

Testing Summary – The iEvac® Smoke/Fire Hood



Certified Model ANSI / ISEA 110-2003

What independent tests have been performed on the iEvac®?

Certification

The iEvac® Smoke/Fire Hood is certified by the Safety Equipment Institute (SEI) as being in complete conformance with ANSI/ISEA 110-2003, American National Standard for Air-Purifying Respiratory Protective Smoke Escape Devices. This certification is earned after extensive independent testing to prove compliance with every requirement in the Standard. This testing was performed by **Intertek** and **Assay Technology**.

Total Performance

The iEvac® Smoke/Fire Hood has a recorded protection factor greater than 80,000. iEvac® is a smoke escape hood, an air purifying respiratory device for immediate evacuation in case of an emergency. Its overall effectiveness depends on the filters, the nose cup and the neck dam. Each of these three integrated elements must play a part in order for the entire hood to be protective. The overall effectiveness is determined by a Fit Test, and is measured by checking the performance during a series of standardized exercises. The Fit Test result is expressed as the protection factor of the iEvac®. For reference, OSHA has assigned a protection factor of 10 for N95 masks and 50 for rubberized full face masks. Another benchmark is the NIOSH test requirement for CBRN APER masks (respirators for escape from toxic and dangerous atmospheres containing chemical, biological, radiological and nuclear hazards). NIOSH requires a protection factor of 2,000 for these masks. **The U.S. Army Research, Development and Engineering Command - Edgewood Chemical Biological Center in Aberdeen, Maryland** conducted tests of the iEvac® using the NIOSH methods and procedures. Under these rigorous protocols, they measured the fit test protection factor for the iEvac® as being greater than **80,000**.

Gases

The iEvac® filters are a proprietary blend of materials specifically formulated to be effective against a wide range of gases and particulates. (Tests against particulates are described below.) Probably the two most dangerous gases encountered during an emergency escape from a fire are carbon monoxide and hydrogen cyanide. These special filters will provide protection against both

these gases. They are designed to provide protection against these life-threatening products of combustion and also against other toxic industrial gases and terrorist gases.

iEvac® filters have been independently tested against gases. Among the tests are the following:

- **carbon monoxide** - a very toxic by-product of combustion tested at 3,000 ppm, 5,000 ppm, and 10,000 ppm
- **hydrogen cyanide** - a very toxic by-product of combustion tested at 400 ppm
- **sulfur dioxide** - a benchmark acid gas tested at 100 ppm
- **acrolein** - a benchmark organic vapor tested at 100 ppm
- **cyclohexane** - a benchmark hydrocarbon gas tested at 500 ppm
- **hydrogen chloride** - a benchmark acid gas tested at 1,000 ppm
- **ammonia** - benchmark toxic industrial gas tested at 1,250 ppm
- **chlorine** - benchmark toxic industrial gas tested at 200 ppm
- **phosgene** - benchmark toxic industrial gas tested at 125 ppm
- **formaldehyde** - a benchmark toxic industrial gas tested at 250 ppm
- **phosphine** - a benchmark toxic industrial gas tested at 150 ppm
- **DMMP** - a simulant for Sarin nerve gas tested at 1,000 ppm
- **hydrogen sulfide** - a benchmark toxic industrial gas tested at 1,000 ppm and 5,000 ppm
- **tear Gas (CN)** - an irritant toxic chemical tested at 16 ppm
- **tear Gas (CS)** - an irritant toxic chemical tested at 3 ppm
- **carbon dioxide** - a special consideration is build-up of carbon dioxide inside the hood. We exhale carbon dioxide naturally, and it is important to make sure that this gas does not build up inside the hood. iEvac® is tested to make sure that the levels inside the hood are safe for the duration of an escape.

Particles

The iEvac® filters are a proprietary blend of materials specifically formulated to be effective against a wide range of particulates and gases. (Tests against gases are described above.) In keeping with its design excellence, the iEvac® filters contain the best possible particle filter, a high efficiency particulate air HEPA filter. This is the same material used in military gas masks to

provide protection against biohazards. The HEPA filter will remove 99.996% of particles that are 0.2 microns in size. It is this ability of the filters to remove sub-micron particulates that keeps out the small particles that may be present in smoke. Also, the filters will remove very heavy particles such as soot. During this test, the filters must remove the soot from the air and still not clog the filters so that it is too difficult to breathe.

Physical Hazards

Many physical hazards may be encountered when escaping from a fire. There will be flames, heat, hot material dripping, and other hazards. Vision will be very important, as will the need for the packaging to stand up to vibration and puncture threats from sharp objects.

Flammability

Tests for heat and flame resistance. During these tests components will not have an afterflame longer than 5 seconds. No component will drip, melt or develop a visible hole or be damaged so that eyes or lungs are exposed to smoke. These tests involve a temperature of 1470°F.

Molten drip

In this test, a flaming drip from an ignited polypropylene rod is allowed to drop onto the hood. No after flame lasts longer than 5 seconds.

Radiant heat

The hood is exposed to a radiant heat panel comprising two quartz lamps with a surface temperature between 980°F (525°C) and 1700°F (925°C) determined from a spectral emittance curve. The hood is located 9.5 inches away from the radiant heat panel and exposed for 15 seconds. The requirement is that the hood is not damaged in a way that exposes eyes or lungs to gas or smoke and that the temperature at the top of the head and inside the eyepiece shall not exceed 158°F (70°C). The hood passed.

Putting the hood on very quickly

Can be unpackaged and put on in less than 30 seconds

Optical properties

Light transmission, haze and field of vision are all tested to make sure that the viewing area is big enough and durable enough.

Corrosion

The hood is exposed to a corrosive salt spray, and tested afterwards

Vibration

This test involves vibrating the packaging for 10,000 cycles.

Puncture and tear

The package is raked by a sharp pointed heavy striker. The packaging does not puncture, rip or tear

Temperature exposure

The packaged hood is exposed to a temperature of 32°F for 24 hours then exposed to 180°F for 24 hours. Then the hood is unpacked and tested for performance.

Pressure conditioning

The packaged hood is exposed to 100 cycles of differential pressure. Each cycle is 60 seconds at ambient, 20 seconds going from ambient to 300 mbar below, 60 seconds at 300 mbar below and 20 seconds back to ambient. Then the hood is unpacked and tested for performance.

More Test Data

We are continuing to develop more test data for the iEvac® Smoke/Fire Hood, and we will add these to our web site as they become available. Ask for test data and details of test methods

Precautions

Of course, no filter and no hood can provide 100% protection, so be sure to follow the instructions in the User Manual.