatest impetus for SCCF systems implementation may serve the necessity to modernize construction domain in Ukraine. The aim of the paper is to trace the SCCF development in world construction experience context.

Significant advance in steel production occurred in the late 19th century, enhancing construction of steel high-rise buildings. It is common knowledge that the production of steel began when English engineer Henry Bessemer invented a process for the manufacture of steel from molten pig iron (1856). According to the Columbia Encyclopedia, “The process was introduced to the U.S. steel manufacturing industry in 1864”[1]. It presented the first inexpensive industrial technique for the construction of unique buildings. However, cast iron continued to be the main material for construction, since it was first used in pagoda construction in Tang Dynasty China. This preference was caused by difficulties with producing steel from alkaline ores. Thus, it necessitated the elucidation of potential opportunities of usage of steel as a construction material.

In 1879 Sidney Gilchrist Thomas solved the issues of eliminating phosphorus from iron that, undoubtedly, became the beginning of wide application of steel in the construction industry[2]. It permitted to construct steel structures of different assignments and, moreover, to combine steel and concrete in the same construction.

Various studies have revealed that the concept of *steel-concrete composite frame system* originated only in 1885. According to Encyclopedia Britannica, the first high-rise building was the Home Insurance Company Building to apply completely all-metal structure in its frame. It was constructed in Chicago in 1885 by engineer William Le Baron Jenney. Building had a 10-storey structure and stretched 138 feet in the air. The frame was made from cast-iron columns, supporting wrought-iron and rolled-steel beams that allowed providing a stability and rigidity of construction systems [3]. Coincidentally, it was the first building to have comprised steel beams.

This solution facilitated the further development of construction practice. As a result, “In 1888, a Minneapolis architect named Leroy Buffington was granted a patent on the idea of building skeletal-frame tall buildings (…) Buffington brought the potential of the iron skeletal frame to the attention of the national architectural and building communities” [cit.ex. 4].

It has led to construction of the first all-steel structure Rand McNally Building, erected in Chicago in 1890. The building was designed by Burnham and Root. The construction in question was considered the first all-steel framed skyscraper in the

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

ROMAN VORONOV, post-graduate student specialty of "ELECTRIC VEHICLES"

A. M. KROKHMAL, PhD (Pedagogic), Associate Professor,

O.M. Beketov Kharkiv National University of Urban Economy

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