



Do you engage in activities or work over cold water? If so, please read this article because your survival will depend on your understanding of the different protective products in the market as well as their functionality and application.

When at sea for work or leisure, there is always a chance that you will find yourself falling overboard or abandoning a sinking ship. You could be a crewmember onboard an ocean liner, Coast Guard personnel, recreational boater, commercial fisherman, or even a pilot forced to evacuate an aircraft over water. Once overboard the chances of surviving are dependent on the temperature of the water and having the proper protective clothing. Because each person's activities and circumstances that may lead to a life-threatening situation also vary, the type of protection best suited for one activity may not be ideal for another. There are a variety of protective options in the market and each product contributes to the wearer's thermal protection by different methods.

Water Immersion and Hypothermia

The human body is fairly well adapted to survive in very cold air for many hours; however, the thermal conductivity of water is 25 times greater than air. This means that the survival of an unprotected person in water below 10 degree Centigrade (50 degree Fahrenheit) beyond an hour is very unlikely. This is reduced to minutes as the water temperature approaches freezing, which is quite common in northern or southern extremes during winter.

Our body's response to sudden cold-water immersion is universal. If unprotected, within 2 seconds of hitting the water, the body goes into "cold shock" and the physiological reaction includes the gasp reflex, hyperventilation, difficulty holding the breath, increase in blood pressure, and rapidly increasing heart rate. The extent of this cold shock depends on how much of the body surface area is exposed to the water.

Between 2 to 30 minutes after immersion, an un-insulated human body becomes incapacitated. A person may have difficulty swimming, lose functional abilities and manual dexterity, and experience muscle cramping. Unfortunately, swimming only speeds the onset of hypothermia.

After 30 minutes, hypothermia sets in and the body's core temperature reduces to a point where a person loses consciousness and eventually the heart stops beating. For more information on the effects on hypothermia, please click [here](#).

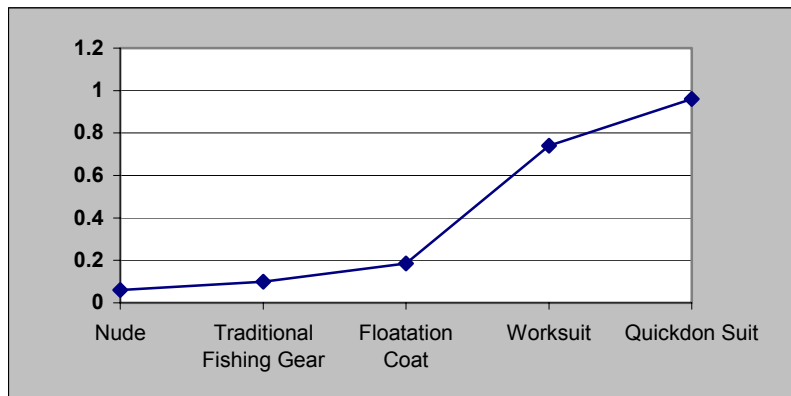
Choosing the Right Type of Protection

It is advisable for everyone involved in activities on the water to have available some sort of protection that will provide buoyancy and thermal insulation. When choosing a product, one should consider the product's Immersed Clo values, which is a measurement of the thermal protection of a suit or device when it is in the water. The higher the Clo number, the longer the predicted survival time in the water. From the Immersed Clo values, predictions can be made of the rate at which a person's body temperature will drop in cold water. For more information on hypothermia and Clo values please click [here](#).



Performance Comparison of Various Protective Gears

Suit Type	Immersed Clo Value
Nude	0.06
Traditional Fishing Gear	0.100
Flotation Coat (ie. MC 1535)	0.185
Work Suit (ie. MS 195)	0.420
Quick-Don Suit (ie. OC8001)	0.96
<i>Dry Suit (ie. MSD 560)</i>	<i>Dependent on the type and thickness of the undergarment worn</i>



The following protective options contribute to the wearer's thermal protection by different methods.

PFDs

Personal flotation devices (PFDs) offer little to no protection from the cold water. It is, however, important to note that during the early stage of water immersion, the PFDs ability to keep you afloat allows you to gasp air instead of water when you experience the gasp response. The flotation it provides also keeps you afloat without expending what little energy you may have left. By raising the body, some PFDs also provide less exposure to the water, which can somewhat delay the onset of hypothermia.

Flotation Coats

Flotation coats are constant wear items that provide the basic level of protection. They are considered 'wet' suits, as water will enter into the coat. However, the thermal insulation of the coat will reduce the heat flow from the warmed water trapped inside coat to the cold water outside. This will help maintain your core temperature, while at the same time, keeping you afloat.

Work Suits

Constant wear work suits are suitable for those whose work or activity requires them to be mobile and active but the nature of their work also prevents them from donning protective clothing in the event of an emergency (i.e. a fisherman accidentally trips and falls overboard).



They are suitable for a wide-range of marine activities from sailing to fishing and a range of industrial uses. Delivering warmth and comfort in cold weather environments. Also considered as 'wet' suits, the integral legs and features such as Tug-Tite straps at the thighs greatly limit the amount of cold water the can flush in and out compared to a coat. The suit's closed-cell foam provides flotation and in-water insulation to delay the onset of hypothermia in the event of accidental water immersion. Some models even have a flame resistant outer shell.

Abandonment or Quick-Don Suits

In platform or ship abandonment situations, time is critical and abandonment or quick-don suits are suitable for such situations. They are designed for those who do not need to wear protection most of the time, but at some point they may find themselves in an emergency situation where they need to don protective clothing quickly. This requirement for emergency donning means that designs must be simple, intuitive and are frequently universal or "one size fits all".

These suits have a completely waterproof outer shell, watertight hood and wrist seals, and attached boots. These suits are designed keep the water out and the wearer dry but they are tolerant of some leakage. The flotation and insulation performance of the foam liner allows users to be immersed for long periods of time in cold water and maintain mental and physical capabilities. As such, they are used in a variety of applications including rescue, marine, and air operations. Because these suits are designed to be simple and fit universally they can be donned within one minute. The shell is resistant to abrasion and puncture while the built-in thermal liner or neoprene foam insulation provides hypothermia protection without the need for any special thermal undergarments.

Dry Suits

Dry suits have the potential to provide the best hypothermia protection; however, the properties and mechanisms that enable them to do so pose some constraints on their practicality for some marine safety applications. They are suitable for tasks, environments, or missions where there is regular exposure to cold water or where emergency donning is not possible. They are also most often used by well-trained and well-equipped professionals who know how to properly care for and maintain the suits. For those using this product, the burden of being a high maintenance piece of equipment is not a considered a disadvantage to their selection.

For its potential to be realized, dry suits must be worn in conjunction with an insulating full coverage undergarment. The integrity of the suit must be at 100%, which means that there can be no leaks or faults in the fabric, construction, zippers, wrist, and neck seals whatsoever. They need to be properly fitted to the wearer particularly at the neck and wrists.

It is important to note that the dry suit alone will not provide much hypothermia protection because without trapping a layer of air against the wearer heat loss will still be considerable. Regular maintenance and service are also critical because any leakage will dramatically degrade the suit's performance. According to a study by the Royal Institute of Aviation Medicine, a leak of 200 ml into a suit will reduce its hypothermia protective capability by 40%¹. Finally, some dry suits will produce a substantial thermal burden when not in the water. Those who

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need to wear one for long periods should consider a suit made from a breathable material such as Gore-Tex.

Suit Maintenance and Training

Immersion suits are designed to save lives by protecting the user from hypothermia and drowning. Just like other specialized equipment, they require proper storage, maintenance, and handling as a damaged or torn suit may result in a reduced level of protection. Here are some tips on how to keep your suit in good working condition:

1. Perform regular inspections on the outer shell, inner liner, and seals of the suit. Check for rips, tears, and deterioration.
2. The user should become familiar with the operation of the zippers, pockets and seals. The life of the user may depend on the condition of the immersion suit and the security of its attachments and equipment.
3. Ensure that the zippers work properly and that there is no evidence of corrosion. Lubricate them according to the manufacturers' recommendations.
4. If the suit has inflatable components (ie. head pillow), manually blow up the pillow at least once a year to ensure that it remains inflated for at least 24 hours.
5. Check that suit components, such as the whistle and the rescue light, are in working condition. Always check the expiry date on the light's battery.
6. Store the suit in a cool, dry place and away from direct sunlight and follow the manufacturers' recommendation on folding to avoid damage to the waterproof zippers. Ensure that the suit is in an accessible area and is easy to reach in the event of an emergency. Avoid storage that subjects the suit to significant compression.
7. After-Sales Service - The protection provided by an immersion suit relies very much on its watertight characteristics. It is extremely important that only qualified approved technicians, with proper equipment, or the manufacturer should make repairs.

Aside from care and maintenance, having the appropriate user training and product experience will also greatly increase one's chances of surviving an accidental cold-water immersion. Take a boating safety certification course or, in a controlled environment, practice retrieving the suit and donning it within one minute. For a list of boating safety and industry association links, please click [here](#).

Immersion Suits: Not a One Type Fits All

An immersion suit is an integral piece of life saving equipment onboard any ship. Proper care and maintenance will extend its working life and quite possibly your own. It is important to understand that there are not "good" or "bad" immersion suit types. Each type has its relative pro's and con's. How important each of these would be, as positive or negative factors in deciding which one to use, will depend on a number of issues related to the user's operational environment. Choose the right protection by considering the type of work or activity in which it will be used, the conditions of risk and danger one faces, the amount of time one has to don it, and commitment required maintain of the suit.