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A critical regard on Romanian regulations related to Indoor Environment Quality in Operating Rooms and a technical case study

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Abstract

Several areas from medical facilities, especially the critical areas such as operating theaters, postoperative rooms, anesthesia and intensive care rooms, require ventilation and air treatment systems to achieve a well controlled microclimate. This fact is indispensable, given the current technological evolution.

This article describes solutions for HVAC systems that can be implemented in accordance with the law regulating this field and makes a brief introduction to the norms and the current situation in Romania. The article also provides some technical solutions that can be applied or should be applied to HVAC systems destined for hospitals located in Romania, giving as example a case study. The technical solutions can be also applied to other areas, in accordance with local regulations, the needs of those areas and in accordance with the climate of the zone.

All the ideas and suggestions come as a result of studies made over the current situation of the norms (national and international) that are referring at the situation of the clean rooms in the medical sector, combined with research articles and guides from all over the world.

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1. Introduction

It is well known that many spaces from medical units require maintaining a good Indoor Environment Quality (IEQ) [1]. The need for a highly controlled microclimate comes from the perspective of achieving an aseptic environment to prevent infections, due to multi-resistant (MDR) germs [2]. Beside the desire to achieve an aseptic environment, according to the needs of the room, it is necessary to achieve the comfort for a good development of human activity in that sector [3]. The areas from the medical facilities that require having a very well controlled microclimate for hygienic reasons, for the prevention of infections, but also for achieving comfortable conditions for the activity of medical personnel and patients are: operating rooms (OR), postoperative rooms (POR) and intensive care unit (ICU). A hospital OR is one of the most complex indoor spaces in terms of usage purposes. If for the OR, a very well controlled microclimate helps to conduct in optimal conditions the activity of the personnel and prevents infection during surgery with MDR germs, for POR and ICU, it helps to accelerate the healing and to prevent the infections [2].

IEQ refers generally to the quality of an occupied space in relation to the health and wellbeing of its users. IEQ is determined by multiple parameters from which the most important are Indoor Air quality and thermal comfort, In accordance with ASHRAE 55 [4] or EN ISO 7730[5] standards, the IEQ of a space is determined by the level of indoor air pollution and other features, including the air temperature, the relative humidity or the air speed. In terms of thermal comfort, the parameters which must be taken into account are the air temperature, the mean radiant temperature, the air relative humidity, the speed of air in the occupied zone [5]. When we refer to the aseptic criteria [6-8], the parameters are the optimal air change rate, producing and maintaining overpressure in the room and the number of steps of filtration and the filtration classes. The air turbulence and the air circulation through the room influence both the conditions of thermal comfort, as well as the aseptic criteria[8]. Of course, there are other important aspects that go together with the ones mentioned and produce the optimal indoor conditions such as: lighting, noise pollution, the load of equipment with specific devices in the considered room, and so on.

This article will refer mainly on the aspects related to thermal comfort and to criteria that are necessary in order to attain the degree of hygiene in critical areas of health units.

Fig. 1 - ”Functional” orthopedic operating room in Romania

The Romanian norm and guideline that regulate the area of Heating Ventilating and Air Conditioning (HVAC) for clean rooms are respectively NP-015 [6] and C 253/1-94[9]. Both are outdated, from 1997 and respectively from 1994, and unreviewed. The guideline C 253/1-94 was the first Romanian standard in the domain of clean rooms, it was elaborate from the American standard FS - 209D [10], probably the oldest standard in this area. The American standard FS - 209D was first published in 1963 and revised several times until it was replaced by the series ISO