

# Surface Water Rescue Technician & Boat Operator Student Manual



## Disclaimer

This manual is intended as a supplement for students who are enrolled or have taken our Water Rescue courses. The information within is not all encompassing and should never be used without proper instruction from Capital Technical Rescue and Safety Consultants, LLC instructors.

In most instances we do not get into the specific operation, use, limitations, warnings, or dangers of pieces of equipment. Even when we do, you should always consult with the latest version of the manual directly from the manufacturer of the product and contact Capital Technical Rescue and Safety Consultants, LLC to receive the proper hands-on training of that device.

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For additional information or questions please contact us at [info@capitaltechrescue.com](mailto:info@capitaltechrescue.com) or by phone at 518-930-4500.

The latest version of this manual may always be obtained at:



<http://www.capitaltechrescue.com/surface-water-student-manual.pdf>



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## Pre-Course Information

### What to Expect

#### What to Bring

- PPE
  - Helmet with chinstrap
  - Gloves: Leather / mechanic style
  - Bathing Suit, Rash Guard, Wet or Dry Suit (weather & water temp dependant)
  - Appropriate layers / under garments
- Personal Items (optional)
  - Towel
  - Change of Clothes (recommended)
  - Poly / Wool Insulation Layers (no cotton clothing)
  - Refillable water bottle
  - Snacks / Lunch
- Notify Us
  - Any medical problems
  - Any allergies – food, bees etc.
  - Any concerns you may have
- Training Weather
  - Be prepared to be working in the water and in cold air temperatures
  - Heavy downpours and/or lighting will stop outdoor training, you will be contacted if the course is re-located or re-scheduled.

### Class at our Training Facility

#### Address

22 Mill Street, Unit 2  
Albany, NY 12204

#### Directions

Directions via Google Maps: <https://goo.gl/maps/r2BDuJtPeRR2>

## Parking

Do not block the gates at the end of the road.

Parking is limited and we try to be good neighbors to a few businesses, so please do not block the dumpster or the loading dock as it is actively used throughout the day.

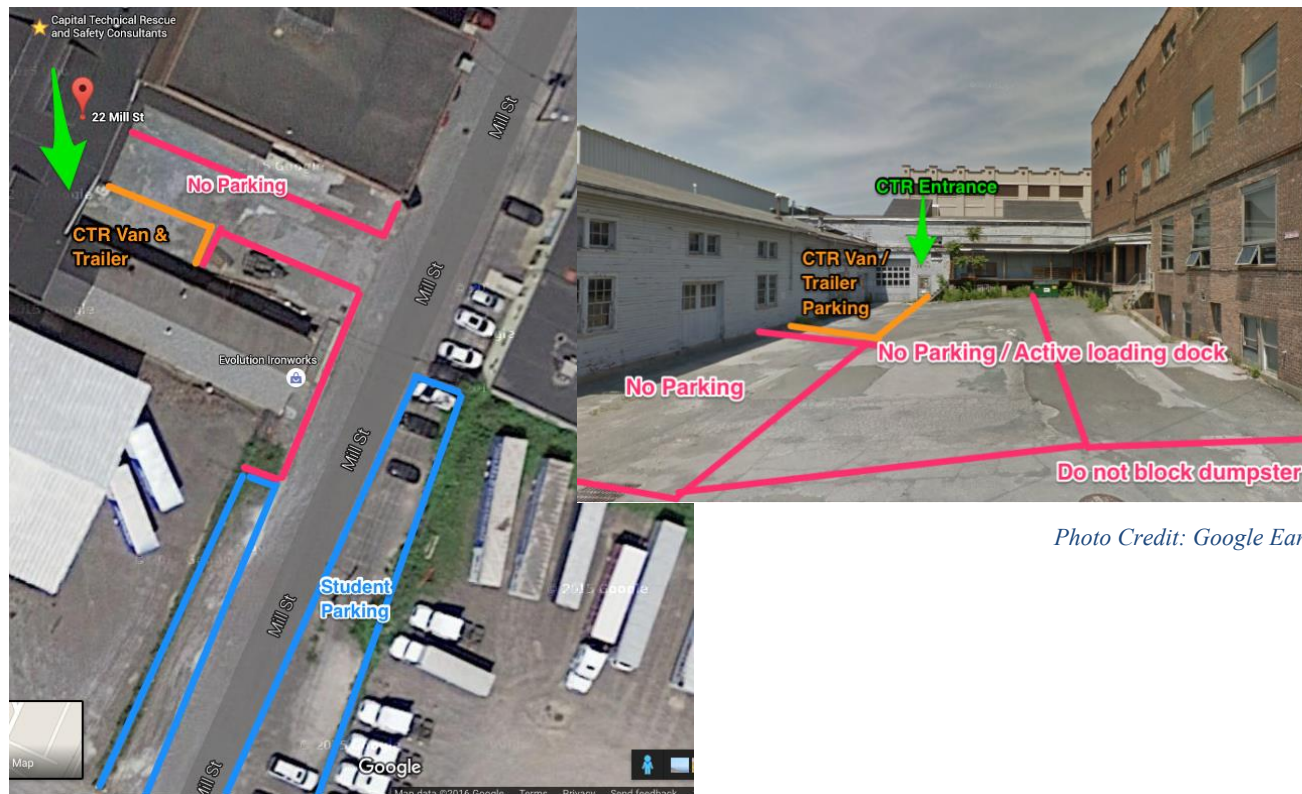


Photo Credit: Google Earth

## Facility Rules

- Tobacco / Vape Free
  - Our facility is 100% Tobacco Free
  - This includes use of smokeless tobacco





## Pre-Course Study Material

- Prior to Day 1 read the following sections:
  - Introduction
  - Standards
  - Water Rescue Disciplines
  - Water Rescue Equipment
  - Water Rescue
  - Surface Water Rescue Simmer Operations
- Begin learning the knots, bends and hitches from the Equipment Section. Each knot has its own information and link to videos.
- Prior to Day 2 read the following sections:
  - Motorized Inflatable
  - Inflatable Rescue Boat Operations
  - Victim Removal Techniques

## Introduction

Ponds, lakes, rivers and other bodies of water are sources of year-round recreation for adults, children and wandering pets. Not everyone heeds the warnings or understands the power of water.

Facts: drowning is the second leading cause of accidental death in the US. Over 1/2 the victims are children. There is a very small window for successful intervention.

There is also a focus in this course on flooding and awareness to swiftwater. The intent is to give you the knowledge and skills to perform a rescue in conditions you are trained for, while also ensuring that you are aware when conditions require a higher level of properly trained and equipped rescuers.

Rescuers drown because they wear PPE improperly or fail to wear adequate PPE at all. Overestimate abilities, inadequate training, lack of proper equipment, or backup and they can underestimate effects of cold water.

This course is designed to address the needs of most teams to perform rescues at the operations and technician level based upon the job performance requirements of the NFPA 1006 standard.

Regardless of where you work and the territory you respond to, this course is an introduction into water rescue and begins your lifelong journey and commitment into becoming a well-rounded technical rescuer. You must realize that like all technical rescue skills, these are perishable, and you must train and practice regularly to be effective and efficient. The recommended training and continuing education sections of this manual will help guide you throughout the course of your journey. Please remember that once you have begun the journey with us, we are always here to help you with any questions or problems you may have. Do not hesitate to send us an email or give us a call whenever you need.



## CTR Background

Capital Technical Rescue and Safety Consultants, LLC (CTR) was formed in 2006 to serve the needs of emergency response personnel whose job duties specifically task them with performing a variety of technical rescue disciplines. These responders have come from a variety of agency types including federal and municipal public sector emergency services as well as private industry emergency response teams and fire brigades.

The primary staff of CTR has been working and teaching together for over 10 years, prior to the formation of the company. Their backgrounds vary from volunteer to career firefighters and fire officers, emergency medical technicians to paramedics, and emergency responses from the smallest local incident to natural disasters and terrorist attacks that have had a global impact.

Previous and current CTR contracts have included teaching technical rescue courses from 6 to over 350 students, with scheduled completion ranging from a single day to over the course of several months. This flexibility has allowed our clients to minimize overtime expenses and ensure that production or response is negligibly impacted. This is also true for our industrial clients and has led us to be one of the most experienced groups of standby rescuers.

Capital Technical Rescue and Safety Consultants, LLC is a proud [Petzl Technical Partner](#) (PTP).

### What is a Petzl Technical Partner (PTP)?

A PTP is a recognized expert company or individual in a vertical environment that demonstrates a thorough understanding of their respective industry, contributes to the development of best practices, and meaningfully integrates Petzl into their systems and curriculum. In return for this promotional support, Petzl endeavors to share our information, our products, our time, and our resources to ensure mutual success and sustainable growth.

### Who is a Petzl Technical Partner?

Trainers & Training Organizations  
Industry Leaders & Influencers  
Consultants & Field Experts



### PTP Mission Statement:

The Petzl Technical Partner (PTP) Program's mission is to develop a diverse network of training company partners and recognized leaders who can help Petzl promote our products and solutions to a wide variety of industries and end-users. Whereas Petzl is an expert in our products and services, we believe that front line, subject-matter experts are the best bridge to the industries we ultimately serve.

As a Petzl Technical Partner, we are part of a network of subject matter experts. There are technical partners located in 5 continents and in over 18 countries.

Capital Technical Rescue and Safety Consultants, LLC serves clients from a variety of industries. These include:

Food Service

- Ingredient Facilities
- Food processing and packaging

Paper Mills

- Fine Papers
- Recycled Paper
- Tissue Paper

Nuclear Facilities

- Nuclear research
- Nuclear training facilities

Chemical Plants

- Silicones
- Formaldehyde
- Methanol
- Pharmaceutical research and development
- Pharmaceutical production
- Biotechnology research and development, production

Industrial Plants

- Nanotechnology production
- Nanotechnology research and development
- Packaging production
- Personal Protective Equipment manufacturing
- Armament Production

Mining Operations

Cement Plants

Research Facilities

Environmental Services

Power Generation – Hydroelectric, Coal

Fire Academies

Municipal Services

Airports

Construction

CTR has a warehouse full of rescue equipment, including multiple rescue boats. Depending on the needs of the client and our hazard surveys will depend on what equipment is required.

Typical CTR Confined Space Rescue Equipment list:

Atmospheric Monitors, RAE Systems	Ventilation Fan (for actual emergencies only)
Rescue Rope, variety of lengths	Supplied Air Systems (SAR) and SCBA
Mechanical Advantage Rope Systems	Pulley systems
Anchor straps	Rope winch system
Tripods, bipods and monopods	Fall arrest rescue equipment
Patient packaging gear, SKED, SPEC PAK	Intrinsically safe radios and lighting
Edge protection	Reference material, iPads, onsite phone
Ascenders & Descenders	Additional hardware and software as needed

In addition to the rescue equipment, we have our own indoor training facility for rope and confined space rescue. Our props are utilized in clients' courses as well as in testing out new and prototype equipment and techniques as well as keeping our staff up to date.

The confined space rescue simulator has multiple levels, opening types, dimensions and space configurations. These include both vertical and horizontal access points, vessels with bottom openings, top openings and more. The simulator is also located in doors and allows us to train throughout the year, regardless of weather conditions.

We are also located just minutes away from the Hudson River and the Corning Preserve boat launch. This allows us to get out on the water and train, test new equipment and get it all back in service quickly.

There are also various other training props, including cell towers, firefighter survival, and lock out tag out in house. Our warehouse area stages equipment we utilize for HAZ-MAT, trench and collapse rescue courses, as well as rigging equipment for heavy duty operations.

As this space continues to evolve, we imagine many more possibilities. These include the capability to evaluate client's issue on site and re-create it in house, so we can practice performing a potentially difficult rescue within a safe area.

You can learn more about our site at the following links:

<https://www.capitaltechrescue.com/post/indoor-training-facility>

<https://www.firehouse.com/rescue/article/12146756/technical-rescue-training-facility-profile-capital-technical-rescue-safety>

## Standards

### NFPA

#### **1006 - Standard for Technical Rescue Personnel Professional Qualifications**

This standard identifies the minimum job performance requirements (JPRs) for fire service and other emergency response personnel who perform technical rescue operations. We utilize this standard to ensure that our training programs provide you with the knowledge and skills to meet current national standards. This standard applies directly to you, the individual rescuer.

#### **1670 - Standard on Operations and Training for Technical Search and Rescue Incidents**

This standard identifies and establishes levels of functional capability for efficiently and effectively conducting operations at technical search and rescue incidents while minimizing threats to rescuers. It is intended to help the authority having jurisdiction (AHJ) assess a technical search and rescue hazard within the response area, identify the level of operational capability, and establish operational criteria. This is known as an “organizational” standard and specifies what your organization should do and know for technical rescue incidents.

#### **1983 - Standard on Life Safety Rope and Equipment for Emergency Services**

This standard specifies requirements for life safety rope and associated equipment used to support emergency services personnel and civilians during rescue, firefighting, or other emergency operations, or during training. It is imperative to understand that this is not a “use” standard. This standard is known as a “manufacturers standard” as it defines how equipment should be made, tested, labeled and documented. Within NFPA 1983 come the terms “General Use” and “Technical Use” which relate to ratings of the specific equipment.

#### **1858 - Standard on Selection, Care, and Maintenance of Life Safety Rope and Equipment for Emergency Services**

NFPA 1858 is written for organizations that evaluate the risks faced by emergency responders and their particular needs for life safety rope and equipment. It is also written for users of life safety rope and equipment to enable them to inspect, maintain, and care for the life safety rope and equipment they use during rescue and training operations that is compliant with NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services*.

NFPA 1858 applies to life safety rope, escape rope, fire escape rope, fire escape webbing, escape webbing, throwlines, moderate elongation laid lifesaving rope, life safety harnesses, belts, auxiliary equipment, litters, and victim extrication devices certified as compliant with NFPA 1983.



## **2500 - Standards for Operations and Training for Technical Search and Rescue Incidents and Life Safety Rope and Equipment for Emergency Services**

This standard is a consolidation of NFPA 1670, 1983 and 1858, and was released at the end of 2021.

## Water Rescue Disciplines

Each type of water rescue has its own characteristics, hazards, and “personality”. What works in one discipline may get you killed in another. As an example, SCUBA divers maybe harnessed and tethered into a rope system, however using tethers in swift water rescue could force a rescuer underwater and cause them to drown.

Seven main areas of water rescue per NFPA 1006 & 1670

- Surface water rescue
- Swift water rescue
- Ice water rescue
- Surf water rescue
- Dive rescue
- Watercraft Rescue
- Floodwater Rescue

## Environmental and Physiological Factors

### Environmental

When performing water rescues in lakes, rivers, and oceans, rescue personnel need to consider various environmental factors that can impact the safety and effectiveness of the rescue operation. Here are some key environmental factors to consider:

**Water Conditions:** The current water conditions, including wave height, water temperature, currents, tides, and visibility, can significantly impact the safety of a water rescue. Strong currents, rough waves, and poor visibility can make it challenging to reach and assist a victim in distress.

**Weather Conditions:** Weather conditions such as wind, rain, lightning, and fog can affect the safety of both the victim and the rescuers. Strong winds can create rough water conditions, while lightning poses a significant risk to those in the water. It's essential to monitor weather forecasts and evacuate the water if conditions become unsafe.

**Water Depth and Bottom Composition:** Understanding the depth of the water and the composition of the bottom (e.g., sandy, rocky, muddy) is crucial for planning a safe rescue. Shallow water may require different rescue techniques than deep water, and rocky bottoms can pose injury risks to both rescuers and victims.

**Underwater Hazards:** Lakes, rivers, and oceans may contain underwater hazards such as rocks, reefs, submerged objects, and strong currents. Rescuers need to be aware of these hazards to navigate the water safely and avoid potential injuries during the rescue.

**Marine Life:** In some bodies of water, there may be marine life that could pose a threat to rescuers and victims. Stingrays, jellyfish, sharks, or other creatures may be present, and rescuers should be cautious when approaching a victim in waters known for marine life hazards.

**Accessibility:** The accessibility of the rescue location is an important factor to consider. Is there a safe entry and exit point for rescuers? Can emergency vehicles reach the scene easily? Accessibility can impact response time and the effectiveness of the rescue operation.

**Terrain and Surroundings:** The surrounding terrain, such as steep cliffs, dense vegetation, or urban structures, can affect the approach and execution of a water rescue. Rescuers should be mindful of their surroundings to ensure their own safety and the safety of the victim.

By considering these environmental factors and adapting their rescue strategies accordingly, rescue personnel can effectively respond to water emergencies and ensure the safety of both the victims and themselves during rescue operations.

## Physiological

### *Hypothermia*

Victims who have fallen through the ice and are in the water are certainly prone to hypothermia, but we must also realize that rescuers will also face the potential for hypothermia.

Hypothermia is defined as the lowering of the body core temperature below 95° F.

There are 3 types of hypothermia:

- Chronic - underlying disease
- Acute - matter of seconds or minutes
- Sub-acute - hours by remaining in cold environment

#### Video:

[Cold Water Boot Camp USA](#)

By: Cold Water Boot Camp  
Dr. Gordon Giesbrecht  
(Professor Popsicle)



Stage	Core Temperature	Signs & Symptoms
<b>Mild Hypothermia</b>	99° - 97°F	Normal, shivering can begin
	97° - 95°F	Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb
<b>Moderate Hypothermia</b>	95° - 93°F	Shivering, intense, decreased muscle coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert
	93° - 90°F	Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, difficulty speaking, signs of depression
<b>Severe Hypothermia</b>	90° - 86°F	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness
	86° - 82°F	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation
	82° - 78°F	Unconscious, heart beat and respiration erratic, pulse may not be palpable
	78° - 75°F	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached

### *Methods of Heat Loss*

Water conducts heat away from the body 25 times faster than air of the same temperature. When someone is already wet and then exposed to the air they lose heat 35 times faster, so it is very important to prevent further heat loss once we remove victims from the water.

Conduction, convection, radiation (up to 80% from head), evaporation and respiration all play a part in our body losing heat. Age, body build, movement, medications, alcohol, and sudden immersion in cold water all affect heat loss. The use of a PFD and the HELP position also help ensure a good chance for survival.

### *Cold Water Survival*

Proper clothing and PPE can attribute to cold water survival, but a PFD is clearly the most important piece of PPE we can put on.

#### **1 – 10 – 1 Principle From Cold Water Boot Camp**

**1-10-1** is a simple way to remember the first three phases of cold water immersion and the approximate time each phase takes.

##### **1 – Cold Shock:**

An initial deep and sudden gasp followed by hyperventilation that can be as much as 600-1000% greater than normal breathing. You must keep your airway clear or run the risk of drowning. Cold Shock will pass in about 1 minute. During that time concentrate on avoiding panic and getting control of your breathing. Wearing a lifejacket during this phase is critically important to keep you afloat and breathing.

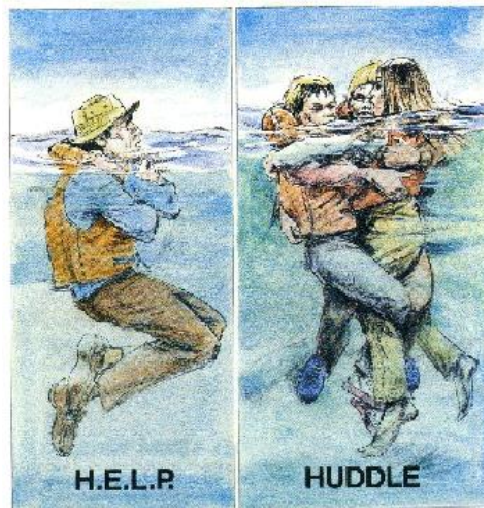
##### **10 – Cold Incapacitation:**

Over approximately the next 10 minutes you will lose the effective use of your fingers, arms, and legs for any meaningful movement. Concentrate on self rescue initially, and if that isn't possible, prepare to have a way to keep your airway clear to wait for rescue. Swim failure will occur within these critical minutes and if you are in the water without a lifejacket, drowning will likely occur.

##### **1 – Hypothermia:**

Even in ice water it could take approximately 1 hour before becoming unconscious due to Hypothermia. If you understand the aspects of hypothermia, techniques of how to delay it, self-rescue, and calling for help, your chances of survival and rescue will be dramatically increased.

- Wear a personal flotation device
- Keep clothes on
- In most cases, do not try to swim
- Get out of the water as soon as possible
- Assume the Heat Escape Lessening Posture (HELP) or Huddle



#### Cold Water Survival Factors

- Age
- Length of submersion
- Water temperature
- CPR quality
- Victim struggle
- Physical condition of the victim
- Individuals have been successfully revived after being under water for over one hour

#### *Drowning*

Drowning is defined as: suffocation in a liquid.

#### Three types

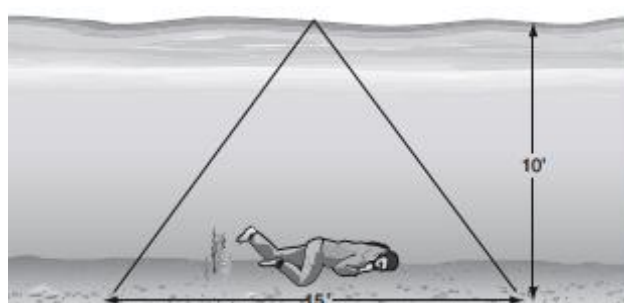
- Dry - no significant fluid in lungs (traumatic asphyxiation)
- Wet - aspiration of fluid into the lungs and causes pulmonary damage
- Secondary - Pulmonary problems such as ARDS / long term infections.

#### Care for drowning victims

- Remove from water
- Ensure ABC's and initiate CPR as required
- Prevent further heat loss
- Handle gently
- Administer 100% oxygen
- Transport to nearest medical facility which can handle these types of emergencies
- Follow local protocol

### *Victim Considerations*

Generally, a person submerged in calm water, or water with no current will be in an area about one and one half times the depth of the water they were in when they went under. For example, in water 10 feet deep, and with no current the victim will most likely be found in a 15-foot-wide circle directly underneath the entry point.



### Multiple victims

- Many well-meaning people will complicate missions
- Additional victims may be hard to spot

Victims may be trapped under an ice sheet

### Searching / Witness Interviews

- Clues – fishing poles, tackle boxes, foot prints etc
- PLS – Point Last Seen

## Water Rescue Equipment

### PPE

#### PFDs

Personal Floatation Devices (PFDs) were traditionally broken up into 5 different types based on the US Coast Guard ratings. In 2014 the USCG adopted a final rule that changed the way PFDs are labeled.

*“The Coast Guard is issuing this final rule to remove references to type codes in its regulations on the carriage and labeling of Coast Guard-approved personal flotation devices (PFDs). Removing these type codes from our regulations will facilitate future incorporation by reference of new industry consensus standards for PFD labeling that more effectively convey safety information and is a step toward harmonization of our regulations with PFD requirements in Canada and in other countries.”*

#### USCG Type 1 – 5 PFDs

- Type 1 & 2 are bulky and are for commercial or recreational boating
- Type 3 work vests are typically what we use
- Type 4 is throwable, such as ring buoys
- Type 5 is specialty, like swift water rescue vests or full body work suits.

#### New PFD Labeling & Standards

### CHOOSE THE DEVICE YOU WILL WANT TO WEAR

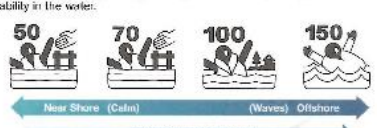
**SIZE & FIT**

- Check label for user weight and chest size.
- Different body types float differently.
- Try your device on in the water to ensure your airway is clear.
- A good fit is secure, comfortable, and adjustable.

TRY IT ON

**PERFORMANCE**

- Lower level number generally offers greater mobility, comfort, and style with good flotation for most people.
- Higher level number generally offers greater flotation, turning, and stability in the water.



CONSIDER YOUR ACTIVITY & ENVIRONMENT

**WATER SAFETY INFO**

- In over 80% of boating fatalities the person was not wearing flotation.
- Most of these are sudden falls overboard or capsizing of a small boat.
- The first moments in the water are critical, even for experienced swimmers.
- Cold water shock causes involuntary gasping, loss of muscle control and swim failure.
- Long term immersion in cold water causes hypothermia and requires thermal protection and flotation in the HELP position to conserve energy.

FLOTATION DEVICES SAVE LIVES

**DESIGN TYPES**

- **INHERENT** – built-in flotation (always buoyant).
- **INFLATABLE** – activator gas canister inflates chamber(s) (no buoyancy until time of inflation, requires canister replacement, may be manual, may require secondary action to don).
- **HYBRID** – combination of flotation and inflation (some immediate buoyancy and supplemental when inflated, may require canister replacement).
- **SPECIAL PURPOSE** – your activity may require special features (safety color, harness, straps, etc.) and accessories (whistle, lights, reflectors, etc.) for certain conditions.

YOUR DEVICE ONLY WORKS WHEN WORN


**MAINTENANCE**

- Over time, exposure to sun, salt, fuel, and milfoil can damage device.
- Allow to air dry. Inspect and test regularly.
- Inflatables require replacement rearming, repacking and regular servicing.

READ, SAVE AND FOLLOW INSTRUCTIONS

**WARNINGS**

- Children should have adult supervision when on or near the water.
- Devices must be fastened correctly and securely.
- Some devices were not designed for certain activities or conditions such as water skiing, towed sports, personal watercraft (PWC) or whitewater paddling.



CHECK LABEL FOR LIMITATIONS OF USE

**APPROVAL**

- Some devices are approved only when worn.
- Check federal, state/provincial and local requirements for carriage, use and wear.

☒

US Coast Guard

☒

Transport Canada

WEAR IT

For more info on the right choice for yourself, your family and friends...  
Visit [www.wearitlifejacket.org](http://www.wearitlifejacket.org)

Credit: [www.wearitlifejacket.org](http://www.wearitlifejacket.org)

Example of a label under the new USCG ruling:



*Credit: USCG*

### Buoyancy Comparison Chart:

HIGHER BUOYANCY MEANS HIGHER LIFT

Type PFDs	Minimum Adult Buoyancy in Pounds (Newtons)
I - Inflatable	33.0 (150)
I - Buoyant Foam or Kapok	22.0 (100)
II - Inflatable	33.0 (150)
II - Buoyant Foam or Kapok	15.5 (70)
III - Inflatable	22.0 (100)
III - Buoyant Foam	15.5 (70)
IV - Ring Buys	16.5 (75)
IV - Boat Cushions	18.0 (82)
V - Hybrid Inflatables	22.0 (Fully inflated) (100) 7.5 (Deflated) (34)
V - Special Use Device - Inflatable	22.0 to 34.0 (100 to 155)
V - Special Use Device - Buoyant Foam	15.5 to 22.0 (70 to 100)

*Credit: USCG*



## Type I



Best for open waters where rescuers may be slow coming. Used on cruise ships, and commercial vessels.

*Credit: Google Images*

## Type II



Similar to Type I just smaller and lighter. For general boating activities, good for calm inland waters.

*Credit: Stearns Stock Images*



## Type III



For general boating or specialized activity such as work, water skiing, kayaking or jet skiing. Make sure vest is labeled for the activity being used for. This is the typical shore based vest used in most departments.

*Credit: Stearns Stock Images*

## Type IV



A type IV PFD is a throwable device, such as a ring buoy or buoyant cushion. Per OSHA 1910.126(c), the working over or near water standard for general industry states that ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

## Type V



Specialized uses or conditions. See label for limits and use. Advanced training recommended for use. Swift water rescue, law enforcement, commercial white water, and kayaking.

*Credit: Stearns Stock Images*

## Type III/ V Inflatable



PFDs may have multiple ratings, such as this Type III / V Inflatable

*Credit: Stearns Stock Images*

### *Rescue Suits*

#### Ice and Cold Water Rescue Suits

Made from either neoprene or coated nylon. Neoprene may absorb petroleum products and is easy to repair with products such as Aquaseal. Coated nylon suits are more modern, do not absorb petroleum, and are easier to clean / decontaminate.



*Left: Coated Nylon Suit / Right: Neoprene Suit*

Both types of suits go on over your clothing and have integrated boots and gloves. They are not for use in swiftwater, as swimming in these suits is difficult. Suits provide their own buoyancy but are not rated as PFDs. Each suit should be outfitted with ice awls and a pea-less whistle.

Ice rescue suits offer thermal protection, but the one size boots and gloves built into the suits won't fit all rescuers well. Rescuers must remember that these suits are very buoyant, including the legs. Some rescuers will put ankle weights on to help prevent inverting in the water.

Zippers for both styles should be kept clean and waxed after every use.

#### Wet Suits

Typically made from neoprene giving some thermal protection in conditions they would otherwise lose body heat rapidly. Wet suits allows water to enter the suit, depending on the fit it will limit the circulation of water in the suit. Wet suits give protection in warm to moderately cold waters. The wet suit protects the whole body except the head, hands and feet. Addition of hoods gloves and booties to cover these areas. There is minimal buoyancy or protection from environment including hazardous materials in the water.



*Credit: Google Images*

## Dry Suits

Dry suits provide the wearer with environmental protection by exclusion of water and adding in thermal protection. Not all suits have liners, some require thermal protection added. Dry suits can be used any time of the year due to this flexibility. The dry suit protects the whole body except the head, hands and feet depending on manufacturer and style. The dry suit isolates the wearer from the outside environment protecting them from potential hazardous material typically found in flood environments.



*Credit: Mustang Stock Images*

## Helmets

Helmets should be available to all rescuers working on the water, ice and at the shore. They should be a lightweight rescue style helmet that has drain holes for water and can fit over the insulated hood for ice rescue suits, wet suits, and dry suits while allowing a chin strap to be fastened.



## Typical PPE for Water Rescuer



### Water entry personnel

- Type V PFD
  - Whistle
  - Knife
  - Light
- Wet or Dry Suit
- Helmet with chin strap
- Boots
- Gloves
- Throw bag

## Water Rescue Equipment

### *Throw bags*

Throw bags are typically 50 – 75' of polypropylene rope. They can be thrown to a victim to try to pull them out of the water and up onto the ice or shore. Other uses are to tether rescuers together, or for utility purposes. This rope is specific to water rescue and will float on water.





### *Rope Reels / Tether Lines*

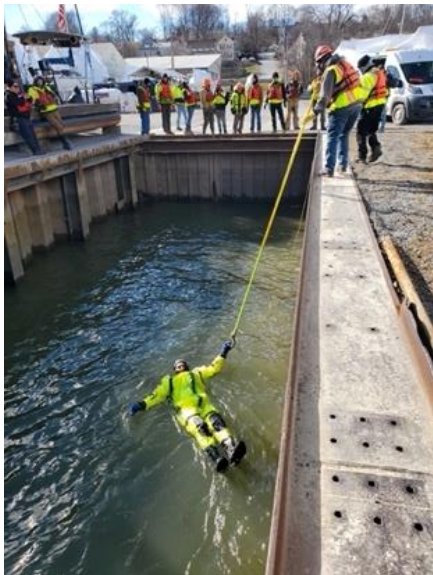
Rope reels are typically available in lengths from 300' – 900', while tether lines are typically bagged rope in either 200' or 300' lengths. Both styles are used to tether rescuers to a shore based crew for when rescuers must travel a long distance to get to victims.



*Stock Photo Credit: marsars.com*

### *Reach Devices*

Reach devices may be a homemade ice staff from wooden dowels to commercially available poles with integrated slings. Other options include using inflated fire hose, which can provide buoyance for multiple victims very quickly.



*Credit: MARSARS Rescue Equipment*

These devices allow rescuers to potentially operate from a safe area, without having to enter the water with the victim, and possibly retrieve them from the water.

### **Ring Buoy**

Type of floatation aid and throw bag. A Type IV device (required on most vessels larger than 16') and include floatation cushions. These are typically used for a throw rescue.





### *Lifeguard Buoy / Can*

A rescue buoy, rescue can, rescue tube, or torpedo buoy is a floatation device that aids in supporting the victim's weight. There are different styles, materials, and designs of the buoy. Typically, they have a floatation tube and a long leash the rescuer can wear to tow tube during swim. The buoy can create a safe distance between you and the victim while providing flotation and something for the victim to hold on to.



### *Victim Slings*

Slings are designed to provide victims with buoyancy, attach the victims into a rope system and to secure a victim under their arms and assist in extricating them out of the water. Slings may be

used on their own, attached to the rope system and rescuer, or with reach devices or ice rescue sleds and craft.



## Mask, Fins & Snorkel



*Credit: MARSARS Rescue Equipment*

## Fins

Designed to help you swim quicker and more efficiently. Rescue fins typically are shorter blades than diving fins. They are designed to go over your water rescue boot and have an adjustable strap.

## Mask and Snorkel



*Credit: Ataclete*

Mask typically can aid in seeing underwater, the snorkel can help you keep your face submerged for longer period of time allowing you to breathe while underwater. Rescue mask typically has a strap that can adjust small to go around just your head or extend to go around your helmet. These are used to aid rescuers conduct searches in relatively clear water.

## Water Rescue Craft



*Various Commercial Sleds*

### *Inflatable Boats*

Inflatable boats are popular because of rapid deployment, weight, and space they take up. Commonly used inflatable boats include styles such as the RDC – Rapid Deployment Craft which can be used for ice rescue, swiftwater, flood and surface water rescues. By design, there is no true bow or stern and can be used in any direction. Two rescuers can deploy the RDC and bring a victim on board, without the need for a rescuer entering the water, and then be hauled back to safety by shore-based crews.



### *Boats*

Other boats may also be a viable option, especially when there may be a fair amount of open water. These may include additional inflatable boats, hover craft, or airboats. Each of them has a place in various ice rescue scenarios but hover craft and airboats are typically very specialized pieces of equipment and require a lot of training.







## NFPA 1983 Overview

As mentioned earlier, this is a manufacturing standard and not a use standard, however understanding what the certifications of NFPA 1983 mean helps guide us in the purchasing of quality products.

- NFPA G Rating - General Rating - Minimum breaking strength of 9,000 lbs
- NFPA T Rating - Technical Rating - Minimum breaking strength of 6,000 lbs
- Most hardware is good as long as it passes inspection, which should also include function tests where applicable.
- Most software is good for up to 10 years from the date of manufacture.
- NFPA 1983 also addresses:
  - Labeling on equipment
  - Record keeping and requirements

## Definitions

kN – Kilonewton – The Newton is a measure of force

1 kN = 1000 Newtons

1 kN = 224.8 lbf (pounds of force)

Often, we consider 1 kN to equal the weight of 1 average person. Certainly, that can fluctuate, but in simple terms when considering how much weight or force a rope or piece of equipment can handle, if it is rated at 10 kN (2,224 lbf), that is approximately the weight of 10 people.

## MBS – Minimum Breaking Strength

Carrier Count - This refers to the number of different yarns that are braided around the core of the rope to form the sheath.

Hand - The “hand” of the rope is a reference to how soft or supple the rope is. Typically, a supple rope will be considered to have a soft hand, versus a stiff rope that has a hard hand.

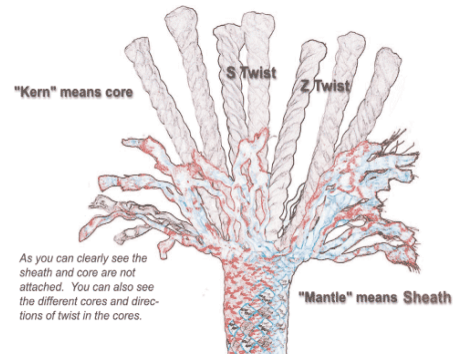


Photo Credit: NRS.com article - [Know the Ropes](#)

Kernmantle – The construction style of the rope where the “Kern” is the core, while the “Mantle” is the sheath. The core typically supports the major portion of the load, while the sheath primarily protects the core and supports a portion of the load.

Static Kernmantle Rope – A life safety rope with a maximum elongation of 6% at 10% of its minimum breaking strength. It is the primary type of rope used in technical rescue due to its low elongation, making it efficient for use in lowering and raising systems.

Dynamic Kernmantle Rope – A life safety rope with an elongation greater than 25% at 10% of the minimum breaking strength. These ropes are typically used by climbers since they help absorb the shock of a fall with their high elongation. Technical rescue teams specially trained in lead climbing, tower rescue and rescue from other structures may choose a dynamic rope over a static because they anticipate the potential of a fall.<sup>1</sup>

<sup>1</sup> Cordage Institute, Terminology for Fiber Rope

## Rope / cordage construction & features

### Suppleness vs. durability

The softer the hand of a rope the easier it is to knot typically. A stiff rope that has a hard hand, will be more difficult to work with and tie knots. Think about how difficult it would be to tie a knot in cable versus a softer rope. Typically, the more supple the rope the less durable it may be. A stiffer rope will be more like cable and therefore will be more durable. Manufacturers all try to balance this with different techniques in making the ropes including coatings, treatments, fiber tensions, directions of the twists and more.

### High carrier count vs. low carrier count

Ropes with a higher carrier count will typically have a softer hand, while a lower carrier count will have a harder hand. Carrier counts in Static Kernmantle ropes typically range from 16 - 48 carriers. This means that there could be anywhere from 16 to 48 different yarns braided around the core of the rope to make the sheath. This will also affect how smooth or flat the surface of the rope is. The last video link below has the most in-depth explanation of all the factors of how ropes are made.



*Each bobbin is a yarn that is being braided around the core of the rope to form a sheath.*

The 2 main construction characteristics that affect the performance characteristics are the number of carriers in the sheath and how much twist is in the bundles that make up the sheath and the core.

A rope with a high carrier count will have a thinner sheath and larger core, lending itself to a less durable rope with low stretch. The opposite being true of a low carrier count rope with a thicker sheath, more durability with a thinner core and more stretch. This primarily the result of a larger portion of the mass of the rope running straight in a high carrier count rope, transferring the energy in a straight line through the mass of the rope.

With a low carrier count rope there is more mass running at angles to the transfer of energy and those fibers need to straighten and bind on other fibers before holding the load, leading to more elongation.

Twisting the bundles that make up the sheath and the core adds structure, a firmness, to the body of the rope. Less twisting will typically result in a very low stretch rope, but it will feel “mushy” and tend to flatten over edges and through devices.



The amount of twisting of these fibers also imparts some stretch to the rope. Adding a lot of twists to these bundles is how a dynamic rope functions as the materials are the same as the fibers used in static ropes.

#### Common Materials

- Nylon
  - Loses strength in water.
  - More stretch compared to polyester and aramid fibers
- Polyester
  - Unaffected by water
  - Low stretch
- Polypropylene
  - Floats
  - Typically water rescue rope, not life safety
  - Classified as NFPA Throwline
- Aramid (i.e. Technora)
  - Unaffected by water
  - Low Stretch
  - High Abrasion/Heat resistance
  - High strength fibers
    - 3 times stronger than nylon / polyester
  - Low resistance to shock

#### Videos:

[How Ropes are Made](#)

By: BlueWater Ropes

[How Climbing Ropes are Made](#)

New England Ropes

[How is Climbing Rope Made?](#)

By: Sterling Ropes

[How Climbing Ropes are Made:](#)

[Inside / Out](#)

By: WeighMyRack - @Edelrid Ropes

#### Common Diameters / Sizes & Uses

- 10.5 – 11.5mm (7/16”) Static Kernmantle Rope
  - May be NFPA T rated at 20kN – some are G rated depending on construction
  - Primarily used in industry, technical rescue teams and gaining popularity within the fire service
- 12.5mm (1/2”) Static Kernmantle Rope – NFPA G rated at 40 kN – common rope diameter used in fire service.
- 6mm technora cord – used for tiebacks – rated for 21kN
- 8mm prusik cords – used as rope grabs, mini-haul systems, accessory cord, sewn cord used as anchors
  - Rated at 15 kN as a single part
  - Cords tied into a prusik loop with a double fisherman’s have a theoretical rating of up to 50% less than 15 kN
  - Sewn cords in a bound prusik loop rated at 20 kN



- 1” Tubular Webbing – rated at approximately 19kN<sup>2</sup>
- 1” Flat Webbing – rated at approximately 26kN<sup>3</sup>

The practice of tying prusiks should be eliminated completely. Sewn bound loop prusiks offer a level of safety that far exceeds the cost savings of making your own.

Rated sewn terminations can be used as anchor straps with a degree of certainty that unaccounted for hand tied prusiks cannot.

Sewn anchor slings should be used wherever possible for the same reasons.

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<sup>2</sup> CMC Rescue

<sup>3</sup> CMC Rescue

## Knots / Bends / Hitches

These knots, bends, and hitches, are the common ones we utilize in rope, water, and confined space rescue. There are many ways to tie each of these, and it is always good to know several ways to tie each.

A knot has many definitions, but for our purposes, it is an intentional complication in rope, cordage or webbing, which has a practical application. A bend is a type of knot that ties 2 ropes ends together, while a hitch is a knot which secures a rope, cord or webbing to another object.

A bight is a fold in a piece of rope so that the two parts lay alongside each other. This is often used to form a loop, as when we tie the “figure 8 on a bight.” We make this bight, or loop, sized appropriately for the task. We refer to the size of the loop or bight, as the “gain” of the knot. The gain is the overall size of the knot. The larger the gain, the larger the loop. In confined space rescue we often try to tie our knots so the gain of the knot is small enough to just clip in two carabiners. This allows us to maximize our lifting height, because if we had a knot with a large gain, and our overhead clearance was low, we could potentially not be able to get a rescuer or victim out of that space.

The working end of the rope refers to the “short” end, the part doing the knotting or the work, or the part under load. It is also referred to by some as the “running end”.

The standing end of the rope is the long part of the rope, or the part not knotted, or the “free” end of the rope.













The bitter end refers to the tail end of the standing end of the rope.













Typically, regardless of the knot, bend, or hitch, we de-rate the breaking strength of the rope a minimum of 30% but more often de-rate it at 50%. This is because there is such a variation in the materials used in rope construction, strength loss of various knots, and condition of the rope itself – new versus used. De-rating the rope at 50% ensures that we have considered all of these factors.










Anything we tie must be easily identifiable by everyone involved. Clean and well-dressed knots, bends, and hitches help us quickly inspected our system and ensure we are ready to proceed. Unless noted in the table below, we do not use “safety” knots when tying the majority of these. Instead, we follow a few rules:





- Tails in rope should be 6” or length of hand
- Tails in webbing should be 4” or width of hand
- Knots should be well dressed, set and easily identifiable

Scan the QR codes below with your camera app, or just tap on the QR Code on your mobile device and it will bring you to a video on how to tie that knot.

Rescue Knots / Bends / Hitches and their uses		
Photo / Name	QR / Alternate Names	Uses
		Stopper knot, used in the terminal end of a rope
<b>Figure 8</b>	Figure 8 Stopper, Flemish Knot	
		Creates a loop to anchor the end of a rope. Loop typically should only be large enough to accommodate 2 carabiners. Tail should be the length of your hand, if it is longer you can tie it off.
<b>Figure 8 on a bight</b>		
		Creates a loop in the end of a rope going through a ring, carabiner, harness, object, anchor point etc. Tail should be the length of your hand, if it is longer you can tie it off.
<b>Figure 8 Follow Through</b>		
		Joins two ropes together Tails should be the length of your hand, if it is longer you can tie it off.
<b>Figure 8 Bend</b>	Flemish Bend	
		Creates a loop / attachment point in the middle of a rope. Can also isolate a damaged section of rope.
<b>Butterfly</b>	Alpine Butterfly	
		Join two ends of ropes together. Binding knot, often used in the terminal end of patient packaging devices. It is imperative that a safety knot is tied on either side of the knot, right up against it.
<b>Square Knot</b>	Reef Knot	

Rescue Knots / Bends / Hitches and their uses		
Photo / Name	QR / Alternate Names	Uses
		Stopper knot, typically used up against another knot, such as the square knot.
Overhand Knot		
		Stopper knot, used in the terminal end of a rope. It is also the basis for several other knots and is used as a safety in conjunction with other knots.
Double Overhand Stopper		
		Used to place limbs as wristlets, must be backed up to ensure locking action. This knot can cause potential trauma and only should be used when other methods are not available/practical.
Handcuff Knot	Texas/California Love Knot, Hobble Knot	
		Joins two ropes of similar size together, often used to create Prusik loops.
Double Fisherman's Bend	Grapevine Bend	
		Typically a temporary holding hitch, easily adjustable. This hitch does slip and should be backed up.
Clove Hitch – Rope End		
		Two opposite hitches are created and dropped over an object to create this hitch. Typically a temporary holding hitch, easily adjustable. This hitch does slip and should be backed up.
Clove Hitch – Half Hitches	Drop Over Clove	

Rescue Knots / Bends / Hitches and their uses		
Photo / Name	QR / Alternate Names	Uses
		Anchor around a post or tree for a static rope, can be used for rappelling or a static safety line. No strength degradation of rope. Post diameter should be at least 8 times the diameter of the rope, typically at least 3 full turns around the post. Can be secured with a carabiner or a figure 8 follow through.
Tensionless Hitch		
		Can be used to tie off descenders. Attention must be paid to the tail strand to be pulled on is away from the device.
Slip Knot	Slipped Overhand Knot	
		Triple wrapped loop of cord for system loads, this creates friction on a rope and can be used as a rope grab. Double wrapped are only suitable for a single person load such as ascending, and should never be used in systems.
Prusik Knot	Triple Sliding Hitch, Prusik Hitch	
		Utility knot creating a loop in rope or webbing, either in the end or the middle. No life loads in rescue.
Overhand Knot on a Bight		
		Forms a bight in the end of the rope that will cinch down the bight. This is useful when you need a carabiner to be loaded upon the spine to keep it from easily side loading the gate or to the bucket of a double pulley when using it at the dead end of a mechanical advantage system.
Poachers Knot / Double Overhand Knot	Strangle Snare	Triple wrap is known as a Scaffold Knot

Rescue Knots / Bends / Hitches and their uses		
Photo / Name	QR / Alternate Names	Uses
		Used with webbing or rope to attach a sling or loop around a bar, ring, or other attachment point. This hitch significantly weakens slings. If using to join two slings together, it may be better to use a carabiner.
Girth Hitch		
		Attaches two ends of webbing together by rethreading one end through an overhand tied in the other side. Tails should be at least the width of your hand.
Water Knot	Ring Bend, Tape Knot, Overhand Follow Through	
Photo / Video Credits: <a href="http://AnimatedKnots.com">AnimatedKnots.com</a> , <a href="http://REI.com">REI.com</a> , <a href="http://CMC.com">CMC.com</a>		



## Water Rescue

### Rescue Sequence

Start at the lowest risk to rescuers and our risk increases with each advancement through the sequence.

Sequence	Action
Self-Rescue	Talk to the victim – Coach towards safety / float on back / tread water / stay calm
Reach	To the victim with a pole, hook, paddle, etc
Throw	Shore based rescue – Throw bag / buoy
Row	Boat based rescue
Go	Contact Rescue
Helo	Helicopter Rescue

### Self Rescue

Self-rescue refers to the ability of an individual in distress to take actions to help themselves before or while receiving assistance from rescuers. When a rescuer is talking to a victim, self-rescue may involve the victim following instructions provided by the rescuer to help themselves in the water. Here are some common examples of self-rescue actions that a victim can take while communicating with a rescuer:

1. Floating: If a victim is tired or struggling to stay afloat, the rescuer may instruct them to float on their back, which can help conserve energy and provide buoyancy. Floating can give the victim a chance to rest and regain composure while waiting for further assistance.
2. Treading Water: In situations where a victim is able to tread water but may be panicking

or feeling fatigued, the rescuer may guide them on how to tread water effectively to stay afloat. Treading water can help the victim stay above the surface and maintain their position while awaiting rescue.

3. Swimming to Safety: If the victim is capable of swimming but needs guidance, the rescuer may instruct them on the safest route to swim to reach safety. Providing clear directions and encouragement can help the victim navigate the water and make their way to a secure location.

4. Using Rescue Equipment: In some cases, the rescuer may provide the victim with rescue equipment such as a reaching pole, throw bag, or flotation device to assist in their self-rescue efforts. The victim can use the equipment as directed by the rescuer to aid in their own rescue.

5. Staying Calm: One of the most important aspects of self-rescue is for the victim to stay calm and follow the rescuer's instructions. Panicking can hinder self-rescue efforts and make it more challenging for the victim to help themselves. By remaining calm and focused, the victim can better cooperate with the rescuer and improve their chances of self-rescue.

By engaging in self-rescue actions and following the rescuer's guidance, a victim can play an active role in their own rescue while receiving assistance from the rescuer. Self-rescue skills are valuable in emergency situations and can help individuals stay safe and increase their chances of survival until help arrives.



## Reach Rescue

Use a pike pole, rescue staff, paddle, or inflated hose line to reach out to the victim. Have them grab on and pull them out of the water if possible.



## Throw Rescue

Any flotation with a water rescue throw rope attached or just a water rescue throw rope. Aim your throw past the victim, but over their shoulder / arms. Have victim wrap rope around their forearm multiple times and then try to pull them out of the water while coaching them to kick their feet.

## Row Rescue

If trained and equipped, use a boat to perform the rescue. This gives rescuers a stable platform to operate from and potentially not have to enter the water, decreasing the risk to the rescuer and keeping them safe.



## Go Rescue

Using the proper PPE, make safe entry into water keeping victim in line of sight.





Depending on the water rescue environment, rescuers may be tethered to shore, a boat or to other rescuers and the line tended. When making a go-based rescue without a tether, the rescuer should choose to use an additional aid, such as a lifeguard buoy or can.

**Never attach a line to a rescuer in moving water without a quick release system!**

While swimming to your victim keep victim in sight by using water rescue swimming techniques that keep your head up and out of the water. This technique allows rescuers to scan the water for any signs of distress or potential victims while still moving towards their target. If there is a lot of open water between you and the victim, then fins may be of assistance.

Rescuers should maintain a safe distance from victims who may be panicking or in distress to prevent them from grabbing onto the rescuer and potentially causing both to submerge. By keeping a safe distance, the rescuer can assess the situation and determine the best approach for the rescue.

Communication is key in preventing a victim from endangering the rescuer during a rescue. Rescuers should calmly communicate with the victim, providing clear instructions and reassurance to help keep them calm and cooperative. Establishing communication can help the rescuer gain the victim's trust and cooperation during the rescue.

Rescuers should make use of appropriate rescue equipment such as rescue tubes, rescue buoys, or reaching devices to assist the victim without putting themselves in harm's way. By using rescue equipment, rescuers can safely provide support and assistance to the victim while maintaining a safe distance.

If the situation escalates or the victim poses a threat to the rescuer's safety, the rescuer should call for backup or assistance from other rescuers or emergency personnel. Working as a team can help ensure a coordinated and effective rescue operation while keeping both the victim and the rescuer safe.

Rescuers should always maintain situational awareness and be prepared to react quickly to any changes in the environment or the behavior of the victim. By staying alert and focused, rescuers can anticipate potential risks and take proactive measures to prevent the victim from endangering them during a rescue.

Approach victim from the side or behind so they can't pull you under water or grab ahold of you.





Rescuer gets behind or to the side of the victim and grabs the victim assuming control. Once the rescuer is in position, they give the signal to the shore crew to pull on the tether line. Rescuer may use a lifeguard rescue buoy or rescue can to give the victim something to hold on to and keep a safe distance. Lifeguard tools can be used to help keep the victim afloat while you swim and tow the victim or are pulled to shore or boat.

## Helo Rescue

Helicopter rescue requires specially trained rescuers and likely may only be available from the US Coast Guard. People trapped on large sections of drift ice and on large bodies of water could require such a rescue. This is one of the most complex and high-risk rescues and should only be utilized if other options are not available or viable.

Not all helicopters are setup for rescue. They all have different sizes and capabilities. Most medevac helicopters do not have the equipment, training, or personnel to perform such rescues. It is important to understand that often we will not have communications with the aircraft unless we have pre-arranged that with them.



Additional factors to consider are the weather, and if they aircraft will need a landing zone near your rescue area.



*Credit: Andy Bernos, Irish Coast Guard*

## Water Rescue Communications

Communications during a water rescue can be challenging. Portable radios often will not work if submerged and are not easily carried with some of the PPE being worn. Often rescues may be far enough away from shore, or where the sound of water may make verbal communication very difficult. Therefore, we must learn to communicate with other methods to include whistle blasts, hand signals and tugging on our rope tether lines.

Any set designation of commands can be used as long as they are known to the entire team.

Any member can call "Stop" for any recognized safety issue.

When utilizing radios, transmissions should be short and concise. Consideration should be given to operating on a designated channel to prevent cross-chatter and confusion. Radios can be difficult to use in areas of dense building materials, steel and concrete block radio transmissions.

Background noise and reverberations/ echoes can render conventional microphones ineffective; use of bone or throat microphones reduce background noise interference. Hearing protective headsets should be used in high noise environments to ensure communications can be heard as well as preventing distractions and hearing damage for rescuers.

In situations where radios or direct verbal communication cannot be used, a different system must be utilized and may include whistle signals as alternatives. Again, these communication systems should be simple commands and not be too verbose as to cause confusion to rescuers. It is too easy to also chain words together that may have opposite meaning, and the recipient only hears the last part of the command, which may have not been the overall intent. We also want the commands utilized to be applicable across multiple disciplines of rescue. For example, if your team does rope and confined space rescue and interacts with a team that does swiftwater rescue you want to have these simple commands that will work across these disciplines.

Effective communication involves two key parties: the sender, who conveys the message, and the recipient, who receives it. To ensure that the message has been understood correctly, it is important for the recipient to repeat back the information. This practice helps confirm clarity and reduces the risk of misunderstandings.

These commands are our preferred method of communications in many rescue applications:

Commands	
STOP	1 Whistle Blast
UP	2 Whistle Blasts
DOWN	3 Whistle blasts
SLOW	SLOW UP / SLOW Down
TENSION	Tension by Hand
SLACK	Make Soft / Slack the line
FLOAT	Lift Up 1 meter (off ground)
AT WILL	Your discretion
RIG FOR	"Rig for raise" - next step
<b>REPEAT COMMAND BACK</b> <b>Ensures they know you heard correctly</b>	

Another method is the OATH System, which has different meaning depending on who initiates the communication.

OATH can be used for communication across rope tugs, pulls, whistle blasts or light flashes.

# OF TUGS	ATTENDANT / Technical Rescue Officer	ENTRANT / Rescuer
1 – Ok:	All OK? OK / Attention / Stop	All is OK / Attention / Stop
2 – Advance:	Advance / Lower	Give More / Lower
3 – Take up:	Turn Back / Tension / Haul	Backing Out / Tension / Haul
4 – Help:	Get Out	Send Help



**OK! / GO! Signal**



**Stop! Signal**



**Help! Signal**

All operators on the team must be familiar with the signals to remain safe and effective.

## Surface Water Rescue Swimmer Operations

### Surface Water Rescue Swimmer

#### Equipment, Skills, and Search Procedures and Methods

A water rescue team can increase their rescue capabilities by training their personnel in Surface Water Rescue Swimmer skills and equipment use. Consisting of a mask, snorkel, and pair of fins typical of snorkeling and SCUBA diving recreational activities, this equipment is easy to use, and with training can provide a water rescue team with enhanced rescue and recovery capabilities.

**Diving masks** are designed to provide a clear view to the swimmer while underwater, and when combined with a snorkel, provide unlimited time “face down” in the water to search below the surface when combined with a snorkel, which gives the swimmer the capability to breathe while their face is in the water. With the addition of the propulsion provided by a set of swim fins, rescuers can establish a search pattern and cover a considerable amount more of a defined search area with more speed than attempting the same without this equipment. Water depth for surface water rescue swimming should be limited to 10 feet. Beyond this depth, a SCUBA Team should be dispatched to continue the operation.

Masks should fit the swimmer’s face snugly, providing a watertight seal keeping water from entering inside the mask when underwater. Proper clearance procedures should be learned and practiced clearing the mask underwater should it inadvertently become filled with water. Masks are available in a variety of faceplate configurations, i.e. single lens, dual lens, etc. Full face

models with integrated snorkel are used for recreational purposes, but not typically found in



rescue caches.

**Snorkels** give the swimmer the ability to breath while their face is in the water when swimming, giving the rescuer an ability to perform lengthy shallow water searches. Snorkels are simple in design, consisting of a mouthpiece attached to a tube that extends above the surface of the water. When diving underwater, snorkels fill with water, and therefore clearance procedures must be practiced until the swimmer is proficient at the skill. Additionally, cautious inhalation should take place until the swimmer has confirmed the device has been effectively cleared. Initial practice should be done while simply standing in the water chest deep and placing the face in the water to practice breathing and clearance procedures prior to swimming and diving.

**Swim fins** are available in a wide variety of styles and stiffness for various snorkel and SCUBA activities. Training fins provide the most flexibility and are best suited for swimming practice before moving on the stiffer, larger open-water versions. Rescue fins are designed to fit over most water rescue boots, and are typically wider and shorter, providing adequate propulsion with less effort for extended search operations. When swimming with fins, a common mistake is to “bicycle pedal” by flexing at the knees as the swimmer moves the fins through the water, however this will consume considerably more energy and be less effective than the “flutter kick.” The flutter kick should be performed by rolling the hips from side to side with a slight bend in the knees. This action will engage larger muscle groups of the lower torso providing more forward momentum with less effort. Swimming with fins can be done effectively on the swimmer’s stomach, back, or side, and provide the capability to cover more distance with less effort when swimming to a surface water victim or conducting shallow water search operations. When diving, the swimmer should force the upper torso down vertically with their legs straight up then pull down with their arms, and not kicking until their legs and feet are fully in the water. When vertical, the swimmer’s weight itself will help drive the body underwater. Once fully underwater, kicking properly with fins will allow the rescue swimmer quick access to depths of 10 ft.







## Search Procedures and Methods

“One of the greatest enemies to an effective search is preconceived ideas and assumptions as to where the search subject is.”

*Canadian Coast Guard Auxiliary*

The ability to conduct effective victim searches is an integral component of water rescues requiring operational skills on flatwater and swiftwater rivers, lakes, and urban flood zones. Searches may be required to cover shorelines, wide area open bodies of water, riverine corridors or flooded urban areas. Victim location is a critical piece of information necessary for determining the strategy and tactics of most rescue situations. It is also needed to determine what

resources are needed, where they may be staged or deployed, and the speed in which this will need to be completed. Accurate and precise location is very important and should be communicated to all personnel as quickly as possible so the Incident Action Plan (IAP) can begin to be developed.

Prior to the deployment of on-water search teams, a number of actions should take place in preparation for the conduct of the search, including:

### **On-Scene Report**

The initial report on arrival to an inland water rescue incident should include the following information:

- Confirmation of incident location,
- Confirmation of incident dispatch information,
- Staging location for incoming resources,
- Establish and or transfer command, and
- Actions taken or needed to control access to the scene.

### **Size-Up**

In order to safely mitigate the emergency, the initial incident commander shall perform a thorough size-up of the incident and gather all the information available to develop an incident action plan which include:

- Use a six-sided approach to visualizing the incident (above, below, four sides).
- Determine location, number, and condition of victims.
- Secure witnesses who may have valuable information on victim location. ▪ Review pre-plans of the location.
- Establish operational zones.
- Obtain and monitor current weather conditions.
- Mark the water level and continual check to determine rise or fall.
- Determine if this is a rescue or a body recovery.

- Consider what will happen if responders do nothing and wait for water to recede.
- Request additional and specialized resources needed to accomplish the objectives.
- Request additional EMS units as needed for the number of victims.

### **Initial Response Operations**

It is also important to implement these critical out-of-water actions during the development of the incident action plan:

- No personnel should be in, on or over the water (Hot Zone) while wearing structural firefighting gear.
- Ensure all responders are in proper PPE and flotation devices.
- Conduct upstream and downstream recon to identify hazards.
- Maintain awareness of the hazards in and around the incident location.
- Position upstream spotter.
- Position downstream safeties.

### **Risk/Benefit Analysis to Determine if Rescue or Recovery**

The Incident Commander should include a risk/benefit analysis before in-water operations are commenced. Responders need to act on training and facts and not out of compassion. The following are key considerations in performing a risk/benefit analysis before developing an incident action plan:

- Victim recognition – assess the patient’s physical and mental status to determine if they can self-rescue or if they need to be rescued.
- Victim viability – determine when and where the victim was last seen, how long they have been submerged, and what is the water temperature.
- Hazards and environmental factors which can jeopardize rescuers.
- What factors will hinder or ease access to the victims? ▪ What is the training and experience of on-scene personnel?
- What are your available resources?
- Monitor weather conditions.

- Protect in place option (water level rising or falling).

### **Situation Report**

The situation report should include the following information:

- Confirmation and condition and number of victims in, on or under the water, if possible.
- Information gathered from bystanders and victim status.
- Is the water/ice moving? How fast and in what direction?
- Possible access for resources.
- Establish operational zones.
- Consider Dive Team (SCUBA) due to reflex/response time.

### **Initial Action Plan (IAP)**

As the location and number of victims is determined, the Incident Commander shall develop the IAP. This plan will be built off of the initial response operations and information gathering of the first-arriving units. An IAP should have several options for the incident operations. As conditions change, the dynamics of the incident cannot always be predicted. The ability to modify tactics is as important as the initial plan. The Incident Command System should be implemented in the initial stages to ensure scalability of the incident.

### **Search Conduct**

Conduct of the search can be categorized as follows;

- Primary
- Secondary

At the operational level, technicians conducting a primary search should concentrate on “areas of interest” or hotspots identified through the information gathered as identified above. In the event the subject (s) are not located in the primary phase, areas not searched can then be prioritized and a secondary search of those areas can be conducted.

The search can be further defined by type;

- Type I-Hasty
- Type II-Open Grid/Wide Area

- Type III-Grid/Thorough

### **Type I-Hasty Search**

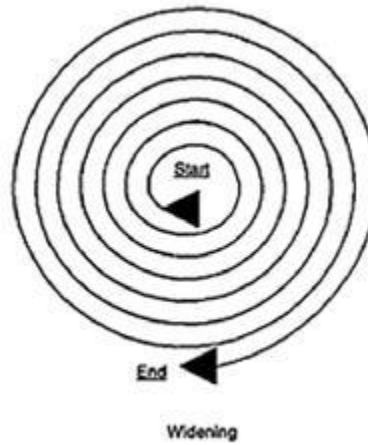
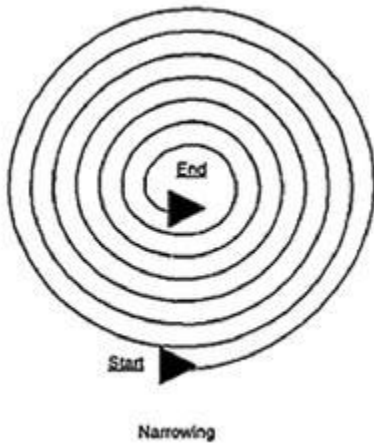
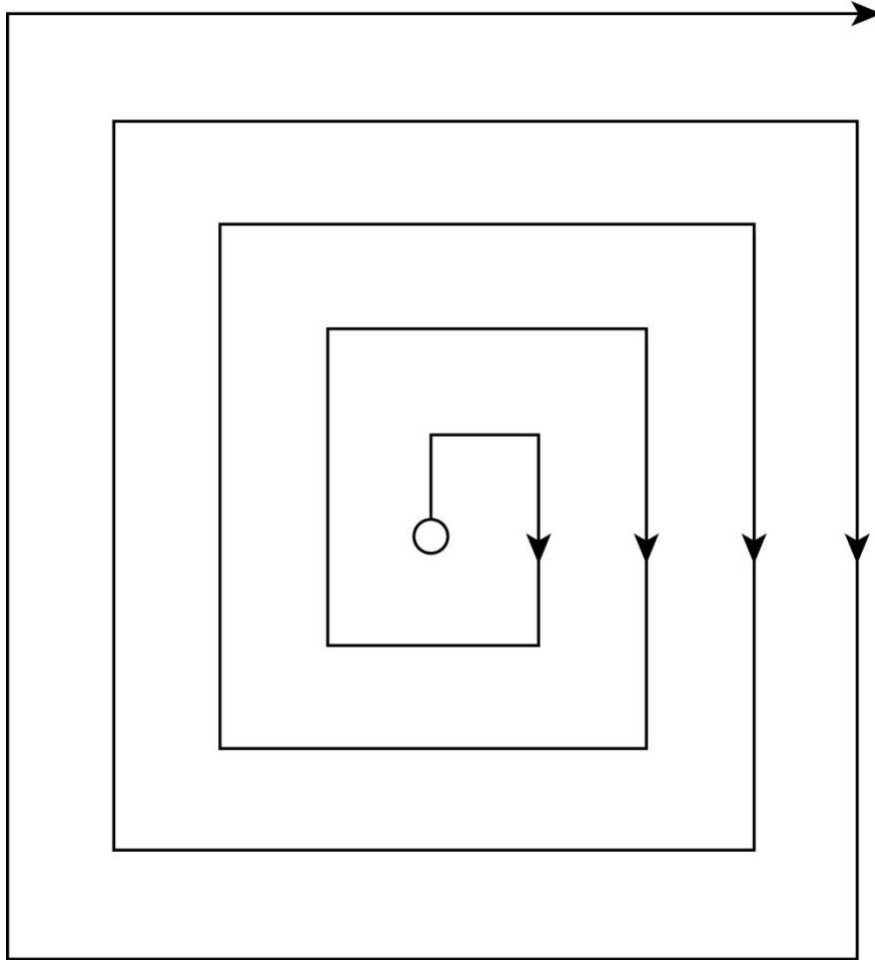
The Hasty Search is a fast-moving operation meant to detect live victims and conduct a reconnaissance of a search area. On rivers, a rapid downstream search as rescuers scan the water and riverbanks would be performed. Wide area open bodies of water may include quickly moving along a shoreline scanning for victims, or rapidly conducting a sweep search in an effort to locate victims in the open water. Conducting hasty sweep searches can be performed by multiple boats and can be done in both forward and reverse sweep patterns to cover defined areas rapidly.

### **Type II-Open Grid/Wide Area Search**

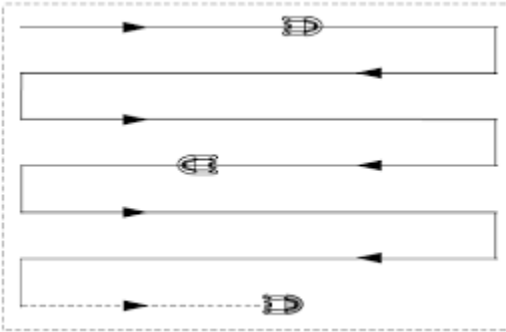
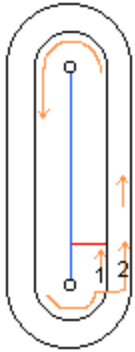
The Open Grid/Wide Area Search is used primarily to cover large areas of water more thoroughly in an expeditious amount of time. The parallel track method of search patterns is very effective in completing this task and can be applied to a wide variety of water covered areas, including large rivers and static bodies of water.

### **Type III-Grid/Thorough Search**

The Grid Search is a methodical search of an entire area and is designed to completely cover a particular area in a slow-moving pattern. These patterns can be either expanding or contracting circular or square patterns. They can also be conducted on rivers by establishing a highline with a moveable control point. Using the boat as a platform, rescuers rely on the bankside controls to move the boat in a grid pattern and the rescuers pole and spot for submerged victims.







## Motorized Inflatable

Coming soon!

## Inflatable Rescue Boat Operations

Coming soon!

Videos from BoatUS:

[Man Overboard Rescue for Powerboats](#)



[Crew Overboard Prevention Tips](#)



## Victim Removal Techniques

### Surface Water Based

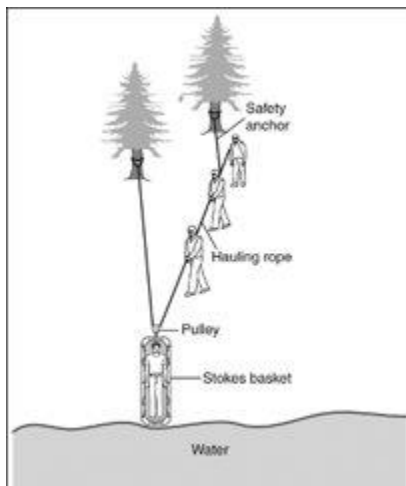
The rescue is not complete until the victim and rescuers are in a safe place.

#### Simple Haul (pull) systems

With manpower a simple haul pulling up a bank or onto a dock may be possible.



Simple 2:1 mechanical advantage can be achieved using on hand equipment. Rope bag with carabiner, the addition of a pulley will decrease friction and help with efficiency.





Stokes with haul (pull) system attached. Prussic lines can be used for rescuer attachment and safety.

Credit: CTR PowerPoint

Different packaging options to help with removal from water.



Typical Stokes Basket with floatation added.



Using stokes basket to move to dock or shore. Photo demonstrates 2 rescuers in water standing. If this is not possible can be done kneeling in boat for transfer.

## Boat Based

### Par buckling



This is a hasty method to get victims into the boat. Two pieces of line or webbing used, preferably 2 inch wide, fasten one end to the boat while rescuers hold other end. Position center of the par buckling strap under victim. Hold tension on straps removing slack from system. The rescuers slowly pull up and sit back and victim is pulled / rolled up the side and into boat.

Pull method single or dual rescuers.



This method can be used to recover victims or rescuers into a boat. 1 Rescuer method, rescuer kneels in boat firmly grasps PFD or shirt. The rescuer then bounces the person in the water, do not dunk the head under, this is to gain momentum from the buoyancy of the PFD. On the up cycle of the bounce the rescuer sits back, the momentum from bounce and the body weight of

rescuer pulls person into boat. The dual or two rescuer method is accomplished the same way however there is one rescuer on each side of the person being recovered into boat.

## **Surface Water Based Victim Removal Techniques**

When conducting surface water rescues, many operations may require a simple raising system to continue the operation once the victim has been secured and has been brought to shore or dockside. Construction of a simple rope system can provide a means of lifting assistance for the rescuers, as well as protection for the victim from a bank fall as they are transported by the rescuers out of the water and/or up the bank to an awaiting medical crew.

Low angle, short distance bank extrications can be enhanced by creating a 2:1 mechanical advantage, which will provide both lifting assistance to the rescuers and protection from a fall of the victim back down the bank. To construct this, place a webbing sling on the head of the Stokes litter and connect a single pulley to it with a carabiner. From the top of the bank, attach a length of rescue rope sufficient to reach the victim location and back up to the top of the bank to an anchor. This can be done either directly via a knot, or with a webbing sling and carabiner which the rope is in turn connected to via knot. Extend the rope to the litter and run it through the pulley. Then bring the end back up to the top of the bank. This becomes the haul line for a haul crew, proving both a 2:1 mechanical advantage when hauling, as well as a line of protection for the victim in the litter should the rescuers have to negotiate over rocks, muddy bank slope, etc.





If the victim has been rescued and brought to a dock location, and the elevation of the dock vs the water requires a raising system, a ground ladder, Stokes litter, and a basic complement of rope rescue hardware can assist in completing the task of victim extrication.

If the ground ladder is long enough to reach the bottom of the water at dockside and form a ramp, place a pulley with a sling and carabiner on the litter. Attach a length of rope to an anchor beyond the dock (vehicle, parking bollard, etc.), bring it to the pulley at the litter, and bring the rope back up to the dock. The rope must be at least twice the distance from the anchor to the



litter and back to the dock for this system to work. This line becomes the haul line, providing a 2:1 mechanical advantage to pull the litter up the ladder, which is used as a ramp. Care should be taken to secure the head of the ladder to an available anchor with rope or webbing prior to the conduct of extrication. The “ladder ramp” can also be used as the point of extraction for rescuers in the water.



If a dockside extrication is required and the water is too deep to ground the ladder and use as a ramp, the ladder can be used as a lever with the dock edge acting as a fulcrum to lift the load. This technique requires the use of two supports to suspend the ladder from the dock. These can be Pike poles, New York hooks, or Halligan tools. Lay the supports on the dock so they extend slightly out over the water and have two rescuers stand on them. Hang the ladder from them so the bottom extends into the water least the length of the litter. Attach a pulley to the top of the ladder with a webbing sling and carabiner. Be sure to engage the main beams and not just the top rung. Next, connect a rope to an anchor behind the ladder far enough away to create a haul field for the haul team. Bring the rope to the ladder and through the pulley. This becomes the haul line for the haul crew. The rescuers operating in the water, once the victim is secured in the litter, should position the litter in preparation for the ladder to be “levered up” by the haul team. The

edge of the dock serves as the fulcrum point. As the haul team slowly pulls and the bottom of the ladder is levered up, the rescuers in the water should position the litter on the ladder. Once this is completed, the haul team can continue to haul, levering the ladder to a horizontal position and lifting the litter out of the water. At this point, the rescuers assigned to standing on the tools supporting the levering action should manually slide the litter onto the dock, completing the extrication from the water. Additionally, this technique can be used to extract the rescuers working in the water. Once on the ladder, they can be individually levered up, and simply move to the stability of the dock.



## Recommended Training / Continuing Education

Technical rescue, regardless of the discipline, is a perishable skill set. Without regular and consistent training, the skills taught will diminish to a point that could be harmful to yourself and your team members. This includes but is not limited to severe injuries or death due to human errors in not operating or rigging equipment properly.

We can assist in any of these skills sets, and have clients who we work with monthly, quarterly and annually to ensure they stay sharp on their skill sets.

### Weekly

Recommended Minimum Time Commitment: 1 Hour

It is recommended that team members practice some type of skill at least weekly. This can be a self-guided focused review or lead by a team member who has proficiency in that particular skill.

Example topics:

- Knots
- Donning PPE
- Victim / Patient Care
- New Equipment Review
- Equipment Inspections

### Monthly

Recommended Minimum Time Commitment: 1 - 4 Hours

It is recommended that team members meet and practice some type of skill at least monthly. This can be a self-guided focused review or lead by a team member who has proficiency in that skill.

Example topics:

- Knots
- Patient Packaging / Rescue Connections
- Basic Rope Rescue Setups
- Pre-Planning
- Equipment Inspections

Monthly training may take place at your location or CTR's indoor training facility in Albany, NY.

## Quarterly

Recommended Minimum Time Commitment: 4 Hours

It is recommended that team members meet and practice some type of simple rescue scenario at least quarterly. This should not be too complicated of a scenario but rather focus on overall team dynamics and putting together all the topics they have worked on over the past few monthly drills.

These scenarios can be guided by CTR or a team member who has shown proficiency in all systems the team uses. These should be low risk scenarios that have been pre-planned and well thought out by the team member to ensure that no one can get hurt during training.

Quarterly training may take place at your location or CTR's indoor training facility in Albany, NY.

## Annual

Recommended Minimum Time Commitment: 8 - 24 Hours

Annual training is not only a great time for refresher training but also to introduce new equipment, techniques, and advancements. The minimum time is typically 8 hours, however if your team does not partake in weekly, monthly and/or quarterly training than you may need up to 24 hours of refresher training.

We recommend that you bring in a trainer such as CTR to perform this refresher training. This will allow for an independent evaluation of your team as well as ensuring that the latest techniques and/or equipment can be taught.

Our most popular option for rope and confined space rescue teams that train regularly is for a 16-hour refresher annually. This allows for time to review equipment and techniques and introduce new techniques and equipment, while still allowing plenty of time for OSHA and NFPA recommended scenarios. For water and ice rescue teams this may vary from 8 hours to 24 hours, depending on the departments response levels and equipment.

Example topics:

- Knot Review
- Equipment Review
- New Equipment
- New Techniques
- Simple and more complicated scenarios

Annual training may take place at your location or CTR's indoor training facility in Albany, NY.



### Other recommended training courses available

CTR has many other training courses and topics that may interest you and / or your team depending on your needs. See our website for the most up to date information.

[www.capitaltechrescue.com](http://www.capitaltechrescue.com)

Initial and refresher training available. Some programs have a train the trainer course available.

- Emergency Response Team Training
  - Team Evaluations
  - Site-Specific Rescue Operations
  - Stop the Bleed / Trauma Response
  - Fire Extinguisher Training
  - Structural and Industrial Live Fire Training
  - Rescue from fall protection
- Rope Rescue
  - Operations
  - Technician
  - Refresher
  - Artificial High Directional
  - Lead Climbing
  - Tower Rescue
- Firefighting
  - Firefighter Survival / MAYDAY
  - Firefighter Escape Systems
  - Fire Boat Operations
  - Engine & Truck Company Operations
- Industrial Training
  - Industrial Escape Systems
  - HAZWOPER
  - Rescue Boat Operator for OSHA for OSHA 1926.106 Rescue Skiff
- Confined Space
  - Entry
  - Awareness
  - Operations (non-IDLH)
  - Operations (IDLH)
  - Technician
  - Rigging Challenges
  - Small Team Operations
- sUAS (Drones)
  - Specific programs for industry, firefighters and emergency response
- Water Rescue
  - Rescue Boat Operator for Water and Swiftwater Rescue
  - Ice Rescue
  - Water Rescue
  - Flood Rescue Awareness
  - Swiftwater Rescue



## Definitions

This section provides standardized terminology used throughout surface water rescue operations. Definitions are drawn from Capital Technical Rescue's curriculum, NFPA standards (1006, 1670, 1983, 2500), USCG regulations, and industry best practices.

### **PFD (Personal Flotation Device)**

A life-saving device designed to keep a person afloat in water. Classified by the USCG into Types I–V, with Type V including specialized rescue vests.

**Reference:** USCG, OSHA 1910.126

### **HELP Position (Heat Escape Lessening Posture)**

A body position used in cold water to reduce heat loss and delay hypothermia. Involves crossing arms and legs while floating upright.

### **RDC (Rapid Deployment Craft)**

An inflatable rescue boat used for ice, flood, and surface water rescues. Allows rescuers to reach victims without entering the water.

### **Throw Bag**

A rescue tool containing floating rope, typically 50–75 feet, used to reach and pull a victim to safety.

### **Rescue Sequence**

The rescue sequence from lowest to highest risk:

**Reach:** Extend a pole or object.

**Throw:** Use a throw bag or flotation device.

**Row:** Deploy a boat.

**Go:** Enter the water for direct contact.

**Helo:** Use helicopter-based rescue.

### **Par Buckling**

A technique using two lines or straps to roll a victim into a boat or onto a dock by creating a sling under the body.

## **Surface Water Rescue Swimmer**

A trained rescuer equipped with mask, fins, and snorkel to perform shallow water searches and victim recovery.

## **Type I–V PFDs**

**Type I:** Offshore, high buoyancy, turns unconscious face-up.

**Type II:** Near-shore, less bulky.

**Type III:** Flotation aid for active use.

**Type IV:** Throwable device (e.g., ring buoy).

**Type V:** Specialized use (e.g., swiftwater rescue).

## **Hypothermia**

A medical emergency where body temperature drops below 95°F. Can affect both victims and rescuers.

**Reference:** Cold Water Boot Camp, NFPA 1006

## **1-10-1 Rule**

Cold water survival guideline:

1 minute to control breathing

10 minutes of meaningful movement

1 hour before unconsciousness due to hypothermia

## **Tether Line**

A rope used to connect a rescuer to shore or a boat for safety and retrieval.

## **Inflatable Rescue Boat (IRB)**

A lightweight, rapidly deployable boat used in surface water and flood rescue operations.

## **Victim Sling**

A flotation and lifting device placed under a victim's arms to aid in water rescue and extrication.

## **Snorkel**

A breathing tube allowing a rescuer to breathe while face-down in the water during surface searches.

## **Fins**

Footwear that increases propulsion and efficiency while swimming during rescue operations.

## **Incident Action Plan (IAP)**

A formal plan developed by the Incident Commander outlining objectives, strategies, and resources for a rescue operation.

**Reference:** NFPA 1670

## **Operational Zones**

**Hot Zone:** Area with direct hazard exposure (e.g., in water).

**Warm Zone:** Support area near the hazard.

**Cold Zone:** Safe area for command and staging.

## **GAR Model (Green–Amber–Red)**

A risk assessment tool used to evaluate mission risk and determine go/no-go decisions.

**Reference:** USCG, NPS

## Appendix

### Appendix A – Reference Materials / Apps

*Title: **Technical Rescue Field Operations Guide***

*Publisher:* Desert Rescue Research

*Author:* Tom Pendley

*Notes:* App or Paper guide. Covers rope rescue, confined space rescue, swiftwater rescue, trench rescue, structural collapse and helicopter operations

*Link:* <https://www.desertrescue.com>

*Title: **CMC Field Guide App***

*Publisher:* CMC

*Author:* CMC

*Notes:* App with charts, diagrams, videos but heavily leans towards CMC products.

*Link:* <https://www.cmcpro.com/app/>

*Title: **Animated Knots by Grog (Grog Knots)***

*Publisher:* Animated Knots

*Author:* Animated Knots

*Notes:* Easy to follow, no internet required.

*Link:* <https://www.animatedknots.com/shop>

*Title: **Risk: SPE, ORMA, and GAR Calculator***

*Publisher:* NCPTT National Park Service

*Author:* NCPTT National Park Service

*Notes:* App to calculate risk assessment scores (GAR Model)

*Link:* <https://ncptt.nps.gov/blog/risk-spe-orma-and-gar-calculator/>



## Appendix B – US Aids to Navigation

[BoatUS Navigation Aids Basics Article](#)

[US Aids to Navigation System – US Coast Guard](#)

US Coast Guard link above is the source for the following pages.



## Appendix C – GAR Model

Risk Calculation Worksheet – Calculating Risk Using GAR Model – (GREEN – AMBER – RED)

See Next Page for worksheet



## Risk Calculation Worksheet - Calculating Risk Using GAR Model (GREEN-AMBER-RED)

To compute the total level of risk for each hazard identified below, assign a risk code of 0 (For No Risk) through 10 (For Maximum Risk) to each of the six elements. This is your personal estimate of the risk. Add the risk scores to come up with a Total Risk Score for each hazard.

### SUPERVISION

Supervisory Control considers how qualified the supervisor is and whether effective supervision is taking place. Even if a person is qualified to perform a task, supervision acts as a control to minimize risk. This may simply be someone checking what is being done to ensure it is being done correctly. The higher the risk, the more the supervisor needs to be focused on observing and checking. A supervisor who is actively involved in a task (doing something) is easily distracted and should not be considered an effective safety observer in moderate to high-risk conditions.

### PLANNING

Planning and preparation should consider how much information you have, how clear it is, and how much time you have to plan the evolution or evaluate the situation.

### TEAM SELECTION

Team selection should consider the qualifications and experience level of the individuals used for the specific event/evolution. Individuals may need to be replaced during the vent/evolution and the experience level of the new team members should be assessed.

### TEAM FITNESS

Team fitness should consider the physical and mental state of the crew. This is a function of the amount and quality of rest a crewmember has had. Quality of rest should consider how the ship rides, its habitability, potential sleep length, and any interruptions. Fatigue normally becomes a factor after 18 hours without rest; however, lack of quality sleep builds a deficit that worsens the effects of fatigue.

### ENVIRONMENT

Environment should consider factors affecting personnel performance as well as the performance of the asset or resource. This includes, but is not limited to, time of day, temperature, humidity, precipitation, wind and sea conditions, proximity of aerial/navigation hazards and other exposures (e.g., oxygen deficiency, toxic chemicals, and/or injury from falls and sharp objects).

### EVENT or EVOLUTION COMPLEXITY

Event/Evolution complexity should consider both the required time and the situation. Generally, the longer one is exposed to a hazard, the greater are the risks. However, each circumstance is unique. For example, more iterations of an evolution can increase the opportunity for a loss to occur, but may have the positive effect of improving the proficiency of the team, thus possibly decreasing the chance of error. This would depend upon the experience level of the team. The situation includes considering how long the environmental conditions will remain stable and the complexity of the work. **Assign a risk code of 0 (For No Risk) through 10 (For Maximum Risk) to each of the six elements below.**

Supervision	_____
Planning	_____
Team Selection	_____
Team Fitness	_____
Environment	_____
Event/Evolution Complexity	_____
<b>Total Risk Score</b>	_____

The mission risk can be visualized using the colors of a traffic light. If the total risk value falls in the GREEN ZONE (1-23), risk is rated as low. If the total risk value falls in the AMBER ZONE (24-44), risk is moderate and you should consider adopting procedures to minimize the risk. If the total value falls in the RED ZONE (45-60), you should implement measures to reduce the risk prior to starting the event or evolution.

GAR Evaluation Scale			
Color Coding the Level Of Risk			
0	23	44	60
10	20	30	40
GREEN (Low Risk)	AMBER (Caution)	RED (High Risk)	

The ability to assign numerical values or "color codes" to hazards using the GAR Model is not the most important part of risk assessment. What is critical to this step is team discussions leading to an understanding of the risks and how they will be managed.



## Appendix D – Daily Checklists

See next pages for example checklists



Capital Technical Rescue and Safety Consultants, LLC  
**Star Sport Bug 12.5 & Honda 20 HP – Daily Checklist**  
Date: \_\_\_\_\_

**Inspect:**

- ☐ Check pressure of the tubes (3.6 psi max)
  - ☐ Check pressure of the thwarts (3.6 psi max)
- NO SCBA USE**

- ☐ **2 – thwarts** (ensure you have when mobilizing)
- ☐ D-Rings
- ☐ Lifelines
- ☐ Bow Carry Handle
- ☐ Lateral Carrying Handle
- ☐ Deck & Transom Attachment Points
- ☐ Floor to transom
- ☐ Inspect engine transom plate and attachment points
- ☐ Inspect points of attachment of the tubes to transom
- ☐ Secure all equipment
- ☐ 2 - White Fenders

**Fuel:**

- ☐ Fuel full
- ☐ Fuel line fittings intact and installed in proper direction
- ☐ Fuel line primer ball - holds prime
- ☐ Fuel tank secured
- ☐ No leaks in all of above

**Prop:**

- ☐ Free of debris
- ☐ No visible damage
- ☐ Prop Guard in good condition

**Motor:**

- ☐ Secured to transom
- ☐ Engine kill lanyard
- ☐ Emergency kill button on throttle handle
- ☐ Safe oil level
- ☐ Fuel primed and engine starts momentarily
- ☐ Tiller steers easily
- ☐ Check throttle twist handle
- ☐ Outboard must be running to check FWD & Reverse Shifter
- ☐ Transom tilt release working
- ☐ Outboard discharge hole clear
- ☐ Fly wheel & pull start line
- ☐ Cowling seal clean and secured

**Equipment:**

- ☐ Oars secured and cap screwed tight to axle
- ☐ Righting / par buckling lines

**Boat bag:**

- ☐ Pump
- ☐ Repair / tool kit
- ☐ 2 - Throw bags
- ☐ E-flare
- ☐ Visual Flag
- ☐ Fire Extinguisher
- ☐ Marine Radio
- ☐ Air horn & Pump
- ☐ Nav light & mast
- ☐ Manual bailer
- ☐ Anchor w/chain and line
- ☐ Pressure Gauge
- ☐ Green First Aid Kit
- ☐ Universal Engine Kill Lanyard

**General Maintenance:**

- ☐ Inspect spark plugs
- ☐ Flush outboard after each use
- ☐ Inspect primary fuel filter
- ☐ Wash down boat

**Transport:**

- ☐ Bow Secured W/ratchet strap
- ☐ Bow line secured to post
- ☐ Ratchet strap Aft section to trailer
- ☐ Motor secured & turned to the side w/cam buckle strap on bottom of motor to trailer

**Toolbox:**

- ☐ Honda Owners Book
- ☐ Marine Sta-Bil
- ☐ Pressure Gauge
- ☐ Spare Pull Cord
- ☐ Spare Fuel Line
- ☐ Brass Flush Kit Adapter
- ☐ Honda Tool pouch (blue)
- ☐ Spare Prop
- ☐ 3 ea. Flat & Phillips Head Screw Drivers
- ☐ 1 ea. Pliers, Needle Nose, Wire Cutters
- ☐ 1 Pump Pliers
- ☐ 1 Utility Knife
- ☐ Universal Engine Kill Lanyard

Version 2022.9.6



Capital Technical Rescue and Safety Consultants, LLC  
Defender 430 & Evinrude E-Tec 30 – Daily Checklist

Date: \_\_\_\_\_

**Inspect:**

- ☐ Check pressure of keel valve (5.8 psi max)  
**NO SCBA USE**

- ☐ Check pressure of the tubes (3.6 psi max)
- ☐ D-Rings
- ☐ Lifelines
- ☐ Bow Carry Handle
- ☐ Lateral Carrying Handle
- ☐ Towing Bridle patches w/D-Rings
- ☐ Deck & Transom Attachment Points
- ☐ Floor securing stringers
- ☐ Floor to transom
- ☐ Inspect engine transom plate and attachment points
- ☐ Inspect points of attachment of the tubes to transom
- ☐ Secure all equipment
- ☐ 2 - White Fenders

**Fuel:**

- ☐ Fuel full
- ☐ Fuel line fittings intact and installed in proper direction
- ☐ Fuel line primer ball - holds prime
- ☐ Fuel tank secured
- ☐ No leaks in all of above

**Pump Jet:**

- ☐ Free of debris
- ☐ No visible damage

**Motor:**

- ☐ Secured to transom
- ☐ Engine kill lanyard
- ☐ Emergency kill button on throttle handle
- ☐ Safe oil level
- ☐ Fuel primed and engine starts momentarily
- ☐ Tiller steers easily
- ☐ Check throttle twist handle
- ☐ Outboard must be running to check FWD & Reverse Shifter
- ☐ Transom tilt release working
- ☐ Outboard discharge hole clear
- ☐ Fly wheel & pull start line
- ☐ Cowling seal clean and secured

**Equipment:**

- ☐ Sheath paddle w/paddles, one each tube
- ☐ Third T-handle paddle as needed

**General Maintenance:**

- ☐ Inspect spark plugs only as needed  
*must be indexed*
- ☐ Flush outboard after each use
- ☐ Inspect primary fuel filter
- ☐ Wash down boat

**Boat bag w/Black Carabiner:**

- ☐ Righting / par buckling lines
- ☐ Pump
- ☐ Repair / tool kit
- ☐ 2 - Throw bags
- ☐ E-flare
- ☐ Visual Flag
- ☐ Fire Extinguisher
- ☐ Hand held sonar
- ☐ GPS
- ☐ Marine Radio
- ☐ Air horn & Pump
- ☐ Nav light & mast
- ☐ Manual bailer
- ☐ Anchor w/chain and line
- ☐ Pressure Gauge
- ☐ Towing Bridle
- ☐ Whistle
- ☐ Thermometer
- ☐ Green First Aid Kit
- ☐ Universal Engine Kill Lanyard

**Transport:**

- ☐ Bow Secured W/ratchet strap
- ☐ Bow line secured to post
- ☐ Ratchet strap Aft section to trailer
- ☐ Motor secured & turned to the side w/cam buckle strap on bottom of motor to trailer

**Red Toolbox:**

- ☐ 1 ea. - Universal & Evinrude Kill Lanyard
- ☐ 1 - Pressure Gauge
- ☐ 2 - Spare Transom slider bailers
- ☐ 4 - Floorboard tie downs
- ☐ 1 - ½" gear wrench
- ☐ 1 - 3/16" PumpJet Screw Driver
- ☐ 1 - 16 mm socket and ratchet
- ☐ 2 - Spare Spark Plugs - Gapped @ 0.28  
Champion 9005 QC10WEP
- ☐ 1 - Spare Inflation Valve
- ☐ 1 - Gray & White flush kit
- ☐ 2 - Spare O-Rings for Halkey Robert Valve
- ☐ 1 - Gap Tool
- ☐ 3 - Spare CR-PZ 1
- ☐ 1 - Owners Kit with Bolts
- ☐ 1 - Spare Fuel Line
- ☐ 1 - SCBA Inflation Hose
- ☐ 1 - Funnel
- ☐ 1 - Flush Ears
- ☐ 1 - Marine Stabil
- ☐ 1 - Grease Gun
- ☐ 1 - Shot Glass
- ☐ 1 - Toluol
- ☐ 1 - Methyl Ethyl Ketone
- ☐ 1 - Hypalon Adhesive
- ☐ 1 - Cleaning Solvent Tube

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