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SAFETY MANAGEMENT OF THE COMPLEX PROJECTS AT THE CONCEPTUAL STAGE OF PROJECT LIFE CYCLE

Abstract. Based on the literature and data analysis, the basic safety requirements for sports facilities. It was described the critical path evacuation of spectators from sports and entertainment facilities during an emergency. Theoretically it is modeled the process of timely evacuation of people in the safe zone. Reduced safety of project construction of sports facilities at the conceptual stage of the project life cycle.

Keywords: safety management, complex projects, evacuation of people, the project life cycle, conceptual stage, the stadium tier.

Introduction

Successful implementations of projects for Euro 2012 depends on whether UEFA will take into operate Stadium. Therefore, the main criterion that puts UEFA is safety. To ensure the safety it is necessary to consider the project at the conceptual stage of project life cycle.

In preparation of Ukraine to the finals of Euro 2012 should solve the problem of safe operation of sports and entertainment facilities, which ever paid much attention. This is due to a large crowd during a variety of sports and entertainment pieces, concerts and recreational business shows, etc. Emergency on such objects often accompanied by injury and loss of life. Primarily this applies to emergencies that pose a real danger to humans within minutes after their occurrence and intense action of the people of dangerous factors. The most reliable way to ensure the safety of people in such conditions is timely evacuation of the facility.

Literary analysis

Addressing this issue is placed on the conceptual stage of the project life cycle. This is because what is at the design stage of the object with a mass stay of people should take into account global and European building codes and standards governing the safety requirements for sports facilities to reduce the risk of the project [1].The solution will conduct land that use stadium for Euro 2012.

As world experience shows the basis for safety of spectators at sports and entertainment facilities is to eliminate the risk of committing a terrorist act, providing immediate emergency response units to emergency that are in place for public events, the rapid evacuation to a safe area or space, to prevent crowds of men and crossing large streams provide quality first aid and more.

One of the most important tasks to ensure the safe operation of sports and entertainment facilities is timely evacuation of people. In European standards clearly state that the duration of the evacuation of spectators at a safe zone and outside sports facilities should not exceed 8 and 12 min. respectively [2, 3]. Therefore every object of Lviv Euro 2012 stadium should have such a space-planning and technical implementation to evacuate people from the premises that was completed before reach Hazard emergency limits. In this regard, the number, size and design evacuation routes and exits are determined depending on the required evacuation time, so the time during which people must leave the premises without giving in to dangerous to life and health of the dangerous factors. Data for the required evacuation time is the initial information for calculating the level of security people in extraordinary events at the stadium. Incorrect definition of necessary evacuation time can lead to wrong decision-making project, increasing the value of buildings and the risk of the project due to insufficient security of people in case of emergency.

Exposition of basic text

Therefore, the main directions of the project construction of sports facilities at the conceptual stage of life cycle analysis are all elements that are in operation to evacuate people, developing a mathematical model of the process of evacuation,

study criteria and on that basis the development of method of determining the optimum time of timely evacuation of people.

Taking into consideration that the evacuation of people from the sport - entertainment facilities during emergency situations relating to complex systems it is necessary to analyze the critical path of evacuation of the most loaded sector in order to optimize and develop a systematic approach to solving problems concerning the management of time people were evacuated from buildings with mass stay of people.

Having reviewed the process of operational evacuation of the stadium as a flexible production line, we introduce the notion of critical path, a buffer zone and will analyze various topologies evacuation schemes. To calculate the time of evacuation to a safe area must first identify the most labor-intensive way of evacuation areas (buffer zones) and apply them to parallelizing operations, pipelined and duplication. After analysis of the sector top and bottom tiers of the stadium into account the complexity of human movement and flow of people, identify the most loaded.

Timing evacuation of the sectors present in the safe zone as a series of calculations using a computer and software that takes into account the topology of evacuation routes TOPAL-EVAKAS. The computer simulation by means of multi-agent modeling the program Anylogic (fig.1) and logical model of evacuation process (fig. 2).
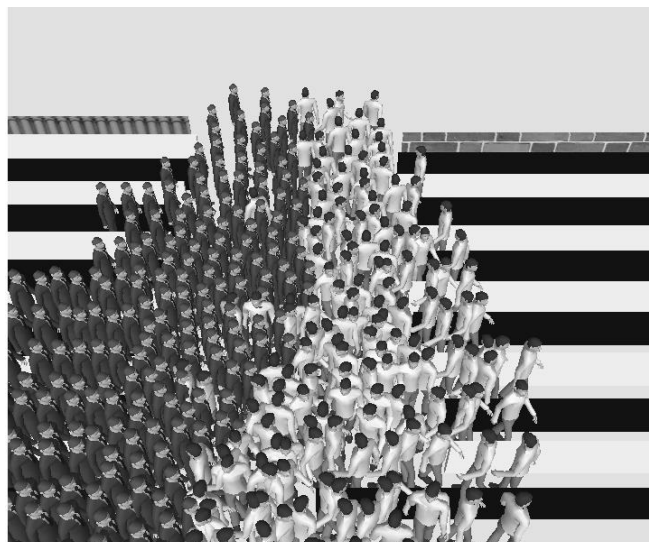

Fig. 1. Computer simulation in 3D at the software Anylogic

$t_2, I_2, v_2,$ **flow 2** $t_3, I_3, v_3,$ **flow 1** $t_1, I_1, v_1,$

Z2   **Z3**   **flow 13**   **B 1**   **Z1**

flow 4 $t_4, I_4, V_4,$ **flow 5**

ВИХІД   **ВИХІД**

Z7   **flow 19**   **A17**   **A18**   **flow 20**   **Z8**

$N_6, I_6, V_6,$ $t_7, I_7, V_7,$

flow 6   **Z6** $t_{19}, I_{19}, V_{19},$ $t_{18}, I_{18}, V_{18},$ **Z5**   **flow 7**

$t_8, I_8,$ **flow 17**   **Z16**   **flow 18** $t_9, I_9,$

$V_8,$ $t_{17}, I_{17}, V_{17},$ $V_9,$

δ_8, q_8 δ_9, q_9

flow 16

flow 8   **Z15**   **flow 9**

$t_{16}, I_{16}, V_{16},$

B 2

flow 13

Z9   **Z13**   **Z10**

flow 10 $t_{13}, I_{13}, V_{13},$ **flow 11**

$t_{10}, I_{10}, V_{10},$ $t_{11}, I_{11}, V_{11},$

flow 12

Z11   **Z12**   **Z14**

flow 14   **flow 15**

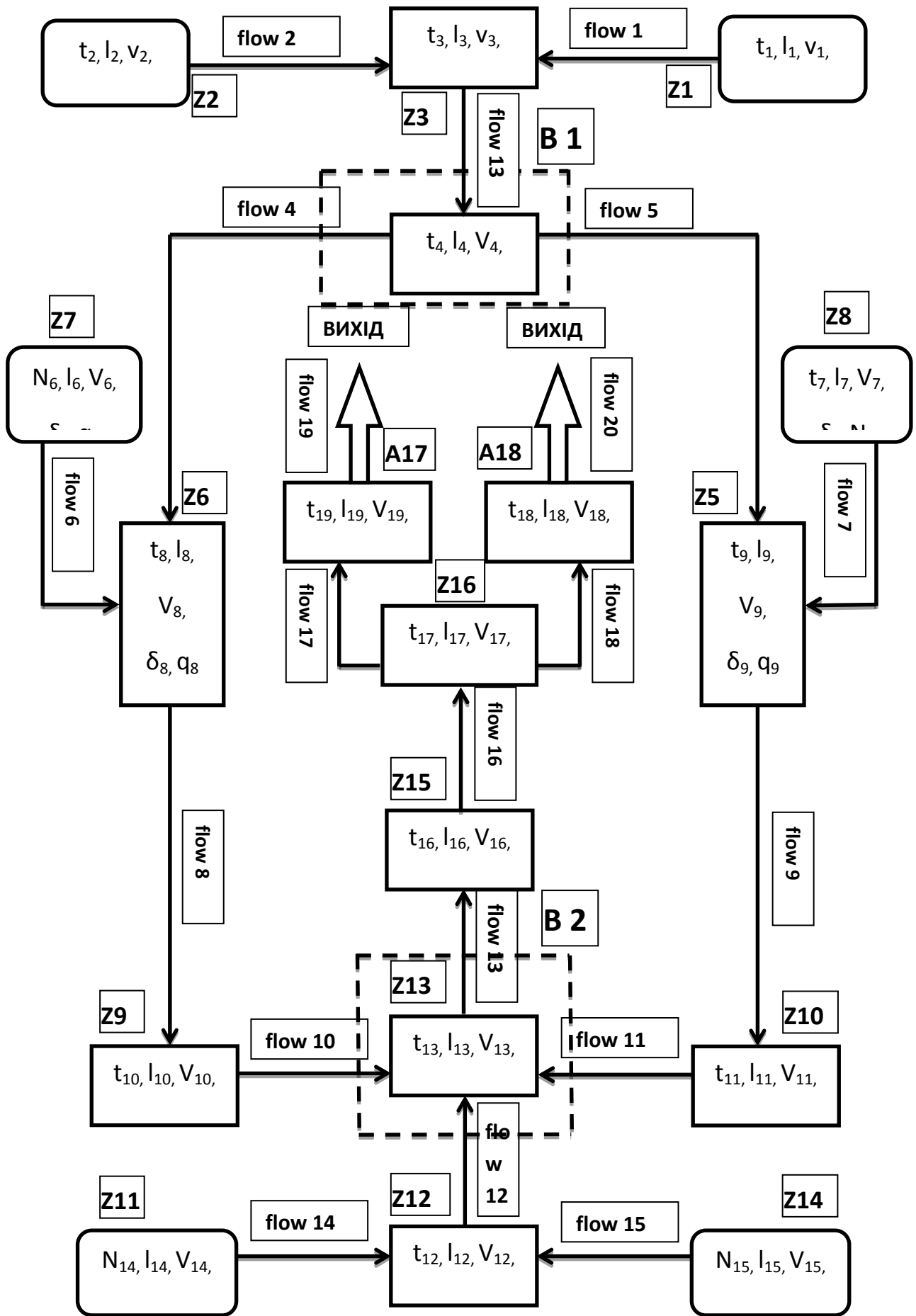$N_{14}, I_{14}, V_{14},$ $t_{12}, I_{12}, V_{12},$ $N_{15}, I_{15}, V_{15},$

Fig. 2. Topological and technological scheme of evacuation of the human stream of the most loaded sector of the upper tier of the stadium at the free zone, where:

Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, Z10, Z11, Z12, Z13, Z14, Z15, Z16, Z17, Z18-blocks topologically-technological scheme evacuation of the upper tier of a free zone and taking into account parameters such as:

t_1 – the movement of the human stream in the first (primary) site, min.;

t_1, t_2, t_3,...t_i – the movement of the human stream of each of these areas after the first evacuation route min.;

l_i – length of each plot evacuation path, m;

V_i – velocity of human flow at each evacuation area, m / min;

δ_i, δ_{i-1} – width of the considered area and previous evacuation path, m;

q_i, q_{i-1} – human traffic flow in the previous sections considered evacuation path, m / min;

B1 - a critical area of human branching flow during evacuation;

B2 - a critical area of human association flow evacuation;

zones B1 and B2 - require special attention during evacuation.

Conclusions

As a result of the work we get the development of probability and optimization methods of calculation time fast evacuation from Lviv stadium Euro 2012 taking into account the topology of critical path analysis. It allows for a timely evacuation of people in the safe zone and consequently reduces the risk of sports facilities construction projects at the conceptual stage of the project life cycle.

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