COLLECTIVE PROTECTION SYSTEMS: DESIGN OF THE ACCESS SYSTEM

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Abstract*: The present study aimed to achieve the experimental model of the access system in the collective protection system based on numerical modeling. Firsty, the sensitive points of the access system to be used during the simulation and modeling were identified, and secondly, the access system was designed using an axial-symmetric model.*

Keywords*: filtration and ventilation system, CBRN agents, air stream, axial-symmetric model.*

1. Introduction

The access system is a mandatory component of the collective protection system (COLPRO), assuring a maximum safety access from outside the COLPRO system, which is contaminated with CBRN agents or industrial toxic substances, inside it, providing fresh air from the filtration and ventilation system. The entry-exit passage has been designed to be made through an access system consisting in two successive compartments with the necessary endowments for the air quality assurance, whose dimensions were minimized in order to shorten the waiting time before entering the main tent, made of CBRN-protective materials.

The passage compartments link: *the contamination control area* (situated outside the access system) and the compartment for vapour contaminants elimination (the first compartment is also known as LHA – liquid hazard area,

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because in this area of the access system are eliminated the liquid contaminants); *LHA and the uncontaminated area* (or TFA – toxic free area) is also known as VHA – vapour hazard area, due to the fact that in this area are eliminated the vapour contaminants and the protection suits of the staff who has to enter TFA can be undressed.

The two compartments are identical and similarly equipped, manufactured from the same material as all the COLPRO system compartments, on a metallic structure.

2. Simulation model

The calculus model submitted to numerical simulation was simplified based on the experimental tests regarding fluid flow through pipes with constant section. For the low viscosity fluids, such as air, the circulation through pipes is significantly influenced by the cross-section form. This hypothesis allowed the assimilation of the rectangular area with a circular area of the same surface.

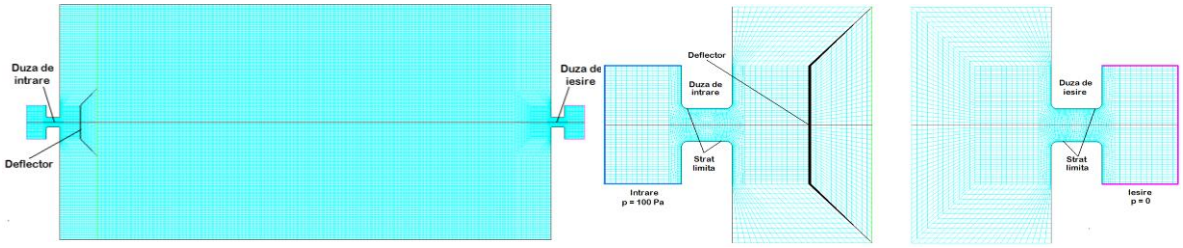

Figure 1. *a – Axial-symmetric model discretized for the design of the air flow process in the passage compartments – the model with deflector; b – The discretization network in the entry and exit areas from the model.*

The physical model for the air stream in the passage compartments, using the hypotheses above-mentioned, consisted in a cylindrical channel with an entry nozzle at one end and an exit one at the other end. The nozzles are placed on the cylindrical channel axis. The physical model dimensions are in agreement with the global dimensions of the passage compartments.

The simplification of the physical model determines, on its turn, a simplification of the mathematical model, thus, the problem of the air flow in the passage compartment reducing to an axial-symmetric problem.

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