

Good Practice for Normobaric Chambers

International Normobaric Association of Doktor
Pokrywka

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1. Introduction

The purpose of this document is to showcase the Good Practice for Normobaric Chambers, created based on the shared experience of scientists, experts, practitioners and organizations involved in the normobaric technology.

It is formulated to create a base for further advice, recommendations, regulations and standards for the application of normobaric technology.

This document has been created by the members of the International Normobaric Association of Doktor Pokrywka and approved by its Board of Directors.

The Good Practice for Normobaric Chambers can be applied to all cases where normobaric technology is applied. Safety protocols outlined herein should also be followed in the case of scientific studies exposing its participants to the effects of normobaric atmosphere.

The contents of this document focus on the safety rules targeted at users, staff, third parties as well as the proper care of infrastructure. This concerns topics such as institutes internal organization, staff training as well as regular and emergency procedures.

2. Definitions

This Good Practice uses following definitions:

Normobaria - an environment created for the purpose of recreation and improving physical condition, characterized by specific atmospheric parameters, consisting of:

- air pressure of 1500 hPa,
- oxygen concentration of 35-40%,
- carbon dioxide concentration of 1-3%,
- molecular hydrogen concentration of 0,5%,

Normobaric chamber - a room or container containing normobaria.

Normobaric system - a normobaric chamber connected to machinery, hardware and software allowing for the creation, maintaining and control of normobaria (gas distribution, energy, etc.)

Normobaric institution - a place where a normobaric system with connected buildings as well as staff and administration is located.

Normobaric session - a time window where a person remains inside normobaria, starting with the compression process, through the session itself, finishing with decompression.

User - a person using a normobaric chamber for the purpose of health and physical condition improvement, as well as participating in a scientific study.

Breathing gas - a composition of gasses used inside normobaric chambers..

Standard operating procedure - a set of tasks performed by staff during normal operation of a normobaric chamber.

Emergency operating procedure - a set of tasks performed by staff in emergency situations or in the case of an unforeseen danger.

3. Staff

Running a normobaric chamber requires the oversight of staff. During standard operating procedure, the functioning of a normobaric institute consists of:

1. Oversight of the session.
2. Operating the normobaric system.
3. Taking care of users.
4. Support during emergencies.

At the least it is recommended that the operation of a normobaric chamber is supported by the following staff members:

Operator - responsible for the safe operation of the normobaric system during the session in accordance with the internal procedures.

Technician - responsible for the maintenance and repairs of the normobaric system ensuring its proper functioning during the session.

Other staff members can be involved in the operation of a normobaric institute depending on the organization and the scope of performed tasks.

4. Qualifications and training

The staff employed at a normobaric institute should be familiar with the Good Practice for Normobaric Chambers and the procedures contained within. It is recommended that the Operator:

- is familiar with the conditions inside a normobaric chamber and be able to easily enter and leave it,
- is trained in the maneuvers allowing to equalize air pressure inside the middle ear and be able to assist users in doing that,
- is able to interpret the readings of all sensors and devices inside the normobaric chamber,
- is trained in First Aid.

The completion of a first aid training by the Operator should be documented by the owner of the normobaric institute.

5. The normobaric chamber and other equipment

5.1 Risk assessment

A normobaric chamber can be a free-standing device as well as a construction regulated by relevant construction law. Due to the characteristic of normobaric chambers certain dangers need to be noted, and proper procedures should be followed by owners to minimize the risk of emergency situations occurring.

1. **Oxygen poisoning** - the oxygen concentration inside the normobaric chamber is automatically regulated by the normobaric system, keeping it inside the range of 35-40%. In the case of a technical failure the concentration could increase above this level resulting in the risk of oxygen poisoning. The normobaric system is required to be equipped with sensors, monitoring the oxygen concentration inside the chamber. Should the concentration exceed 40%, oxygen supply should be stopped until the level drops down to proper levels (below 40%).
2. **Carbon dioxide poisoning** - similar to oxygen, the concentration of carbon dioxide is regulated by the normobaric system, keeping it inside the range of 2-3%. In the case of a technical failure the concentration could increase above this level resulting in the risk of carbon dioxide poisoning. The normobaric system is required to be equipped with sensors, monitoring the carbon dioxide concentration inside the chamber. Should the concentration exceed 3%, carbon dioxide supply should be stopped until the level drops down to proper levels (below 3%).
3. **Fire** - fire is a real risk connected with the operation of a normobaric institution. Creating a written procedure in the case of a fire inside the normobaric chamber is recommended. The procedure should contain the evacuation procedure for both users and staff.
4. **Barotrauma** - in the case of quick change of pressure inside the airlock, people with a dysfunction of the Eustachian tube can suffer from a pressure induced injury of middle ear (barotrauma). The procedure of compression and decompression should contain steps minimizing the risk of this occurring, including, but not limited to, slowing down the compression process or stopping it in the case of users reporting discomfort or pain.

Risk factors are mostly connected to the proper composition of breathing gas inside the normobaric chamber. All sensors used in the normobaric system should therefore be periodically calibrated to ensure their proper function.

5.2 Additional documentation

The owner of a normobaric institute should have additional documentation, including:

Technical documentation - all documents concerning the devices and machinery used inside the chamber, including certificates with their expiry dates and information about further recertification.

Compression and decompression procedure - a document describing all actions performed by the staff during compression and decompression inside the airlock, detailing steps taken to minimize the risk of barotrauma in users.

Maintenance log, showing:

- maintenance procedures as well as their schedule,
- all maintenance events (inspections, recertifications, parts replacements) including technical failures.

All normobaric devices and machinery should be periodically serviced, in accordance to the schedule provided by the producer.

6. Safety

The normobaric chamber is a place created for the purpose of recreation and physical condition improvement. Similar to saunas, steam baths, salt caves and brine graduation towers, using it does not fulfill the purpose of treatment or alleviating symptoms of disease.

The owner of a normobaric chamber is required to act in accordance with the local, as well as international law. Steel normobaric chambers, due to possible corrosion, should have all welding checked for the purpose of proper technical maintenance.