



MINISTRY OF DEFENCE
SUB-SECRETARIAT OF DEFENCE
GENERAL INSPECTORATE OF HEALTH

⋮



**DEPARTMENT INSTITUTE FOR PREVENTIVE
MEDICINE**
“Capitán Médico Ramón y Cajal”
ENVIRONMENTAL AND NBC HEALTH SERVICE

REPORT ON THE PRESENTATION OF THE BUBBLE | PURE AIR SYSTEM BY ZONAIR3D

On 13 October, a presentation was given at the *Instituto de Medicina Preventiva de la Defensa* [Department of Defence Institute for Preventive Medicine] on the BUBBLE | PURE AIR system by representatives from the company that manufactures the product, ZONAIR3D. The product in question is a mobile space made from PVC (medically treated and phthalate-free) in the shape of a bubble. The filtering system (pre-filter and absolute HEPA filter), architecture, positive pressure and air input flow control, enables people inside the bubble to breathe 99.995% pure air – free from contaminating particles and viral, bacteriological and allergenic agents.

The HEPA filter was originally developed for the Atomic Energy Commission during the Second World War and the name stands for High-Efficiency Particulate Air. This type of filter is made from tiny glass fibres that are matted together to form a highly dense membrane. This creates a high-density filter that is capable of trapping tiny particles.

Once the contaminating particles have passed through the filter, they are blocked from returning to the air by the filter's highly absorbent pores.

The size of the particles trapped by the air purifier are measured in microns. One micron is 1/1000 of a millimetre. Particles that measure 10 microns or less are invisible to the naked eye.

The size of objects:

100 microns: the diameter of a human hair

25 microns: waste or other particles

10 microns: thick dust, plant spores and pollen

5-10 microns: flakes of skin, mould, pollen, normal dust, flakes of skin from pet animals

1-5 microns: fine atmospheric dust, dust mite waste

0.3 to 1 micron: tobacco smoke, metallic gases

The traditional HEPA classification scale consists of various HEPA filter quality levels on a scale from 10 to 14. Level 10 filters provide 99% filtration and trap particles measuring up to 2 microns or more from the air that passes through the filter. Filters that provide up to 99.97% filtration and trap particles that measure only 0.3 microns from the air that passes through the filter are level 14 filters. Such filters are used for laboratory clean rooms and are referred to as absolute filters. It should be pointed out that bacteria have an average size of 0.5 to 5 microns (and would therefore be removed from the air by the filter) and viruses measure between 10 and 300 nanometres (millionths of a millimetre), i.e. 100 times smaller than bacteria and not removed from the air by these filters.

Most germs, and viruses in particular, are carried on particles of a larger size (flakes of skin, dust, fabric particles, breath droplets, etc.), which are much larger.

The HEPA filter fitted to the BUBBLE | PURE AIR system is a level 14 filter and is therefore considered to be an absolute filter.

These filters are currently classified as follows in Europe, according to most penetrating particle size:

HEPA/ULPA Filter Classification (EN 1822 standards)

HEPA Filter Group	Global MPPS % of MPPS eliminated
H10	up to 85 %
H11	“ 95 %
H12	“ 99.5 %
H13	between 99.95 - 99.75%
H14	between 99.995 - 99.975%

MPPS: Most Penetrating Particle Size.

According to this standard, the HEPA filter fitted to the BUBBLE | PURE AIR system can also be considered as an absolute filter given that it achieves a global 99.995 % of MPPS eliminated.

The certificate from the Environment Centre Department of the Polytechnic University of Catalonia reads as follows:

La calidad del aire en el interior es alta: IDA 1 (norma UNE-EN 13779). Los incrementos en la concentración de dióxido de carbono (CO2) no superan los 350 ppmv sobre el contenido del aire exterior. El incremento máximo obtenido con una persona en el interior y la posición del regulador al mínimo son del orden de 140 ppmv.

The interior air quality is high: IDA 1 (UNE-EN 13779 standard). Increases to the carbon dioxide concentration (CO₂) do not exceed 350 ppmv above the content of the exterior air. The maximum increase obtained with someone inside and the regulator set to minimum is approximately 140 ppmv.

In light of the above, it can be said that the type of filter fitted to the system provides air that is more than 99.996% particle-free and similar to that of a “White Room”. Furthermore, the positive pressure generated inside the system means that the outside air and the particles contained therein cannot enter the bubble.

The filter does not contain active carbon and cannot therefore be used in an NBC environment.

In principle, the structure is not made to withstand corrosive chemical agents, such as Yperite. This extreme could be assessed at the materials laboratory of the *Instituto Tecnológico de la Marañosa* [Marañosa Technology Institute]. The interior air quality could be checked by carrying out studies on the level of particles, CO₂, CO and microbiology.

CONCLUSIONS:

It could be suitable for surgical healthcare facilities (such as ROLE 2 installations) by installing it inside the tent-type surgery module, which has no pressurisation or specific air filtering system. It would eliminate dust, germs and insects from the operating area in dusty field environments.

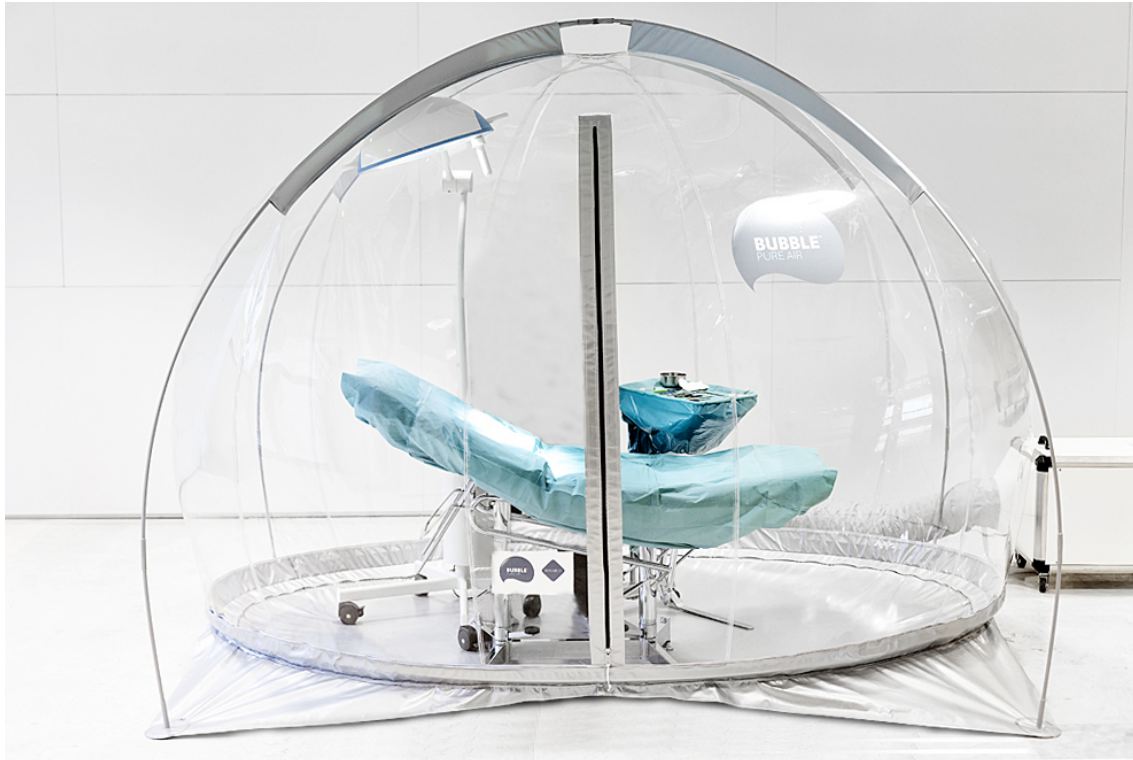
This extreme should be assessed in terms of size and functionality for surgical services. Personnel, equipment, gases and lighting requirements generate certain space requirements that could be greater than the model currently available is able to meet. In any case, the manufacturing company can also produce the BUBBLE | PURE AIR system to any size measurements required. It is also possible to manufacture the system with an intermediary chamber that enables the entry and exit of personnel without modifying the positive pressure.

The system also shows itself to be suitable for creating a clean room for the treatment of burns and immunodepressed patients (for example, in the case of radiation injuries). It would also help reduce the chances of infection during the application or replacement of treatments and bandages.

It could also be useful for treating patients with asthmatic respiratory pathology. Such cases are frequent in such environments as Afghanistan, which are rich in breathable particles. Besides the corresponding medical

treatment, isolation from allergens could avoid the need for a MEDEVAC in serious cases.

It is possible to carry out a study on and place a custom order for fitting the system with an NBC filter containing active carbon and using a non-corrodible material for use as a COLPRO shelter or group NBC shelter.



References:

1. TSI Application Note ITI-041: Mechanisms of Filtration for High Efficiency Fibrous Filters
2. <http://www.thomasnet.com/articles/instruments-controls/air-filters-different-types>
3. ASHRAE Transactions 3: 523-534.
4. Air Purifier Buying Guide, AchooAllergy
5. www.alcion.es/Download/ArticulosPDF/if/05articulos.pdf