Fire Behavior and Protection in Hyperbaric Chambers

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What affect does air pressure have on combustion? on fire protection? These questions have been prompted by the medical profession’s increasing use of relatively high-pressure environments. To find the answers, the authors conducted tests in the hyperbaric chamber of a Los Angeles hospital.

HYPERBARIC oxygenation therapy is a somewhat broad term that serves as a general description of a relatively new medical technique, which was originated abroad and is now receiving widespread attention in the United States. Patients receiving this therapy breathe pure oxygen and undergo treatment or surgery in an environment of higher-than-normal atmospheric pressure. Special chambers — hyperbaric chambers — in which air pressure can be increased to several atmospheres have been designed. The authors are advised that, in most cases, current practice involves operating the chamber at two or three atmospheres (15 or 30 psig) and, on rare occasions, at four atmospheres. Seven atmospheres (90 psig) is the maximum pressure contemplated. In considering the fire safety aspects of hyperbaric chambers, one factor is of overriding importance. Patients and medical personnel are trapped in an environment from which quick escape is impossible once they have entered the chamber, the doors have been closed, and the air pressure raised. Before anyone can leave the chamber, it must be depressurized — and depressurized slowly in order to avoid the dangerous and possibly fatal physical effect known as “the bends.” Even if the chamber were depressurized at a rate of 2 lbs/min, which is considered a rapid rate, any fire condition occurring inside must be controlled and extinguished long before evacuation becomes possible. In view of these circumstances, it is obvious that unique precautions must be taken to minimize the possibility of fire by exercising strict control over combustible materials and sources of igni-
tion, and to provide fire control facilities that are adequate to cope with any foreseeable emergency.

The administration of the Hospital of the Good Samaritan in Los Angeles is vitally interested in fire safety. They frequently consulted the Los Angeles Fire Department and the California State Fire Marshal’s Office regarding the planning, construction, and operation of their hyperbaric oxygenation therapy facility. The fire service is indeed fortunate, for the authorities at Good Samaritan provided both the assistance and the chamber with which the authors tested fire protection and fire behavior in hyperbaric chambers.

**THE HYPERBARIC CHAMBER**

The chamber, made of half-inch-thick steel, was designed and constructed in accordance with ASME standards. Its body is cylindrical, and its ends hemispherical (see Figure 1). An interior partition divides the 10-ft diameter, 26-ft-long tank into two chambers — one 8 ft long, and the other 18 ft long. The smaller of the two chambers serves as an air lock to provide more ready ingress to, and egress from, the larger working chamber when it is pressurized. Both ends of the chamber and the partition are

![Diagram of the hyperbaric chamber](image-url)

*Figure 1. The hyperbaric chamber in which the fire tests were conducted.*