

DUI

DIVING UNLIMITED INTERNATIONAL

CXO DRY SUIT OWNER'S MANUAL

This is a special insert and provided along with the DUI Drysuit Owner's Manual



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PROUDLY DESIGNED & MANUFACTURED IN THE USA

IMPORTANT SAFETY INFORMATION

The CXO Drysuit Owner's Manual is an addendum to the *DUI Drysuit Owner's Manual* and *Risk Management for Public Safety Divers Manual*. Both are available at DUI-Online.com or by contacting DUI at (800)325-8439 or (619)236-1203



!! WARNING !!

The DUI CXO drysuit is designed to be worn as a completely encapsulating unit, with attached gloves and attached hood in combination with a full face mask, in order to minimize diver contact with hazardous materials. Contaminated water diving requires specialized training. The DUI Drysuit Owner's Manual and the DUI CXO Drysuit Owner's Manual covers only the basics of drysuit functions and care. It should not be used as a substitute for drysuit instruction, OSHA HAZWOPER courses or contaminated water diver training. It is important for the user to understand that exposure protection does not eliminate the risks associated with contaminated water diving.

When used properly, as part of a complete hazardous diving program which should include all steps for planning though definitive decontamination, the use of a drysuit may minimize these risks. Please seek proper professional instruction when diving in contaminated water.



PERMEATION TEST RESULTS

Permeation test results of CXO polyurethane material provided by ICS Inc. Laboratories, Brunswick, Ohio

The chemicals that were selected for testing were the same chemicals tested in FEMA's comparative study in 1993: *Protective Clothing and Equipment Needs of Emergency Responders for Urban Search and Rescue Missions*. FEMA selected these 5 chemicals as representatives of the chemicals most likely to be encountered by divers. Selected chemicals are not water reactive, have vapor pressures less than 250mm Hg (which means they will not evaporate spontaneously) and are miscible in water. As in the FEMA study, chemicals were tested in a concentration equal to their maximum solubility in water up to a concentration of 10% which represented the extreme limit of exposure.

A complete copy of the FEMA report may be found on the DUI website: http://www.dui-online.com/pdf/fema_report_excerpt.pdf

Results:

The results for the permeation resistance of Red/Black PU laminated fabric, as assessed by ASTM F739-07 are summarized in Table I below. The data reports the initial breakthrough time (first when the lowest detectable permeation rate is evident), the normalized breakthrough time (first when the permeation rate of 0.1 µg/cm² /min for open loop system is detected), and the Steady State Permeation Rate are reported. During the 480 minutes test period, if a stable permeation rate was not reached, the Steady State Permeation Rate was not calculated. The cumulative permeation (<6.0µg in 1 hour period), as outlined in the NFPA 1951-07, section 845.4; “Chemical Permeation Resistance” was used as the pass/fail criteria for the fabric.

Table I

Permeation Resistance of Red/Black PU Laminated Fabric (ASTM F739-07)

Chemical Challenge	Average Normalized Breakthrough Time (min)	Average Steady State Permeation (µg/cm ²)	Cumulative Permeation per Hour (µg/cm ²)	Results NFPA 1951 (<6.0µg/hr)
10% Acetone in water	>480	ND	0	Pass
Dichloromethane in water	24	NA	2.6	Pass
N-Hexane in water	>480	ND	0	Pass
10% Sulfuric acid in water	>480	ND	0	Pass
Toluene in water	>180	ND	0	Pass

Note: ND=Not Detected during the 480 minutes test, NA=Not Attained during the 480 minutes test

The above table indicates a summary of the chemical permeation test results for the CXO polyurethane material. A complete report is available at DUI-Online.com.

While these permeation results indicate the CXO provides diver protection from a broad range of chemicals, all chemical testing suffers from serious limitations regardless of the material. It is important to understand these limitations and be aware no suit will protect a diver under all circumstances.

The most significant limitation is that this testing has been done only on new or pristine suits. No one can say if repeated exposure to chemical contamination and the effects of normal wear and tear will have an effect on the material. However it is reasonable to assume used suits will not have the permeation resistance of new suits. The effects of exposure to multiple types of contamination simultaneously are also unknown. The permeation testing was done at one atmosphere of pressure. The effects of higher ambient pressures are unknown.

It is also important to note that this permeation testing has been done only on the suit material itself. Other critical components of the suit such as the valves, zipper, seals and glove materials have not been tested. There has also been no testing done on the commercially available full face masks commonly used by public safety, scientific and commercial divers. Until this question is resolved, the overall level of protection is difficult to determine. It is the intention of DUI to address the permeation resistance of the zipper and the attached hood with future generations of the CXO as the technology to do this testing improves.

DECONTAMINATION

Decontamination of the CXO should take place after each dive. Choose the best solution to definitively decontaminate the diver based on the contaminants in the water. Solutions vary in their application and effectiveness. Failure to properly decontaminate the drysuit will result in a shorter lifespan of the suit. Failure to properly decontaminate the drysuit will increase the health risk to the diver and all those who may handle the drysuit.

For more information on the importance of decontamination, methods, solutions, and limitations, please refer to the *Risk Management for Public Safety Divers Program Manual* which is available at DUI-Online.com.

CONTAMINATED WATER DRYsuit VALVES

DUI uses special valves designed for contaminated water diving. **THESE VALVES ARE YELLOW.**

A contaminated water inlet valve is equipped with special fluorosilicone o-rings to minimize the risk of exposure to contamination. While fluorosilicone o-rings are more chemically resistant than traditional rubber o-rings, it does not eliminate the risk of exposure. The type of chemical, repeat exposure to chemicals or extensive chemical exposure should be taken into consideration prior to each dive.

A contaminated water exhaust valve includes a double exhaust diaphragm and a check valve made with fluorosilicone to minimize the risk of exposure to contamination. The double exhaust helps to minimize the possibility of water leaking into the suit through the valve. While the fluorosilicone check valve is more chemically resistant than traditional check valves, it does not eliminate the risk of exposure. The type of chemical, repeat exposure to chemicals or extensive chemical exposure should be taken into consideration prior to each dive.

Because the double exhaust makes the valve taller and it sits higher on your arm, the vent rate will be slightly slower than a regular exhaust valve. While vent rates are impossible to validate in the field due to differences in body positioning and insulation, care should be taken to always have a slow and controlled ascent and dive the exhaust valve in the fully open position.

Decontamination of the valves is critical to the care and maintenance of your suit. It is very possible that you will need to replace your valves if they are exposed to high concentrations of hydrocarbons and other chemicals.

ZIPSEAL NECK/HOOD COMBINATION

The CXO Drysuit is equipped with a latex neck/hood combo. A hood liner is necessary for creating an air space AND for insulation. The air space is required for the diver to equalize his/her ears.

!! WARNING !!

A ruptured ear drum could occur if a liner is not worn and the diver is unable to equalize.

DUI, the world's leader in diver thermal protection, is active in all aspects of contaminated water diving operations including chemical and biological contaminants. These efforts include the development of equipment and procedures, the establishment of both military and industrial standards and the ongoing education of divers to obtain the knowledge and training necessary to minimize risks in all types of diving and water related operations.

We are proud to support these brave men and women who serve to protect the lives of others.

The logo for DIVE OPS features the word "DIVE" in large, bold, orange capital letters above the word "OPS" in the same style. A stylized blue and orange fish or wave graphic is positioned between the two words, partially overlapping the "O" in "OPS".

**DIVE
OPS**



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