Swiftwater Rescue Technician

Curriculum Manual

Revised – March 2023

Swiftwater Rescue Technician

Water Rescue Course

This edition of the Swiftwater Rescue Course was prepared by the RESET Swiftwater Workgroup. The Workgroup created the curriculum June –November 2009. Portions of this material are the product of previous work done by technical rescue specialists in the years leading up to the organization of this document. The remainder of the material was the work of the committee members with input from various sources including members of the technical rescue team and outside technical specialists.

Purpose

This curriculum is not meant to cover all methods acceptable for swiftwater rescue operations. The purpose is to standardize those methods taught during this technical rescue course. All the learning material in this document is intended to cover the Knowledge, Skills, and Abilities (KSA) needed by rescuers at the swiftwater rescuer level.

Scope

The organization of the knowledge, skills and abilities (KSA's) within this curriculum is designed to follow the Job Performance Requirements (JPR) outlined by the National Fire Protection Association (NFPA) 1006 – Standard for Technical Rescuer Professional Qualifications 2017 edition. Standardized organization following NFPA 1006 is intended to allow the rescuer's training to be consistent with other emergency response organizations. Each JPR will be accomplished by using techniques specified in this curriculum, and adopted by RESET as the authority having jurisdiction. RESET participating agencies include:

Austin Fire Department
San Marcos Fire Department
Austin/Travis County EMS
Westlake Fire Department
Pedernales Fire Department
Williamson County EMS
Leander Fire Department
Lake Travis Fire Rescue
Pflugerville Fire Department
Cedar Park Fire Department
Oak Hill Fire Department
Round Rock Fire Department
Georgetown Fire Department

Instructor Obligation

It is the responsibility of all instructors delivering any part of this curriculum to cover all of the learning material covered in the lesson plans. No instructor has the authority to delete, omit, or otherwise leave out any content within the curriculum. Anyone assigned the task of covering any part of this curriculum should build his/her class in such a manner that optimizes instructor style while at the same time maximizing the learning for the students.

2009 RESET Swiftwater Rescuer Workgroup Members

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RESET Swiftwater Manual Revisions

Jeff Deane 2013
Greg Reddish 2016
Jacob Brownlee/Greg Reddish/Dave Clark 2023

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Rules of Engagement

1. Horseplay is **STRICTLY FORBIDDEN**, especially during any evolution.
2. The use of tobacco products around any rope equipment is not permitted.
3. PPE will be worn during all evolutions.
4. Gloves are to be worn when handling any rope that has the potential of becoming loaded.
5. Report all equipment that is damaged or dropped from a height of more than six (6) feet.
6. Instructors and students will be responsible for checking rigging by sight and feel at all times.
7. All vertical rescue evolutions require a separate safety line.
8. No equipment is to be used in an evolution unless an Instructor is present.
9. The word **"STOP"** will be used to stop all activity during an evolution. Any student or instructor may use this word. It is to be used when any unsafe action, potential problem, or an unsafe condition is observed.
10. "**ONE WHISTLE BLAST**" will be used for stop and attention for a message to be communicated.
11. **"THREE WHISTLE BLASTS REPEATED"**: I need help (similar to evacuating a burning building)
12. The words **"FOR REAL"** will be used to designate any problem, which is not part of an evolution.
13. When a **"FOR REAL or THREE WHISTLE BLASTS"** situation occurs, the Instructors will take charge and are in command.
14. The word **"ROCK"** is used to alert everyone of a falling object.

Swiftwater Rescue Technician

Class Title:
NFPA Standards and Course Objectives

NFPA 1006 JPR(s):
Not Applicable

Time:
5 Minutes

Scheduling Suggestions:
Classroom setting, should be taught on the first day

Materials/Equipment needed:
Lesson Plan

Instructor requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson the rescuer should be able to:

- Identify the four NFPA standards that pertain to technical rescues equipment, rescuers and rescue agencies.
- Describe the purpose of NFPA 1983, NFPA 1006, NFPA 1670, and NFPA 2500

NFPA Standards and the Rescue Technician
It is important for search and rescue professionals to understand standards and how they apply to their work. There are three National Fire Protection Association (NFPA) standards that pertain to technical rescue:

- **NFPA 1006**- Standard for Technical Rescuer Professional Qualifications (2021 edition)
- **NFPA 1670**- Standard on Operations and Training for Technical Search and Rescue Incidents (2017 edition)
- **NFPA 1983**- Standard on Life Safety Rope and Equipment for Emergency Services (2017 edition)

NFPA 1006 is the professional qualification document that details what Knowledge, Skills, and Abilities (KSA's) individual rescuers need to know. 1006 identifies Job Performance Requirements (JPR(s)) for a variety of technical rescue environments including: rope rescue, confined space, water rescue, etc. The Standard uses a training model called "Core + 1". What that means is that there is "Core" JPR(s) (Chapter 5) that all technical rescue personnel should be able to accomplish. These requirements are essential to *all* of the specialty areas of the technical rescue field. Once the core skill set is mastered; the trainee will be qualified for advanced instruction in any of the specialty areas (ex. rope rescue, water rescue, structural collapse, confined space, etc.) to Level I or II.

NFPA 1670 is a standard set up to identify response capabilities of an organization. A person cannot be trained to NFPA 1670. It is an organizational standard not meant to apply to an individual's training. Emergency response organizations should use 1670 to identify what level of capability they will offer with a given type of rescue. This standard identifies three organizational response capabilities:

- **Awareness Level** is the minimum capabilities of first in units and provides information on how these individuals should react at a technical rescue incident. It must be stressed that this is not anoperational function level.
- **Operations Level** rescuers are trained to identify hazards, use equipment, and apply limitedtechniques in low angle or high angle rescues.
- **Technician Level** rescuers meet all of the requirements of the above plus apply more advancedtechniques, coordinate, perform, and supervise technical rescues.

1670 also identifies the need for standard operating procedures, preplanning, the need to provide training to rescuers, etc.

NFPA 1983 is a manufacturer's standard specifying design and performance requirements for equipment typically used at technical rescue incident. It is important to understand that this standard specifically states it is not a user's standard dictating use requirements. This standard

identifies testing procedures and minimum performance requirements required to be NFPA compliant. This does not mean rescuers are required only to use equipment that is NFPA compliant. A limited amount of equipment used in water rescue will be available with an NFPA certification.

NFPA 2500- On the horizon is NFPA 2500 which is intended to be a consolidation of the three standards above (1006, 1670, and 1983). It is still unclear what this will look like and how successful they will be. As of this writing only 1670 and 1983 have been combine and it is unknown if they will include 1006 anytime soon. NFPA indicates the first version of this document will be ratified sometime in 2022.

Swiftwater Rescue Technician

Class Title:
Rescue Philosophy

NFPA 1006 JPR(s):
17.1.4, 17.2.1

Time:
40 minutes

Scheduling Suggestions:
Classroom setting, should be taught on the first day

Materials/Equipment needed:
Lesson Plan (ppt, DVD, screen etc. as needed)

Instructor requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson, the rescuer should be able to:

- Identify the primary priority of Swiftwater Rescue Training.
- Explain what legal issues may arise from performing a rescue.
- Give a basic description of search operations
- Explain the Low to High Risk methodology of swiftwater rescues.
- Implement the components leading to the development of successful judgment and those leadingto a successful rescue.

Introduction:

Water rescue, especially in moving water, is inherently dangerous. Even without any medical concerns or injuries the victim may present, just making access is an undertaking that can involve a large number of personnel and requires in-depth knowledge of the subject matter. Understanding the priorities in swiftwater rescue and the responsibility for oneself, one's team and the victim is only the beginning of the very involved process in becoming proficient in this discipline.

Identify the primary priority of Swiftwater Rescue Training

- Self-rescue #1 priority
    - Crux of the class
    - Most important information in class
    - Hydrology
    - Reading the river
    - Personal experience in water
- Safety of team members is the #2 priority
- Don't attempt rescue unless assured of the first two
- Is it okay not to attempt a rescue?

Explain what legal issues may arise from performing a rescue.

- Maintain a training record
    - Legal Protection
- Assuming a mantle of professionalism
    - Difference between volunteer and professional
    - Duty vs. moral obligation
- Standards of Care
    - SRT 1 Course is an internationally recognized standard of care
- Negligence / Malpractice
    - Duty to act
    - Breach of duty
    - Injury must have occurred
    - Proximate cause
    - Standard of Care
    - Reasonable prudent person
- Don't lose them again
    - Losing victim contact (abandonment)
    - Maintain physical contact

Give a basic description of search operations

- Search and Rescue (SAR)
    - LAST
        - Locate
        - Access
        - Stabilize
        - Transport

- SAR Fundamentals
    - Witness (reporting party) interview
    - Point Last Seen (PLS)
    - Containment
    - Probability of Detection (POD)
    - Probability of Area (POA)
    - Hasty search

Explain the Low to High Risk methodology of swiftwater rescues

- Low to High Risk rescue options
    - Talk, Reach, Throw, Row, Go-tow, Helo
    - Play to the group's strengths

Implement the components leading to the development of successful judgment and those leading to a successful rescue

- Elements of a successful rescue
    - Training, practice, experience, judgment
    - Successful rescuers need all four
    - Instructors only provide the first
- Practice-Practice-Practice-Practice is essential
    - Information half-life is 6 months
    - Practice breeds experience
    - Take classes in different locations
    - Make practice realistic

Swiftwater Rescue Technician

Class Title:
Site Survey, Pre-planning, and Scene Size-up

NFPA 1006 JPR(s):
17.1.1

Time:
25 Minutes

Scheduling Suggestions:
Classroom setting, should be taught on the first day

Materials/Equipment Needed:
Lesson Plan (ppt, screen etc. as needed)

Instructor Requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson the student shall be able to:

- Describe how to properly conduct a pre-plan of potential swiftwater hazard areas in their districtor jurisdiction
- How to conduct a site survey of low water crossings or other areas that are prone to swiftwaterrescues
- How to conduct an accurate scene size-up during a swiftwater rescue including:
    - Establish of the ICS
    - Placement of upstream spotter(s)
    - Placement of downstream safeties
    - Request additional resources

Introduction:
In Swiftwater rescue it is always a good idea to know in advance where certain features and hazards are going to be found during flood events. This is known as the pre- plan. Another more focused aspect of the pre-plan is the site survey in which a department will look closely at problem areas and plan on how to deal with potential rescues in these areas prior to the event. During an actual event the first arriving unit on scene must conduct an accurate scene size-up and use the information gained to effectively plan and manage their rescue.

Pre-planning:

- Know the waterways in your area
    - Year-round flow
    - "Wet" season only
- Where are the bridges?
- Where are the low water crossings?
- Where are the low head dams?
- Mark locations with GPS coordinates
- Know GPS Coordinates in advance
- Mark potential problem areas on map
- Know alternate routes
- Meet with other local agencies/aircrews and exchange information
- Make sure your department has equipment ready and in working order

Site Survey:

- Look at potential problem areas in your area more closely:
    - Low water crossings
    - Low water bridges
    - Low head dams
- Anywhere that has a flood gauge…it's there for a reason!!
- Try to look at locations in both normal and flood conditions
- In dry or low water conditions identify potential hazards
    - Rocks
    - Strainers
    - Hydraulics
    - Fences
- Identify a "point of no return" beyond which a rescue may no longer be possible
- In flood conditions especially at low water crossings and low water bridges get an idea of waterdepth and speed
    - This will help you in planning a rescue in regards to a shallow water crossing
    - You can know in advance of potential water speeds in the event of a lost victim and place downstream spotters accordingly

- Keep written records
    - Update annually
    - Distribute to other agencies and organizations as needed
    - Coordinate with local GIS department for development of detailed maps with topo and USNG

Scene Size-up:

- Establish Incident Command and location of CP
- Determine number of victims
    - Are they visible?
    - Are they downstream?
- Place upstream spotter based on by water flow/speed, terrain, communications, and line-of-sight
- Place downstream safeties as needed
- Determine rescue scenario
- Risk vs. Benefit (talk, reach, throw, row, go-tow, helo)
- Available resources
- Request additional resources early
- Mutual Aid
- Aircraft
- Specialty Resources
    - Communications
    - GIS
- Ground SAR as needed

Swiftwater Rescue Technician

Class Title:
ICS and Communication

NFPA 1006 JPR(s):
Not applicable

Time:
15 Minutes

Scheduling Suggestions:
Classroom setting, should be taught on the first day

Materials/Equipment Needed:
Lesson Plan (ppt, screen etc. as needed)

Instructor requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson, the rescuer should be able to:

- Describe the intent of the Incident Command System
- List different communication mediums in the swiftwater rescue environment.
- Explain the hand and audible signals commonly used in swiftwater rescues.
- List ways that rescuers can be located and tracked after dark

Introduction:
The swiftwater rescue incident can quickly overwhelm resources and further complicate the situation. Use of the incident command system is necessary to keep the incident managed and affect the rescue in a safe and efficient manner. The typical swiftwater rescue in the Central Texas area will only involve an incident commander, safety, PIO, and an operations section. The use of the rest of the remaining 3 sections may be employed on a large scale, area wide incident with multiple agencies and jurisdictions involved.

Describe the intent of the Incident Command System
The incident command system was developed in an effort to effectively manage on-scene and responding resources. On large scale incidents effective span of control was quickly overrun and mass free-lancing quickly followed. Personnel accountability and effective tactical deployments were impossible to track.

The incident command system was designed to keep control of the incident through unity of command and limited span of control. The system has been adapted to cover any incident of any size. In the swiftwater rescue realm, ICS plays an important role due to the dynamic nature of the incident. Usually there will be multiple agencies, bystanders, reporters, and victims on- ~~the~~ scene. It is very important to account for and manage all of these aspects of such an incident. Personnel accountability and safety are paramount in the incident command system.

List different communication mediums in the swiftwater rescue environment.
A swiftwater incident scene can have multiple communication barriers. These barriers can range from environmental (background noise from apparatus, people, weather, moving water) to visibility (darkness, distance) and natural (geographic features, heavily wooded areas). Rescuers and rescue teams should have alternate forms of communication with each other in order to successfully complete tasks.

A. Electronic
    a. Radios
        i. Portables (handheld)
        ii. Mobiles (vehicle / Base)
    b. Cellular telephones
    c. Protection- Dry bags

B. Signals/Tracking
    a. Audible
        i. Voice
        ii. Whistle
        iii. Air horn
    b. Visual
        i. Hand & arm
        ii. Lights
        iii. Chemical light sticks 2 colors—1 for rescuers (green), 1 for victim (red)
        iv. Strobe

Explain the hand and audio signals commonly used in swiftwater rescues.

A. Hand Signals
    a. One arm in the air-I need a rope
    b. Two arms in the air-I need help
    c. Hand placed on top of head-I am Okay
    d. Arms held in a circle above head-I need medical attention

B. Audio Signals/Horn blasts
    a. One blast-Attention or Stop
    b. Two blasts-Attention/Look UP stream
    c. Three blasts-Attention/Look DOWN stream
    d. Three blasts repeated-I need help (similar to evacuating a burning building)

List ways that rescuers can be located and tracked after dark.

A. Visual
B. Lights and Reflective tape
C. Chemical light sticks
D. Strobes
E. Marking tape
F. Audible
G. Whistles

Swiftwater Rescue Technician

Class Title:
Hydrology

NFPA 1006 JPR(s):
17.1.2

Time:
35 Minutes

Scheduling Suggestions:
Part of this lecture may be taught in the classroom on the first day using slides and other teaching aids. However, lecture should be taught in the real world as much as possible.

Materials/Equipment Needed:
Classroom, Projector, but best with moving body of water which incorporates all features of hydrology.

Instructor Requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson the student shall be able to:
Have a basic knowledge of hydrology as it is encountered during a moving water event:

- Accurately describe the force of moving water in terms of pressure against fixed objects and people
- Accurately compute current velocity with appropriate information
- Define Laminar Flow
- Define Helical Flow
- Describe Top Load
- Describe Suspended Load
- Describe Bottom Load
- Describe physical features of hydrology.

Introduction:
In a moving water environment, it is important to understand the dynamics in this environment as well as the hydrology. This knowledge not only assists with victim location and rescue but also self-preservation if necessary.

A. Power of moving water
    - Speed Doubles / Force Quadruples
    - Weight of water - 8.33 lbs./gal / 62.2 lbs./ft3
    - Estimating current velocity - The speed, or velocity, of water is measured in feet per second. The velocity of swift water can be determined by measuring the time it takes for an object to float a specified distance down the river, and then dividing that time into the distance. For example, if it takes this object 20 seconds to travel 100 feet, the velocity would be 5 ft./sec, which is equal to 3.4mph.
    - Water pressure on fixed objects
    - Water volume/flow - Velocity is important for the technical rescue team to determine the volume of water flowing. To do that, multiply the width by the depth by the velocity in ft./sec. For example, if a wash is 100 feet wide and 4 feet deep flowing at 5 ft./sec, then $100 \times 4 \times 5 = 2{,}000$ cubic feet of water per second. One cfs is equal to about 450gpm.

B. Swift water terminology
    - Upstream – Direction from where the water is flowing
    - Downstream – Direction water is flowing to.
    - River Left – Left side of water way when facing downstream
    - River Right – right side of waterway when facing downstream
    - Current Vector - the direction the current is flowing that does not necessarily follow the direction of the banks.
    - Laminar flow - Layered flow of water that is slower on the bottom and faster toward the top.
    - Helical flow - Circular action of water at the banks caused by friction that forces water midstream.
    - Top Load - Object that is positively buoyant and floats on surface.
    - Bottom Load - Object on the bottom stuck in the mud or too heavy to be moved by the current. It can cause foot entrapments.
    - Suspended Load - Neutrally buoyant object that moves with the current but is too heavy to float. It can be dangerous and hard to see.

C. Hydrologic features
    - Eddy - Horizontal reversal of water caused by water flowing around an object. An eddy will be on the downstream side and is a safe place for rescuers to exit the water.
    - Eddy Fence - Distinct line where current flows in opposite direction. A rescuer needs to get over the eddy fence to enter the eddy.
    - Eddy Hopping – Using the downstream side of multiple eddies to move across a body of water by rapidly jumping/swimming from one eddy to the next.

- Upstream V - Water going around an object above or slightly below the water's surface creates a V pointing upstream. The objects below can be hazardous.
- Downstream V - Convergence of water flowing to the path of least resistance creates a V pointing downstream, as in a bottleneck. The main channel, which isn't always midstream, can be identified by the largest series of Vs.
- Hole/Stopper/Keeper - Life-threatening vertical reversal of water caused by water flowing over an object, such as a low head dam. Water is forced down and then circulates back up. Some water continues downstream while some recalculates. Rescuers should exit water immediately.
    - Smiling Hole
    - Frowning Hole
- Standing Wave - rhythmic series of waves caused by the convergence of main channel currents as the result of rising river water, underwater obstacles or ledges, or an increasing river speed.
- Strainer - any object that allows water but not solid objects to pass through it
- Hydraulic - vertical reversal of water flow where the pressure of the current falling over a gradient causes the channel water at the base of the gradient to be forced downward into a loop style reversal and back to the surface at which point part of the water continues downstream and part reverses back upstream to the base of the gradient. The churning whitewater of a hydraulic consist of between 40-60% air.
- Horizon Line - A line across the river where your downstream view diminishes; evidence of a significant drop.

While these ideas will be explained to the student in a classroom environment, many of these topics will be reinforced during training in a moving water environment

Swiftwater Rescue Technician

Class Title:
Personal Protective Equipment

NFPA 1006 JPR(s)
17.1.2

Time:
60 Minutes

Scheduling Suggestions:
This class should follow after Hydrology on the first day.

Materials/Equipment Needed:
Various PFD's, Thermal protection (wet/dry suits), helmet, gloves, foot protection, knife, whistle, light source and other miscellaneous equipment. Students should their gear for inspection.

Instructor requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson, the rescuer should be able to:

- Select proper PPE for the swiftwater environment
- Explain how to properly don PPE for the swiftwater environment

Introduction:

The knowledge of what NOT to wear in a swiftwater environment is almost as important as knowing WHAT to wear. Structural firefighting gear has no place near the water. An understanding of the various components and their proper application is paramount to a successful outcome of the operation.

Select proper PPE for the swiftwater environment

- Personal Flotation Device (PFD)
    - Coast Guard Type III / V
    - Proper fit
    - Floatation: 15 ½ pounds minimum

- Helmets
    - Whitewater or rock climbing type
    - Use only those approved for whitewater
    - No "fixed" or wide brim
    - Drains water well (no "bucketing" as per NFPA)
    - Firefighter type helmets
        - Have unacceptable brims
        - Lack drain holes
        - Heavier than the other type helmets
        - Risk of C-spine / facial injuries

- Thermal protection
    - Wetsuits
        - Good thermal / Trauma protection
        - Long wear life
        - Restrictive
        - Allows direct skin contact (haz mat issues)
        - Requires proper size for optimal thermal protection
    - Drysuit
        - Excellent thermal protection
        - Insulation worn underneath the suit
        - Works in a variety of water temperatures
        - Impervious to weather, rain, wind, etc.
        - Protects skin from direct contact with water
        - Doesn't have the trauma protection of wetsuit
        - Generally, more expensive than wetsuit

- Footwear
    - Trauma protection
    - Thermal protection
    - Tennis shoes okay in warmer water

- Gloves
    - Trauma protection
    - Thermal protection
    - Secure wrist closure

- Knife
    - Life saving device
    - Extremely sharp
    - Secure sheath system

- Whistle
    - Necessary for communication
    - Necessarily loud
    - Pea less

- Fins
    - More efficient swimmer
    - Lifeguard style preferable over diving fins
        - Less surface area for current to push against
        - Ability to walk forward with them on

- Light
    - Should have two sources of light
    - Headlamp, waterproof flashlight is best combination
    - Chemical lights
    - Strobe light (except during helicopter ops)

- Eye protection
    - Goggles
    - Glasses

Explain how to properly don PPE for the swiftwater environment

- Proper fit of PFD
    - Snug around chest/under rib cage
    - Little separation on shoulders when lifted with thumbs
- Proper fit of helmet
    - Fasten chin strap
- Properly secure knife
- Proper use of eye protection
- No loose items hanging from self/equipment

Swiftwater Rescue Technician

Class Title:
Medical Considerations

NFPA 1006 JPR(s)
17.3.1; 17.3.3

Time:
30 Minutes

Scheduling Suggestions:
Classroom setting, should be taught on the first day

Materials/Equipment Needed:
Lesson Plan (ppt, screen etc. as needed)

Instructor requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson, the rescuer should be able to:

- Identify medical conditions that would prohibit the victim from aiding in their own rescue.
- Identify signs and symptoms of heat and cold related illnesses.
- Understand where injuries usually occur and what parts of the body they are likely to affect at a swiftwater incident.
- Understand the behavior/psychology of a drowning victim

Introduction:
It is imperative that the rescuer know and understand the possible medical complications that can occur during a swiftwater rescue. There are multiple avenues for illness, injury and/or death and the better recognition and understanding a rescuer has, the more likely a successful rescue will occur. It is highly recommended that the swiftwater rescue technician also be an emergency medical technician.

Identify medical conditions that would prohibit the victim from aiding in their own rescue.
It would be impossible to list all of the possible injuries and conditions that would prevent a person from aiding in their own rescue. It is a safe avenue to assume that any victim in need of assistance will not be able to assist in any way. With this pre-established mind set, rescuers should employ rescue tactics that plan for the worst case scenario. If a victim proves the ability to assist, then the rescue should be more efficient and timely therefore decreasing the dangerous exposure time to the hazard.

Identify signs and symptoms of heat and cold related illnesses.

- Heat
    - Heat Exhaustion
        - Causes dehydration
        - Nausea
        - Vomiting
        - Cool, clammy skin
    - Heat Stroke
        - Markedly elevated core temperature
        - Usually indicated by lack of sweating and altered mental status.
- Cold
    - Immersion Hypothermia
    - Cold water causes blood to shunt away from extremities (cold extremities)
    - Frequent urination
    - Uncontrollable shivering
    - Sluggish circulation to the brain (altered mental status)

Understand where injuries usually occur and what parts of the body they are likely to affect at a swiftwater incident.

1. Most injuries occur within 10 feet of the edge of the water.
2. Most occur at the lower end of the body and diminish in number farther up the body.
3. Injuries toward the top of the body are usually more critical
4. Neck and back injuries should be treated and packaged appropriately.
5. Extremity injuries (breaks, sprains, cuts, contusions, etc.) are very likely.
6. Shoulder dislocations are very common in moving water
7. Post drowning syndrome (parking lot drowning). Occurs after someone ingests a large volume of water. The lungs get affected and death is possible for about the next 24 hours.

Understand the behavior/psychology of a victim.

- Normal survival behavior
    - Victim may or may not be calm
    - Still capable of rational thought and purposeful movements to attempt to stay alive.

- Panic
    - Loses the capacity for rational thought.
    - Counterproductive, random, non-purposeful movements (screaming and thrashing at the water).
    - Most difficult to deal with.

- Counter-panic
    - Victim becomes totally unresponsive and simply floats along
    - Oblivious to rescue attempts.
    - Consider other causes (hypothermia, head injury, ETOH)

- Instinctive drowning response (IDR)
    - Head tilted back
    - Mouth open
    - Arms flailing in unison
    - Head bobbing up and down. This behavior is instinctive and cannot be controlled. It may appear like the victim is playing, but keep in mind that anyone exhibiting IDR must be rescued immediately.

Swiftwater Rescue Technician

Class Title:
Search operations

NFPA 1006 JPR(s):
17.1.3

Time:
40 Minutes

Scheduling Suggestions:
Classroom setting, should be taught at the end of the first day

Materials/Equipment Needed:
Lesson Plan (ppt, screen etc. as needed)

Instructor Requirements:
1:15 Instructor to Student Ratio

Objectives:
At the end of this lesson the student shall be able to:

- Understand Probability of Detection
- Understand Probability of Area
- Define Point Last Seen
- Define Last Known Point
- Demonstrate a working knowledge of the following:
    - Hasty Search
    - "Bastard" Search
    - Containment Search
- List the individual positions and functions of a search/rescue team
- Be familiar with the 15 guidelines of water rescue

Introduction:
In Swiftwater Rescue there may be a need to conduct operations in which a victim has been swept downstream before responders can affect a rescue. In this scenario responders will move away from a rescue operation to a search operation until the victim has been located. In this case a working knowledge of ground search tactics and terminology is needed.

Terminology:

- Point Last Seen (PLS)
    - Victim was seen at this location
    - Note time that has passed
    - Search area carefully for clues/tracks
    - Attempt to establish direction of travel

- Last Known Point (LKP)
    - Position that victim was last known to be at
    - May be an area
    - Check for traps clues
    - Attempt to establish direction of travel

- Probability of Detection (POD)
    - Percent chance that clues or the subject would be noticed in the search area.
    - Based on:
        - Terrain
        - Type of Search Tactic
        - Time in Search Area
        - Time of Day
        - Probability of Area (POA)

Clue Awareness:

- Being aware of your surroundings and identifying items that could be a clue to the presence of a person(s) of interest.

Search Tactics:

- Bastard Search – assume the victim is not actually lost and check the locations they would most likely be.

- Hasty Search – A rapid search for clues and/or victim in obvious places within a search area. The objective of a hasty search is to put well-trained SAR members in the field as quickly as possible to search as quickly as is reasonably possible, to check high-probability areas where a subject might be injured or lost. Hasty teams may use vehicles, 4-wheelers, and/or snow mobiles as well as search on foot. Tracking and air-scenting dogs are also frequently used in this phase of a mission.

- Containment Search – Search tactics designed to "contain" the lost person within a certain area. Searches are conducted along roads, trails, or other natural pathways. Can be done in conjunction with a hasty search.

Other search tactics:

- Choke Point Search – Searching primarily along points that are natural access and egress into a given area

- Grid Search – A very detailed search in which every square foot of an area is searched in detail. Very manpower and time intensive.

- Track Trap Search – using natural areas in which a victim is highly likely to leave a footprint. Knowledge of victim's footwear is helpful but not required.

List the positions and functions of a search/rescue team

Leader- The person in charge of the team. This person is responsible for accountability of the team, disseminating information to the team, and making tactical decisions to carry out the strategy for the incident or portion of the incident. This person may also be the initial IC if they are the first unit to arrive on scene.

Hasty Team -Small team of highly mobile, highly skilled personnel who utilize fast, non-thorough search tactics in an effort to locate victims who have been swept downstream. Their goal is to get to the furthest possible point that a victim could have potentially made it to while checking high probability of detection areas. This limits the search area to as small an area as possible.

Upstream Spotter(s) -Watch for debris flowing downstream that could potentially cause problems for the rescue operation further downstream. They need to be located at a point far enough upstream to give adequate warning for rescue personnel to make an adjustment in tactics if an object is likely to interfere with the rescue operation.

Downstream Safety- This is a team of personnel who are in place to rescue anyone (victim or rescuer) who is somehow unexpectedly swept downstream from the rescue operation.

Rescuers- These personnel will actually perform the rescue tactic(s) that the team leader has chosen to affect the rescue.

Rigging Team- Personnel who will put systems in place to assist the Rescuers in effecting the rescue. This could be as simple as manning a live bait line to as complex as setting up a highline system across the river.

Swiftwater Rescue Technician

Class Title:
Throw Bags

NFPA 1006 JPR(s)
17.1.6; 17.1.7; 17.1.4

Time:
60 minutes (static)
90 minutes (dynamic)

Scheduling Suggestions:
First thing on day 2 to practice prior to getting in the water (static), then again later in the day as a rotation (dynamic) and throughout the rest of the course.

Materials/Equipment Needed:
Multiple types and rope length throw bags, one per student, open area on dry land

Instructor requirements:
1:15 Instructor to Student Ratio (static)
1:5 Instructor to Student Ratio (dynamic)

Objectives:
At the end of this lesson, the rescuer should be able to:

- Properly select a throw bag for use in the swiftwater environment
- Properly deploy a throw bag that is properly loaded
- Deploy a rope using the "second chance" method
- Properly re-pack a rope into a rope bag
- Demonstrate how to properly instruct and belay a victim to the shore

Introduction:

As discussed earlier in the Risk-Benefit assessment, reaching or throwing a device to the water bound victim may be the most effective way of affecting a rescue. The throw bag is the most reliable tool for the job, given his intuitive ease of use and its lack of moving parts that can malfunction or be otherwise unavailable. Being proficient in the skill of deploying a throw bag is one of the quintessential aspects of water rescue.

Properly select a throw bag for use in the swiftwater environment

- Consider length and environment

Properly deploy a throw bag that is properly loaded

- Underhand, overhand, "side winder"
- Consider obstacles and footing
- Maintain contact with the end of the rope through the throw
    - Two points of contact with the rope is required at all times

Deploy a rope using the "second chance" method

- Goal is second throw within 40 seconds
- Second Chance Techniques
    - Standard Coil
    - Split coils
    - Bag filled with water

Properly re-pack a rope into a rope bag

Stuffed in from the opening and packed down as you go to fit into bag. Do not coil rope and stuff that in the bag.

Demonstrate how to properly instruct and belay a victim to the shore

The victim needs to be instructed to expect the rope in order to be able to catch it. Let the victim know "rope! Catch the rope!" As soon as the rope is deployed, you need to place it behind your back, low on your bottom (similar to belaying a rappel), with the running end coming out on the downstream side of your body. Hold on to the end with the knot against your closed fist. **Do not place your hand through the loop and do not attempt to tie-off the rope!**
Once the victim has caught the rope, he/she needs to be instructed to place it over the shoulder opposite from the shore are standing on. This will place them in the appropriate angle to pendulum to the shore (Ferry Angle)

Dynamic Belay

- Dynamic belaying is done by either moving downstream with the victim or letting out rope. The victim will not require as much strength to hold on to the throw bag and will still pendulum to shore as tension is held. Also, the rescuer will not be pulled into the water.

Water Rescue Course
(Surface- and Swift- Levels I&II)

Class Title:
Water Negotiation Skills

NFPA 1006 JPR(s):
17.1.12; 17.2.1; 17.2.2

Time:
90 minutes

Scheduling Suggestions:
After static throw bags on day 2

Material/Equipment Needed:
Full PPE

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student will be able to:

- Describe and Demonstrate safe water entry techniques
- Describe and Demonstrate proper offensive and defensive swim positions
- Describe and Demonstrate proper ferry angles and their uses
- Describe and Demonstrate proper eddy hopping/eddy entry techniques and its uses

Introduction:
Safe water entry techniques are essential for students to grasp to ensure their safety when entering the water during flood situations. Offensive/Defensive swim positions are important to ensure students safety while negotiating their way around in flood water. Learning and using proper ferry angles is very important for students to learn to assist them in moving around in flood waters. They are also used with rescuers and victims during throw bag and tension diagonal operations. Eddy hopping is an essential skill that needs to be learned in order to assist students in finding a safe area or exiting flood waters. They are also used during throw bags, tension diagonals and brining victims into shore. Good water negotiation skills are a vital part of water rescue.

Water Entry
Students will demonstrate the proper techniques for shallow water entry.

1. Squat down close to water
2. Jump out not up
3. Keep head above water
4. Get into proper swimming position(offensive/defensive)

Swimming positions (offensive/defensive)
After making proper water entry, students will need to demonstrate proper swimming positions.

- Offensive – Heads Up, chest down, aggressive free-style swim using arms and legs to power through the water and reach a target.
- Defensive – Back down, face up, knees bent and feet up always pointing downstream to see where you are going. Use ferry angles, back paddle to steer and use feet to push off of objects to protect yourself.

Ferry angles
While demonstrating the different swim positions, students will demonstrate the use of ferry angles to move back and forth in the current vector.

- Defensive swim position
    - Keep your body at 45-degrees to the current vector (direction of flow)
    - Keep head pointed in the direction you want to go
    - Use arms to back paddle to assist in moving faster.
- Offensive swim position
    - Students need to demonstrate ferry angles for offensive swim positions.
    - Keep head upstream, facing the shore you want to go to.

Eddy's

- Eddy entry
    - Students will approach an eddy in the defensive swim position
    - Once they recognize and approach the eddy fence, transition into offensive swim position or gator roll into the eddy.
    - Power through the eddy fence and into the eddy.

- Eddy hopping
    - Students will use multiple eddies to move around the river.
    - When exiting an eddy, students should move upstream as much as possible, and use proper water entry techniques to push out as far as possible and offensive swim to the next eddy.

Swiftwater Rescue Technician

Class Title:
Shallow Water Crossing/Rescue

NFPA 1006 JPR(s)
17.2.1

Time:
90 minutes

Scheduling Suggestions:
After static throw bags and water negotiation skills on day 2

Materials/Equipment needed:
All water PPE, Pike Pole or Boat Oar or other long, narrow pole, throw bags, Suitable site to perform shallow water crossing

Instructor Requirements
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the rescuer should be able to

- Assess the river characteristics for shallow water techniques
- Identify the level of risk when performing a shallow water technique
- Perform a shallow water crossing as an individual and as part of a team
- Rescue a person utilizing a shallow water entry technique

Introduction:
One very effective rescue technique is a wading entry. This method is also called a shallow water rescue. It has some obvious limitations and is considered a higher risk technique than shore-based rescues. It can be used only in relatively shallow waters and in slower currents. Multiple factors must be considered when deciding on entering a moving current utilizing these techniques. Also, there are some inherent risks such as foot entrapments and being flushed downstream. It is imperative that personnel entering the water are fully capable of performing self-rescue techniques.

Assess the river characteristics for shallow water techniques
There are three major factors to assess as part of the risk/benefit analysis before deciding to enter the water to perform a shallow water rescue.

- 1^{st} is the ability of the rescuers to perform a self-rescue and having adequate personnel to deploy upstream spotters and downstream safeties.
- 2^{nd} is allowing enough distance downstream before encountering another hazard before being able to reach the shore.
- 3^{rd} is the river itself. The speed at which the water is flowing, the depth of the water, and the composition of the river bottom all play a factor in the success of a shallow water rescue.

The first two are covered in more depth under different modules of this course. We will focus on the 3^{rd} factor here.

The speed of the river plays a major part in the success or failure of a shallow water rescue. The laws of physics tell us that as the current speed doubles, the force it imparts on an object quadruples. There have been studies that show water moving 3mph has a force of about 17lbs on a person's legs and 34lbs on a person's body. If the speed doubles, the forces increase to 67lbs and 135lbs respectively. It is not uncommon to see river speeds of more than 12mph in the flood environment. This speed will have a force of 269lbs on the legs and 538lbs on the body. Obviously, these numbers will differ slightly from individual to individual.

The depth of the river is also a major factor. As the rescuer's get into deeper water, the flotation of their PFD begins to "lift" them off the bottom of the river. This decreases the "friction" they have with the bottom and lessens their ability to maintain traction. When this effect takes full hold, the rescue changes from a shallow water technique to a regular entry technique.

The composition of the river bottom should also be considered. Areas of the river that are always wet may have algae growth making it very slick. Also, roadways and bridges that become submerged are relatively slick. River bottoms comprised of sand or small stones allow the rescuer to "dig-in" and take on more force from the water. Sections of the river with very rough, crevice filled bottoms should be avoided due to foot entrapment risks.

There is no magic formula to determine if a shallow water entry will work. Often times the rescuer's must "feel" as they go along to determine if the rescue will be successful or fail.

Identify the level of risk when performing a shallow water technique
Anytime a rescuer enters the water, the level of risk increases dramatically. The term "shallow water" can be misleading and be perceived as a lower risk option. This is still considered a "go-tow" technique which is among the highest risks a rescuer can perform. A thorough scene size-up is very important when performing a shallow water entry. Often times these techniques are employed when accessing a stranded vehicle in a low water crossing. In rural areas, there may be a barbed wire fence just downstream of the bridge creating a major strainer problem. Other areas may have a dense vegetative growth issue while others have serious hazards such as hydraulics or drop-offs. As stated before, there must be an adequate space downstream to allow a rescuer who may be flushed downstream to safely perform self-rescue. The number of personnel on scene will play a factor in performing a shallow water entry. There will be a minimum of 6 personnel needed. Different techniques may require even more personnel entering the water increasing the risk as well.

Perform a shallow water crossing as an individual and as part of a team
There are 3 general techniques that can be performed for shallow water crossing.

- Single person
    - Not used as sole method for victim removal
    - Another technique will be used to remove victim
    - Side steps while facing upstream
    - Utilizes a pole or oar for stability and to feel ahead
    - Always maintain 2 points of contact with river bottom
    - Exposes only 1 rescuer to water entry
    - More difficult than in a team

- Line Astern
    - Multiple rescuers facing upstream in a line
    - Side step while facing upstream
    - Front person uses a pole or oar for stability
    - 2^{nd} person and beyond hold PFD of person in front of them pushing them downward to maintain traction
    - Front person forms an eddy behind them so they should be the biggest rescuer.
    - Exposes multiple rescues to water entry
    - Allows placement of a victim between rescuers to extricate

- Wedge
    - Similar to line astern but 2^{nd} and 3^{rd} rescuers are shoulder to shoulder behind 1^{st}
    - 3^{rd}, 4^{th}, and 5^{th} are shoulder to should behind 2^{nd} and 3^{rd}.
    - Front rescuer utilizes a pole or oar for stability
    - Rescuer in the back hold across the shoulder of the person next to them and rescuers on the edge hold the person in front of them with their outside hand
    - Allows placement of victim in the middle of the wedge which protects them well.
    - Front person forms a small eddy for people further back so they should be the biggest rescuer.
    - Exposes multiple rescues to water entry

Single Person wading technique

Line Astern wading technique

Wedge wading technique

Water Rescue Course

(Surface- and Swift- Levels I&II)

Class Title:

Vehicles in Swiftwater

NFPA 1006 JPR(s)

17.2.1

Time:

30 Minutes

Scheduling Suggestions:

Power Point day 1 in the morning, practical portion afternoon of Day 1.

Materials/Equipment Needed:

Car, boat ramp and drafting engine to provide water flow.

Instructor requirements:

1:15 Instructor to Student Ratio

Objectives:

At the end of this lesson, the rescuer should be able to:

- Understand how to properly size-up a vehicle in the water
- Explain the correct way to approach a vehicle in the water
- Understand methods to help stabilize the vehicle
- Demonstrate the proper way to get victims out of the vehicle

Introduction:

One of the most common swiftwater rescues we will encounter is a vehicle in a low water crossing. This is also one of the rescues that claims the most lives of would-be rescuers. We will review the proper way to size-up a vehicle in the water and methods to make a rescue safer and have a better chance of success.

❖ Remember our priorities for rescue

- #1 Self
- #2 Team
- #3 Victim

❖ Size up considerations

- Speed
  - Remember: 2 feet of water can move a vehicle
- Depth
- Bottom surface
- Downstream hazards
- Changing conditions
- Available resources
- Amount of time to act

❖ Rescue options for vehicles

- Talk
- Reach
- Throw
- Row
- Go/tow
- Helo

*Remember this is not a linear process. There are times when a "boat" would be more dangerous than a "helicopter" and times when "go" would be safer than a "boat" etc.

❖ Running the incident (S.A.V.E.)

➢ Safety

- After assuming Command it is important to request resources early in incident
- It is pivotal to assign upstream spotters and downstream safeties'

➢ Access

- The most common method to access the vehicle in the water is by using the line astern or wedge wading techniques. When approaching, wade out parallel to the vehicle and work in the downstream eddy of the vehicle if possible. NEVER approach the vehicle directly upstream, it is a dangerous strainer

- Anticipate how you will access the victim(s) once you reach the vehicle. When planning to break a window or opening a door you MUST consider what will happen to the stability of the vehicle when you carry out that action. Breaking a window on the upstream side of the vehicle that has water pillowing off of it could have serious negative effects. The vehicle losing power or the force of water may prevent the doors from opening. You may have to use a rescuer upstream of the door to create aneddy to open the door into.

➢ Vehicle stabilization

- Tie a rope to a vehicle post or through the car, if possible. The goal is not to make this anchor "bomb proof". The goal is to add some stability to the rescue. The rope can also serve in other ways. It can be used as a hand hold for rescuers or victims or used later in the incident to wade back.

➢ Effective Victim removal

- Take PFD's for the victims. Some victims can put the PFD on in the vehicle, some large victims may not fit through the window/door with a PFD on and need to be positioned on the window sill or taken out of the vehicle before the PFD is put on. Also, it can be difficult to put on a PFD in an enclosed space. NEVER go more than an arm's length inside a vehicle.
- When getting people out of the vehicle, get them onto the roof or in the Eddy behind the vehicle. If removing to the roof remember it is very slippery and they need something to hold on to. The rope brought out to stabilize the vehicle is one choice. Reaching in an open window and pulling a shoulder seat belt out can also provide a good hand hold.
- An important consideration when removing victims from a vehicle is that you are changing the weight on the vehicle. The removal of weight may have a detrimental effect on the vehicle. Size-up the vehicle when you reach it and try to evaluate its' stability. If its' stability is questionable then consider adding a rescuer to the vehicle each time a victim is removed or consider removing all victims at one time.

Swiftwater Rescue Technician

Class Title:
Foot and body entrapments

NFPA 1006 JPR(s)
17.1.6; 17.1.11

Time:
30 Minutes

Scheduling Suggestions:
During day 2 as part of shallow water techniques, following shallow water crossing.

Materials/Equipment Needed:
3 throw bags, 3 carabiners, full PPE when performing in the water

Instructor requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson, the rescuer should be able to:

- Explain the priority during foot or body entrapment
- Demonstrate procedures to assist a trapped victim
- Demonstrate one method to safely remove a victim from an entrapment

Introduction:
By definition, all rescue subjects are trapped and must be extricated. Being stranded on top of a car or debris pile, on the bank of a rapidly rising "river" with no place to go, or physically pinned by the moving water are examples of persons needing to be rescued. There are obviously many problems to overcome when dealing with a person who is trapped in moving water. These victims will tire very quickly and often be forced underwater where they will soon drown.

Airway protection become the highest priority for rescuers faced with this situation. Rapid deployment of a "breathing line" is one of the best and safest ways to accomplish this task. Just like all rescue techniques, there are pros and cons to attempting this as well as many variables that must be dealt with. Sometimes the only option may be to free them from entrapment and allow the water to flush them downstream where a more practical and definitive rescue technique can be employed to remove them from the water.

Explain the priority during foot or body entrapment
As stated above, airway protection is the highest priority for managing an entrapped victim. One common method is to deploy a "breathing line" across the river from downstream of the victim and walk it upstream to the victim where it can be used to lift and support a victim's head and torso, keeping their face out of the water. This method does not follow the rule of never placing a rope perpendicular to the current, since that feature is required for the technique to work. It also requires rescuers on both sides of the stream with a rope long enough to reach across. Coordination is often difficult due to the distance between the rescuers and the noise that comes with moving water.

In some instances, quickly freeing the victim from entrapment will serve double-duty in keeping their face out of the water and freeing them at the same time. This technique must be thoroughly evaluated and a risk/benefit analysis performed before it is put into action. Once patient contact is made in such a "snatch and grab" evolution, it has to be maintained or liability issues may arise from losing the victim.

Demonstrate one method to safely remove a victim from an entrapment
There are several methods to attempt to free a victim from entrapment.

One line method (Bechel-Ray Method) – This method bears the lowest risk

- Step 1 – get rescuers to both sides of the river, each with a throw bag.
- Step 2 – throw a line across the river from one rescuer to the other
- Step 3 – Clip the lines together bag-to-bag.
- Step 4 – fill the bags with rocks or other weight and close tightly
- Step 5 – pull the bags across until they line up with the patient
- Step 6 – allow the bags to sink on the downstream side of the victim while the rescuers pull upstream.

The intent is to "grab" the entrapped body part and pull it free, so the victim will be flushed downstream where a rescue can be affected by a team already in place. If the victim holds on to the rope, one rescuer can feed line while the other pulls the victim to shore. A tension diagonal may also be used by properly positioning the rescuer. Another option is to release one side of therope completely, allowing the victim to pendulum in.

Two-line loop – This adds mechanical advantage and also "grabs" the victim. However, it may cause injury to the victim such as rope burn and compression injuries.

- **Step 1-3** are the same as before. The bags are then pulled up the victim's downstreamside and held in place by the rescuers.

- **Step 4** – using a carabiner, attach a third throw bag to the rope between the victim andone of the rescuers.

- **Step 5** – Throw that third line across the stream to a third rescuer upstream from thevictim.

- **Step 6** – the third rescuer moves downstream and crosses the line already in place. Thiscreates a loop around the victim.

- **Step 7** – pull the victim upstream, freeing them from the entrapment and subsequently tosafety.

Swiftwater Rescue Technician

Class Title:
Eddy Hopping

NFPA 1006 JPR(s):
17.1.12; 17.2.1

Time:
30 Minutes

Scheduling Suggestions:
Towards the end of day 2 after dynamic throw bags.

Materials/Equipment Needed:
Proper PPE for each student for a moving water environment

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student shall be able to:

- Recognize an eddy in a swiftwater environment
- Properly plan to move an SRT squad from one shore to another using a system of eddy's
- Properly utilize equipment and strong swimming techniques to move an SRT squad from one shore to another
- Properly utilize bridge abutments as a series of eddy's to move an SRT squad from one shore to another
- Properly rescue a stranded patient from an eddy
- Properly rescue a stranded patient from a bridge abutment

Swiftwater Rescue Technician

Class Title:
Strainer Exercise

NFPA 1006 JPR(s):
17.1.13

Time:
30 minutes

Scheduling Suggestions:
At the end of day 2

Material/Equipment Needed:
Full PPE, 2 ropes, accessory cords or webbing, 2 carabineers, strainer prop

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student will be able to:

- Describe obstacles and dangers associated with strainers.
- Properly demonstrate the technique for going over/avoiding strainers.
- Properly demonstrate the technique for getting off of a strainer after becoming hung up.

Introduction:
Strainers are very dangerous obstacles that can be found at every flood incident. It could be a tree limb, power lines, fence, guard rail or any other object that allows water to pass through, under, over or around it, but not other objects (i.e. rescuers). Learning the proper way to negotiate a strainer, if it cannot be avoided can save the life of a rescuer. Rescuers should avoid going under a strainer at all costs.

Technique for going over/avoiding strainers

1. Get out if possible
2. Unable to avoid, students will approach in defensive position until approximately 25 ft. away, transition into offensive position, grab strainer, push it down while powering over the strainer.

Technique for getting off of a strainer after becoming hung up

1. Students will approach the strainer in the defensive swill position and allow feet and waist to go under the strainer, becoming "hung up" in their chest.
2. Students will keep arms above the strainer to avoid being pulled under.
3. Using a combination of leg kicks and arm power, students will pull themselves over the strainer.

Safety

- Before performing this drill all students should remove extra ropes and carabineers if there is a potential of becoming hooked to the strainer.
- The strainer should not be hard tied on both ends allowing at least one end the ability to be released and pulled to the side in case a student becomes trapped.
- If possible an instructor should be at or near the strainer to assist students.

Swiftwater Rescue Technician

Class Title:
Contact Rescues

NFPA 1006 JPR's:
17.2.1; 17.2.2

Time:
60 minutes

Scheduling Suggestions:
Beginning of day 3 as part of victim management

Material/Equipment Needed:
Full PPE

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student will be able to:

- Describe the uses for a contact rescue
- Demonstrate a contact rescue in moving water

Introduction:
Contact rescues is a skill that rescuers can use to perform a fast rescue for a victim moving downstream in a body of water. This becomes necessary when other options have been unsuccessful, or the victim is in distress. Rescuers need to remember that the victim may be in a state of panic, and they must take caution when approaching the victim. Rescuers must not allow the victim to climb on top of them and endanger their lives. The rescuer must gain and keep control of the victim, while assuring them that you are there to help.

1. If possible, approach the victim from upstream – As the victim is moving downstream, allow them to get just downstream of you before making entry into the water. You can move downstream faster than upstream
2. Always wear Full PPE before entering the water.
3. Do not make contact with the victim if they start to swim to you. Move towards the closest shore and get them to follow. Continue to talk to them and see if they can save themselves.
4. Use rescue devices if they are available. You can extend a buoy or rescue board to allow the victim to climb on.
5. If contact must be made, quickly grab the victim under the arms or across the chest and gain control. Ensure them that you are there to help and try to get them to assist in swimming.
6. Remember good ferry angles and tow the victim to shore.
7. Have downstream safeties in place to throw a bag to you if unable to swim back.

Swiftwater Rescue Technician

Class Title:
Line crossing techniques

NFPA 1006 JPR(s):
17.1.14; 17.1.1

Time:
30 min

Scheduling Suggestions:
After victim management and just prior to tension diagonal on day 3

Materials/Equipment Needed:
Body of water, Swim Fins & -boards, assorted swiftwater PPE

Instructor requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson, the student will able to:

- Identify three reasons to span a body of water with a rope
    - To affect a rescue
    - To transport personnel and gear from one bank to the other
    - To facilitate boat operations (tethered or 2:1 drop)

- Identify ways to accomplish the task of bringing a lifeline from one bank to the other
    - Throw bag
    - Line gun
    - Raft or Boat
    - Swim the line across using a tethered swimmer

- Swim and maneuver in a water environment using floatation and swimming aids
    - Fins
    - Boards

Introduction:
There may be any number of reasons to span a rope across a body of water. Three will be covered in this manual. While the application and further set-up of each will be covered in greater detail later in the course, this lesson focuses on the task of getting the line across.

Effecting a rescue
A rope may be stretched across the water to affect the rescue of a victim. If the victim is able to, he/she may float into the rope and hold on to it. The rope is then released on one side of the stream, and the victim pendulums to the opposite bank. This technique is very similar to using a throw bag, but allows the rope to be stationary and "waiting" on the victim. It also allows the rescuer to stay out of the water.

Transporting personnel and gear from one bank to the other
The rope may be set up as a tension diagonal to allow rescuers and gear to float from one bank to the other. If desired, the rope may be rigged as a highline to keep rescuers and gear out of the water. Both techniques will be covered in detail later in the course.

Facilitating boat operations
A rope may be set across a water way in conjunction with a mechanical advantage system to allow the boat to travel in all directions safely while in the water

The first and oftentimes most difficult step in establishing any kind of crossing line is to get the rope, or the first rope of multiple, across to the other shore. The following list highlights the most common techniques in no particular order.

Using a throw bag or throwing the rope
The most common way of spanning a body of water is also the simplest. That's not to say it's the easiest. Throwing the end of the rope across using a knot or some other means to weight the end may not always be feasible given the distance to be traveled, wind-, weather- and shore conditions, as well as the throwing ability of the rescuer. It is much less dangerous then other techniques and involves no specialized gear. It also allows the rescuer to stay out of the water.

Using a line gun
Two types of line guns are in use by rescue teams: air powered and fire arms.
The air powered type uses a pressurized air from an SCBA bottle to propel a specialized projectile carrying either a guiding line to haul the main line across, or in some cases, an actual small diameter lifeline may be used.

Fire arms, though not as widely used, are a very effective means to get the line across. A brass projectile with a guiding line attached to it, is propelled by a cartridge. Guiding lines come in coiled lengths of 300' or 600'and are stored in a canister below the barrel. The line pays out as the projectile passed through the air, and will later be used to haul the main line across. These line guns are not as susceptible to wind and usually have a greater reach than air powered units. However, being a firearm, the same basic rules apply:

- Always consider it loaded until proven otherwise.
- Do not point it at anything you do not wish to destroy.
- Be aware of your target, what's around it and what's beyond it.
- Keep your finger off the trigger until ready to shoot.

Raft or Boat

A raft or a boat may be used to transport the line across. When using a non-motorized raft, one needs to consider the amount of drag the rope will create as it pays out. Depending on the distance to be traveled and the flow of water, this drag can be considerable to the point of making the operation ineffective and therefore unsafe. When using a motorized boat or raft, care must be taken to avoid entanglement of the rope in the prop of the motor.

Swimming the line across

If no other means of line crossing are available or feasible, using a tethered swimmer remains the only option. This option is not only strenuous and requires great skill by the rescuer, it is also the most dangerous one. It places the rescuer in the water and is therefore much further down the list of options, considering the rule of **talk, reach, throw, row, go-tow, helo**, covered earlier in the course.

Aside from the usual PPE, floatation and swimming aids may be used to accomplish this task with fins and boards being the most popular ones. The principle is as effective as it is simple: the board provides additional floatation, while the fins will aid in propulsion. The rope being taken across also acts as a tether, in the event the swimmer requires assistance, he/she can pendulum back to the bank.

This skill should be demonstrated during this lecture, and each student should be given the opportunity to practice it throughout the rest of the course.

The use of a helicopter in rescue operations is not without risks as covered earlier in the class. Furthermore, the availability of a helicopter may negate the need for a crossing line all together.

Swiftwater Rescue Technician

Class Title:
Tension Diagonal

NFPA 1006 JPR's:
17.1.1

Time:
30 minutes

Scheduling Suggestions:
Immediately following line crossing techniques on day 3

Material/Equipment Needed:
Full PPE, 2 ropes or throw bags, accessory cords or webbing, carabineer for each student

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student will be able to:

- Describe the uses for a tension diagonal
- Describe the proper way to tension a line across a body of water
- Describe the hazards created when tensioning a line across a body of water.
- Describe different techniques for getting a line across.
- Properly demonstrate a technique for getting a line across a given body of water and tension the line.
- Properly describe and demonstrate the proper ways to "attach to or hold onto the line" to a tension diagonal and cross the body of water.

Introduction:
Tension diagonals are a tool that rescuers can use to perform many different tasks. They can provide a way to get rescuers and/or equipment across a body of water or to access a victim. They can be set up to cross close to a victim that is stranded in the middle of the current on a tree, vehicle, bridge pillar or any other object. Or they can be set up down stream of operations as a safety to catch rescuers and move them to one side of the river. Students need to realize the dangers involved when getting a line across a body of water, tensioning the line and using it to cross the water. The first thing students need to remember is NEVER tension a line 90 degrees to the current vector. The line needs to be at least at a 45-degree angle to the current to prevent it from creating a "V" in the middle. Students need to remember that once to tension a line across the water, you have now created a "strainer" that can be a hazard if put down stream of other operations. Also upstream spotters need to be in place in case a large piece of debris comes down that may hang on or wipe out your tension diagonal.

Technique for getting a line across

1. Swim
2. Walk
3. Shoot
4. Throw

Technique for tensioning a line

1. There are several ways to tension a line across the water. Mechanical advantage can be used if you have a long line or few people to help pull and hold the line while it is tied off.
2. If you have help the line can be pulled tight and tied off.
3. Remember if there are no anchors, that you can use a dynamic anchor, like a few people, to hold the line. This allows you to change the angle of the tension diagonal if needed, but is harder on man power.
4. When tensioning the lines, just remember that you want it as tight as possible, also you want the line to be approximately 12"-18" above the water to prevent debris building up, or drag on the line.

Truckers Hitch

- A few feet from a suitable anchor tie a butterfly knot
- Wrap the end of the rope around the anchor
- Run the end of the rope through the butterfly knot and pull back toward the anchor
- When properly tightened secure with a half hitch and overhand

Hard Tie method

- One end of the rope will be hard tied to an anchor with a tensionless hitch or another direct connect method
- The other end will be tensioned as tight as possible using a tensionless hitch to secure it to the other anchor

Z-rig method

- One end of the rope will be hard tied to an anchor with a tensionless hitch or another direct connect method
- The other end of the rope will be tensioned using a Z-rig with a Clutch or Sirius acting as the progress capture device.

Techniques for using a tension diagonal

1. Once a line is set up for use, students need to go over the proper way to use the tension diagonal.
2. Ferry angles come into play again and are key for using a tension diagonal to cross a body of water. If your ferry angle is wrong, you will not go across. Remember, 45 degrees to the current with your head facing the side you want to go to.
3. There are several different ways to "attach" to the tension diagonal. Try several to find out which one works best for you.
4. Hold on with hand using carabineer, piece of accessory cord or webbing.
5. Attach with live bait tether and hold onto it.
6. If you have a tension diagonal going from river left to river right, you will be starting on the river left side wanting to go to river right. You need to enter the water on the downstream side of the line, with your back towards the river right side. Attach/Hold on with your left hand (opposite side from which you want to go, just like throw bags) and sit down and let the current take you. This will naturally cause your body to get into the proper ferry angle and go across.

Swiftwater Rescue Technician

Class Title:
Tethered Swimmer and Live Bait Rescues

NFPA 1006 JPR's:
17.2.1

Time:
2.5 hours

Scheduling Suggestions:
Following Tension Diagonals on Day 3.

Material/Equipment Needed:
Full PPE, Water Ropes, Quick release shackle or cordage, Knife, Locking Carabiner

Instructor Requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson the student will be able to:

- Identify when a tethered swimmer or live bait rescue is necessary.
- Understand the inherent dangers of such an operation.
- Understand how both operations work and what is necessary to perform this type of rescue.
- Act as a rescue swimmer on a tethered rope, and conduct a contact rescue.
- Act as a rescuer on a live bait operation and conduct a contact rescue.
- Operate their quick release harness on the PFD.

Introduction:
Contact Rescues have their own inherent dangers, and rescuers must evaluate the situation to decide if putting a rescue swimmer into the water is the best option. Tethered Swimmer and Live Bait Operations are based off of the Combat Swimmer, but with special equipment, the rescue swimmer is attached to a rope that extends to the shore. We will look at each operation separately, although they share some similarities.

Advantages:
The rescue swimmer can focus on making contact with the victim, and swim more effectively with both arms. A tether gives us some control of the swimmer, and once they make contact with the victim, the shore based team can do a bulk of the work to retrieve them both. The rescuer can use both hands to manage the victim, rather than trying to swim while holding the victim.

Disadvantages:
The tethered line can snag on obstacles, and make it difficult to maneuver or strand a rescuer. Line drag of the rope in the water can make swimming less efficient. Rescuers must be aware of where the rope is in the water and not allow it to entangle the swimmer or victim.

Equipment:
The Rescue Swimmer must be properly trained in the operation of their live-bait PFD. PFD's must be equipped with a quick release rescue belt built into the vest. Typically, this release system is rated at 1100lbf (5kN). The rescuer will clip the tether line to the harness's ring or by means of a cow's tail. If the swimmer clips directly to the ring, they must use a locking carabiner to avoid inadvertently becoming clipped to other loops on the vest. In either case, the tether must be attached to the quick release belt.

Tethered Swimmer:
The rescue swimmer's primary goal is to intercept the victim. The rescuer should initially position themselves downstream of the victim, and try to anticipate where the victim will end up. They have a limited amount of rope on their tether (typically 75'-150'), so one option to maximize their working window is to start slightly upstream of the tenders. Once the victim is spotted, the swimmer should time their water entry and swim aggressively out into the current, attempting to ferry out until directly downstream of the victim. The swimmer can momentarily stall against the current or swim aggressively downstream to make contact. The key is timing so that the swimmer can make contact before running out of rope.
If the swimmer is jumping out into the water to make contact, they can take a few coils of rope slack and drop it as they jump to avoid extra drag initially. Rope tenders should allow plenty of rope to flake out freely during the swimming phase, to cause the least amount of drag. Once the swimmer has the victim or runs out of rope, the tenders will belay them to shore, using pendulum effect of the current. Sites should be open with few obstacles, and special consideration to what's downstream in the event that the swimmer has the release from the tether.

Live Bait
Also called the V-lower, the live bait operation places a rescuer, attached to their quick release PFD belt, on tag lines that reach both shores. The tag lines should be hooked up

directly to the ring on the belt, or cow's tail. This allows tenders on both shores to belay/lower the rescuer into position. The rescuer can direct the tenders with whistle blasts or hand signals. Once in contact with the victim, the shore teams can haul them back upstream of the hazard and ferry them to one shore. This technique works best in shallower water, aiding the rescuer in getting into position and using the power of the shore teams to haul a victim back upstream slightly (Ex. Foot entrapment). When used in deeper and swifter water, attention should be paid to the forces placed on the rescuer, and the effect of the water wanting to flow over their head. The rescuer can arch their body to keep it on top of the water or use an air pocketcreated by the eddy around their head. Special attention should be given to hazards downstream in the event that the rescuer has to release.

Operating the Quick-Release Belt on the PFD:
Field work should allow for students to all operate their quick release belt in both a tethered swimmer and live bait configuration. Before any in-water operation, students should all practice the 2 ways to release their belt, as well as the troubleshooting process on shore.

2 ways to release:

1. Pull the ball on the shackle, allowing the tail to release.
2. Pull the tail of the belt straight out, and then be sure to let go, allowing it to release.

Troubleshoot: If the tail fails to release after pulling the ball or the tail, then the rescuer can take their thumb and slide it in the top of the release belt between the PFD and belt, and continue down pulling the belt out.

Safety: Any time an operation using these techniques is used, a way of releasing the rope should be used. Quick release shackles or releasing rope device should be used. Also a knife and person capable of cutting the rope should be readily available at the anchor. Instructors should be placed near the anchor and near the rescuer.

Swiftwater Rescue Technician

Class Title:
Anchors, Rope systems, Mechanical Advantage, and Highlines

NFPA 1006 JPR's:
17.1.14; 17.1.1

Time:
60min

Scheduling Suggestions:
Static instruction first thing on day 4, application later in the day as part of boat operations.

Materials/Equipment Needed:
Ropes, pulleys, webbing, carabiners, prussik cords

Instructor requirements:
1:5 max Instructor to Student Ratio

Objectives:
At the end of this lesson, the student will able to:

- Identify procedures for operation of rope systems particular to water rescue
    - Determine incident needs
    - Capabilities and limitations
    - Site evaluation
    - Personnel assignments and commands

- Construct rope systems particular to swiftwater rescue needs
    - Anchor selection
    - Review from General rescuer course

Introduction:

Rope systems in the water rescue environment may be utilized not only to extract a water bound victim, but may also be needed to evacuate the victim up the bank on either side in order to receive definitive treatment.

The systems employed tend to be much simpler than those used in other rope rescue environments. The main differences are that the load is usually attached to only one rope, and that the system employs less "hardware" due to the rescuers having to "travel light." Another reason is the time it takes to set up a rope system. The victim may simply no longer be in the same location by the time it takes to set up a system. Especially with the limited number of rescuers that may be present.

Therefore, this course will focus on simple systems such as the "Georgia Haul" and the 3:1 Z-rig covered in the General Rescuer course. As well as simple anchoring techniques such as the tensionless hitch, the looped knot, or the basket anchor.

Anchoring

Anchors are the foundation of rescue systems and often the first portion built when constructing a rescue system. Anchors come in many variations. The intent of this curriculum is to provide definitions and principles that will lay the foundation for anchors as a whole and take those principles and apply them in the field to construct anchors for use in rescue systems.

Definitions

Anchor point- an object in which rescue systems, or components of a rescue system, are attached and is capable of supporting the force applied.

Marginal Anchor- an anchor point that, by itself, is not capable of supporting the applied force. Marginal anchors either need to be combined in sufficient numbers to support the anticipated force or need to be improved (usually with back-ties). In ReSET we typically only teach back-tied "marginal anchors".

Single Function Anchor- An anchor point or anchor system that is viewed as capable of supporting one function, example: one half of a two-rope system**.**

Multi- Function Anchor- an anchor point or anchor system that is viewed as substantially capable of supporting more than one function, example: both halves of a two-rope system. Multi- function anchors are also referred to as "Bombproof" anchors. When attaching more than one function to a multi-function anchor, each function or attachment should be separately anchored to the anchor point.

Single Point Anchor- an anchor point that only includes one anchor point in its construction. Examples: and single tree or a single I-beam.

Multi-point anchor- an anchor system that uses multiple anchor points in its construction to create a focal point in a location where the rescuer needs an anchor point but one does not exist

Anchor Points

Given the time sensitive nature of water rescue, the only anchoring methods taught in this course are single point anchor systems. Though other systems may be utilized given a specific situation (artificial anchors, load-sharing, etc.), their increased set-up time may not make them as feasible to be used in the swiftwater environment. It must be stressed that all anchors used at this level must be Single Point Anchors and bombproof. Great effort should be made to ensure students can select appropriate single point anchors.

Anchoring Rules

- Strongest part of the system
- Back up questionable anchors
- Keep angles at 120 degrees or less
- Pad sharp or rough edges
- Rig high

Anchors

- Tensionless Hitch
- Looped Knot
- Webbing looped and doubled (AKA- Basket, 3 Bight)

Mechanical Advantage Systems or Haul Systems

Mechanical Advantage (MA) is defined as the ratio of tension at the load compared to the force required to move it. There are many types of haul systems and each rescue will require a unique system for that rescue.

How MA Works

Work = Force x Distance- The amount of force required to raise a load is less but more rope is required to be moved through the system to equal the same amount of work. So with a 3:1 for every 3 feet of rope pulled by the haul team the load only travels 1 foot.

For a simple system the number of ropes that support the load share the load equally. This includes the line that we pull on. So we hold a fraction of the load in that one line and the other lines and the anchor gets the rest.

Types of MA

Simple Systems

- All traveling pulleys move toward the anchor at the same rate of speed.
- Is one system working on itself
- Counting the number of ropes at the load will determine the MA ratio

Examples of simple systems used in water rescue

- 1:1 (Georgia haul)
- 3:1 z-rig

Different Haul System Configurations

Inline

- Uses the mainline to construct the haul system
- Z-Rig

Piggyback

- Uses a separate rope to construct the haul system and is then attached (piggybacked) onto the mainline.
- Attach to the mainline with a rope grab device (usually a Prussik in the water environment).

Parts of a haul System used in the water environment

- Anchor(s)
- Mechanical advantage system
- Progress capture device (PCD)
- Haul team

Progress Capture Device

A progress capture device (PCD) is a component that captures the progress of the haul system. When the load is raised a distance, the PCD will hold the load at that point until the rescuer: resets the system, continues the haul, lowers the load, or whatever is needed during the evolution. Examples of some PCDs are: Gibbs, Rescuecender, Single Prussik, Munter Hitch, etc.

Highlines

Highlines can be very valuable in bringing a rescuer to a stranded victim, or when setting up boat on a highline. As discussed earlier in the course. Care must be taken to plan, set-up and operate the sesystems very efficiently due to their more complicated and time-consuming nature.

Highline is defined as a horizontal rescue system used to transport equipment or people across a span. These systems are often called Tyrolean's. A Carriage made up of pulleys is placed on a

horizontally tensioned Mainline (Trackline) and is operated horizontally by Control Lines (Taglines). Generally, with a Highline the majority of the weight is supported by the Mainline. The Control Lines just allow us to ferry the load back and forth on the Mainline. In this course we will be using highlines to maneuver a boat in a swift water environment.
The majority of weight/load will be supported by the water, and the anchors will see much less of a load as compared to the high angle environment.

There are two ends or sides to a Highline. In an effort to stick to NIMS terminology we will use the designation "Division" to separate the different ends. The end, which is normally characterized by having the majority of activities and resources including: equipment staging, additional personnel, command components, and various other items/functions will be called Division A. Some schools and agencies call this the "near side" or "working end". Division A often appears to have the majority of the "work" occurring. In reality there is a lot of activity on the other side as well. The other end will be called Division B. Some schools and agencies call this the "Dumb-end" or "Far-side" because it is on the far side away from the bulk of activities. These terms will aid us in clearly communicating between the two sides when coordinating a highline operation.

The first major complication will come when trying to get the ropes, rigging gear, and rescuers across the span. There are various solutions to this problem as discussed earlier in the course. With one addition: when sending the first rope(s) across try and send two. This will aid in facilitating the rigging much better.

Method #1 for Boat on a Highline.

The Mainline
The terminal end of the Mainline rope should be anchored to a suitable anchor on the Division B side. This can be any anchor we use in our other technical systems. Though the most common anchoring method used is the tensionless hitch. This is common for two reasons:

1. After a prolonged period of time a knot under constant tension from the Mainline system will be extremely difficult to untie.
2. This method will allow us to retain the majority of the rope's strength. It should be noted that the Division A would normally incorporate a method of attachment that will be below the ropes MBS (Tied off Munter, Tandem Prussiks, Knot, Sirius, Clutch, etc.). So, efforts to maintain 100% of the ropes strength are negated if the same is not true on the other end.

On the Division A, one of the Mainline systems used in General Rescuer or Rope Level I should be used:

- **Munter Progress Capture Device** (PCD) with a piggybacked Block and Tackle haulsystem
- **Inline Z-Rig** with **Sirius or Clutch**.
- **Truckers Hitch**
    - few feet from a suitable anchor tie a butterfly knot
    - Wrap the end of the rope around the anchor

- Run the end of the rope through the butterfly knot and pull back toward the anchor
- When properly tightened secure with a half hitch and overhand

Control Lines

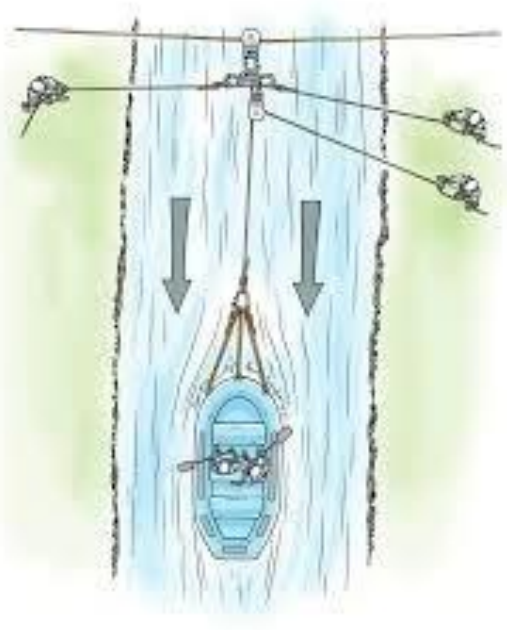
With the Mainline rigged and the carriage in place we need Control Lines to move the load from one side to the other.

On both sides, Division A and Division B, systems are rigged to traverse the load back and forth. Any system taught in General Rescuer or Rope Level I can be used for the control lines:

- Inline Z-Rig with single Sirius or Clutch PCD.
- If mechanical advantage is not needed, the control lines can be operated by the rescuers just pulling hand over hand and wrapping the rope around an anchor point to add friction and created a tensionless hitch, if needed
  o Note: The ends of these ropes should be attached directly to the carriage with a knot and a carabiner.

Single Tension boat lower

The boat will be attached to a single rope at the bow of the boat using a figure 8 on a bight attached to a carabiner.
The rope will run up to the "carriage" riding on the mainline and travel though a pulley that is attached to the bottom of the carriage.
The rope will then run to either river left or river right.
A inline haul/lower system will be used to to lower or raise the boat in the current.
Georgia haul with a munter progress capture/ lowering device



Gear list:

Two Tension Boat System

The purpose of a Two Tension Boat System is to provide additional control and stability to a boat in the swiftwater environment. This method relies on more gear, more time for setup and more planning. However, if time allows it provides a greater level of control and maneuverability of the boat in the swiftwater environment.

The mainline is secured at both ends with either Clutches or Sirius, this gives the mainline the ability to move back and forth during the operation of the system. In calm water the mainline will be able to be moved back and forth without mechanical advantage. While underload, a 3:1 Z rig may be needed to assist the boat with moving the boat from side to side.
The mainline will need to have 2 butterfly knots tied into the rope aprox 6-8 feet apart, these knots will be attachment points for single pulleys.

River left and river right will both have mirrored systems built consisting of single tensioned line using a clutch as a control decent/ progress capture and a inline z-rig for hauling.
Each line will terminate at the boat, connecting to the boats bridal attachment on the corresponding side

Operation

The intent of the Highline is to be simple. It is rigged with systems that have been used over and over again in previous courses and evolutions. We are now just applying them horizontally instead of vertically.

To move the load up- and down- stream, use the system attached to the boat, either from shore or from the boat directly. To traverse the load across the stream, use the systems rigged on both Control Lines. One system will need to be in the “Lowering” mode and one in the “Raising” mode. Coordination should be used to try and minimize the amount of “fighting” between these two systems. The boat crew may assist in the movement by putting the boat into the corresponding ferry angle.

Evolutions

Time should be offered to allow students to see these systems demonstrated by building “Mini-Highlines” between trees. Discussions about all the characteristics of the systems should be undertaken prior to moving past the Mini-Highline session. Full-scale versions of a Boat on a Highline should be built and operated during the class.

Swiftwater Rescue Technician

Class Title:
Catch Curtain

NFPA 1006 JPR's:
17.1.14; 17.1.1

Time:
15 min

Scheduling Suggestions:
Static instruction on day 2, application later in the day as part of boat operations.

Materials/Equipment Needed:
2 Ropes (can be throw bags) several carabiners

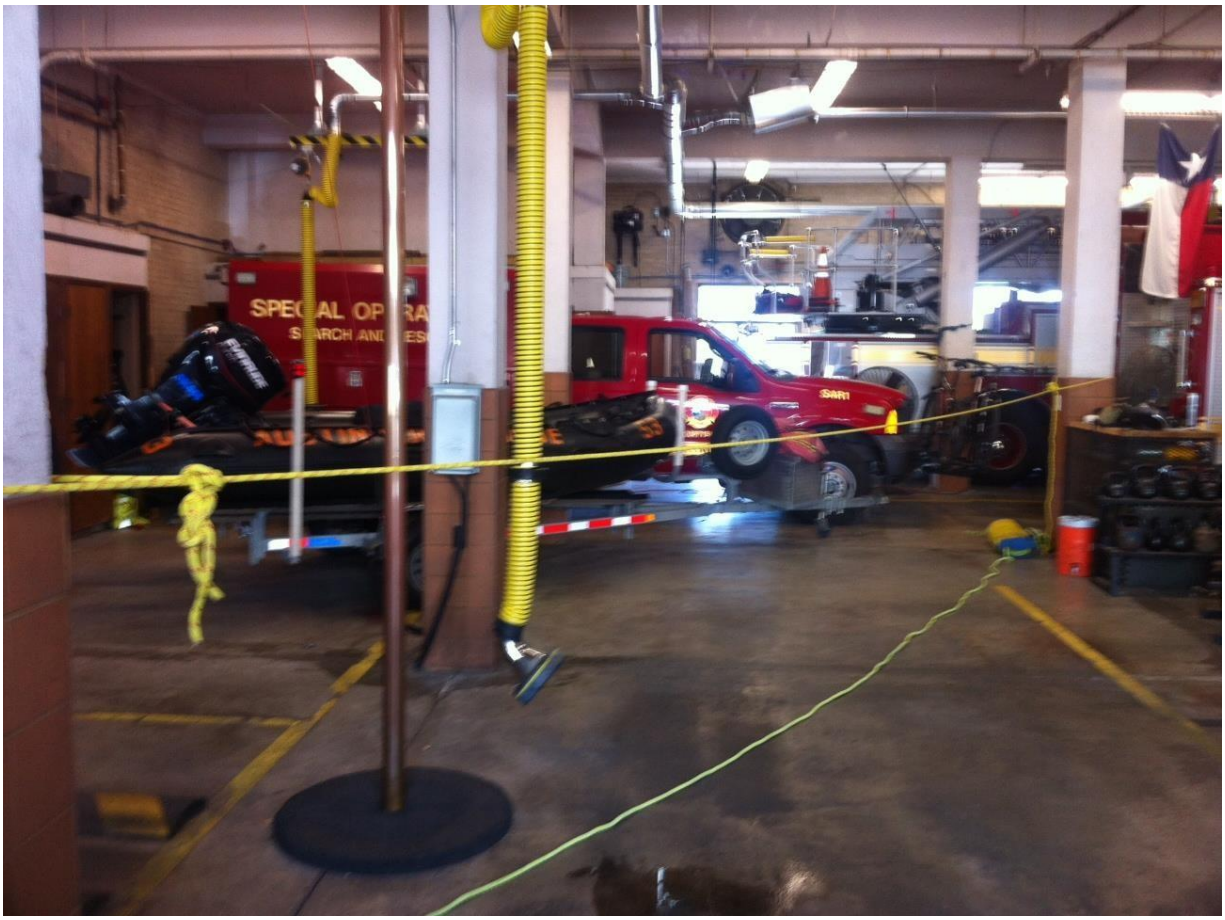
Instructor requirements:
1:15 max Instructor to Student Ratio

Objectives:
At the end of this lesson, the student will able to:

- Understand situations the catch curtain may be beneficial
- Be able to construct a catch curtain

Introduction:
A Catch Curtain is a device that can be built with very little equipment, and set up downstream of an operation or in anticipation of catching victims caught in swift water. It builds off of the tension diagonal, which follows the rules that we don't tension ropes straight across the current vector. The Catch Curtain requires a person(s) to operate on the upstream side and on the downstream side, and can be set up at the same time as the tension diagonal.

First, get 2 ropes across the river and build a tension diagonal with one rope.



Next, on the upstream side with the other rope, take a large bight (equal to the distance from the tension diagonal to the water) and tie an overhand on a bight (or fig 8 or butterfly). Then use a carabiner and attach the bight to the tension diagonal. Move down that rope 4-6’ and repeat this process. Then move down another 4-6’ and repeat. You can make as many bights as you want, but generally 2-4 are easiest to manage. The finished product should look like this:

The 2 teams can move the catch curtain back and forth with the control ropes along the tension diagonal to catch their target. When they have a survivor in the curtain, they can slide the curtain to the downstream side, and offload them. Then, they can reset the curtain for further operations. Multiple people can be caught at the same time. To keep debris from fouling the curtain, both teams can raise up on the control ropes and allow objects to flow under.

Swiftwater Rescue Technician

Class Title:
Continuous Loop

NFPA 1006 JPR's:
17.1.1

Time:

Scheduling Suggestions:
During day four as part of the rope skills

Materials/Equipment Needed:
200' rope, 4-5 carabiners, full PPE when performed in the water

Instructor requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson, the student will able to:

- Explain how a continuous loop is designed to function
- Properly set-up, operate, and break down a continuous loop system

Introduction:
The continuous loop is rope system that follows some of the same principles as the tension diagonal, employing ferry angles to move rescuer and victims across the current. However, the rope moves, rather than staying fixed. The movement across the current vector is still at the same angle (45 Degrees) as the tension diagonal. A minimum of 3 rescuers is required but more may be beneficial or necessary. The ideal distance from shore or across the current should be less than 75 feet. The technique is best employed where a shallow water crossing is possible but multiple victims have to be moved.

Set up:
Tie a rope into a loop using a figure 8 bend or other knot suitable for joining to ends of rope. All rescuers start on the same side of the current. The initial rescuer takes a bight of rope to the target object using a shallow water crossing technique while being belayed from upstream. Once he reaches the target, the belay persons spread out along the shore, one upstream, one downstream from the rescue site. The loop should be in a triangle form at this point. The rescuer can now attach victims to the rope on the downstream side and the rope is rotated in a fashion allows the victim to be moved to the shore (clockwise to go river right, counter-clockwise to go river left). A coordinated effort to move the rope must be utilized. Once the victim reaches the shore, another victim can be attached immediately, without the need to reset the system. If more rescuers or equipment are needed at the target, they can me moved simultaneously with victim movement.

Break down:
The simplest way to break down the system is to allow all but one rescuer to return to the shore just as the victims did. The final rescuer can be belayed with the rope as they pendulum to shore.

Swiftwater Rescue Technician

Class Title:
Boat Operations

NFPA 1006 JPR's:
17.1.8; 17.1.10; 17.1.11

Time:
12 min

Scheduling Suggestions:
Prior to lunch on day 4 (two/four point tethers) and at the end of day 4 prior to scenarios (boat flips, etc.)

Materials/Equipment Needed:
Body of water, raft w/ paddles, assorted swiftwater PPE

Instructor requirements:
1:5 Instructor to Student Ratio

Objectives:
At the end of this lesson, the student will able to:

- Use a watercraft for rescue operations
    - Nomenclature, design limitations
    - Communications
    - Watercraft pre-deployment checks
    - Launch and recovery
    - Swimmer deployment and recovery
- Negotiate a designated water course in a watercraft
    - Dynamics of moving water and effects on watercraft
    - Conditional requirements for PPE
    - Motorized vs non-motorized watercraft
    - Managing hazards
    - Crew assignments and duties
    - Broaching and righting of watercraft

- Extricate an incapacitated water-bound victim from the water
    - Parbuckling (rolling) technique
    - Simple mechanical advantages
    - Lifting techniques
- Two- and four-point tethers
    - Set up
    - Special considerations

Introduction:
Boats are an invaluable tool in water rescue. But they're not the only tool to use and they require a great amount of training. While some jurisdictions may have a whole fleet of motorized and non-motorized boats, others may have none at all. This course will focus on the most basic aspects of boat operations and additional education and training will be necessary to become familiar and proficient with different types of water craft.

Use a watercraft for rescue operations:

Nomenclature and design limitations
While there are very specific terms in the marine world when it comes to water craft of all shapes and sizes, we will try to keep it simple, using everyday terms to describe what we're working with. The front is the front, the back is the back, and the sides are referred to accordingly.

Design limitations vary greatly with the craft used. Some are suitable to be towed behind a motorized craft, while others lend themselves better to be tethered from shore or be paddled by a crew of two or four. The important thing to remember is to use the "right tool for the job." Paddling an inflatable raft in rapidly moving water, or using a motorized rigid-hull craft to approach a low head dam may or may not be the best course of action. Also, care must be taken to bring enough rescuers and still leave room for the victim(s) without overloading the craft.

Communication
Depending on how many rescuers operate the boat, communications get more complex. In any event, one person in the boat should be the one giving commands. In a paddled raft, that may be the person sitting at the rear, while a motorized craft may require the person in the front to point out obstacles and/or give directions to the tiller man.
Using terms like "left", "right" and "stop" works best. Traveling upstream, pointing to the right and saying "left" meaning "river-left" can be very confusing. Confusion leads to ineffectiveness, thus compromising safety. Any clear and concise communication that is agreed on by those in the boat and those on shore is effective, no matter what terms or signals are used.

Pre deployment checks
Before a boat is launched, a pre deployment check needs to be performed. Those will vary depending on the boat and its features. Below are some of the most important ones

- Is the chosen boat the right one for the job?
- Is it inflated properly?
- Are valves closed and adjusted for navigation?
- Pop-off valves need to be left uncapped

- Drain plugs in place?
- Are there enough ores and paddles in working order?
- Craft is not damaged and attachment points are in working order. Check the motor and
- fuel (if applicable)

Launch and recovery
Depending on the boat used, this can be fairly simple or pretty complicated, time consuming and man-power intensive. While a small raft or inflatable can be launched and recovered almost anywhere, the addition of an outboard motor to the same boat changes those procedures dramatically. A submerged roadway makes a great boat ramp, but neither one might be available or be too far away. The right boat for the job may just be the one than can be readily launched and recovered.

Swimmer deployment and recovery
Swimmers are deployed in two ways: They either "belly flop" in the water or roll backwards off the side of the boat. Either technique is designed to reduce the depth of immersion in the water thus reducing the risk of striking objects on the bottom.

Two techniques for recovering a swimmer will be discussed here. One for using a paddled raft and one for using a motorized boat.

For a paddled raft: the "dunk and pull" method is very effective. With the swimmer on the side of the boat, the rescuer, squatting inside the boat, garbs the swimmer by the PFD and dunks him/her once or twice in order to gain momentum. On the third "upswing" the rescuer falls backwards into the boat, pulling the swimmer in with him/her. While there are different views as to whether the swimmer should face the boat or face away, both applications work equally well.

Negotiate a designated water course in a watercraft:

Dynamics of moving water and effects on watercraft
Currents have the greatest (negative) effect on a watercraft if they impact the most surface area on the boat i.e. the sides. Therefore, boats should only travel up- or downstream, never perpendicular to the current. The boat will be most stable with the bow pointed into the current and the bottom of the boat channeling the water underneath the hull or floor. Traveling downstream may cause the boat to be swamped or broached. A wave traveling faster than the craft gets underneath it and turns it upside down. It takes great skill and practice to maneuver any boat in fast moving current. This is especially true for motorized craft. Any transition from up- to downstream travel or vice versa needs to be swift and accurate, so as to not expose the broadside of the boat to the current any longer than absolutely necessary. The same goes for "peeling" in and out of eddies.

Conditional requirements for PPE
PPE for boat-based operations should not be any different from other swift water rescue PPE. PFDs, helmets and appropriate footwear are mandatory for all on board. Dry suits are highly advisable, especially in a flood environment, but may not be as detrimental in a still waterrescue scenario. Gloves are always a good idea.

Motorized vs non-motorized watercraft
There are many advantages of a motorized craft over a non-motorized raft. However, the increased amount of training and experience needed to effectively operate a motorized craft may make them a less then optimal choice. One should bear in mind that it is not so much the boat being used, but how proficient the rescuers are in the use of the boat. This class will focus on paddled rafts and non-motorized crafts. While briefly touching on the differences and consideration for both.

Managing hazards
As mentioned before, boats should only travel up- or downstream, never perpendicular to the current. That being said, the best way to mitigate hazards is to avoid them all together. One way to do that is to have one crewmember tasked with "reading the river." That person should be very familiar with river hydraulics and the signs associated with them. Positioned at the bow of the boat or raft. He/she points out any hazards or "points of interest" so that the crew can steer around or towards them. Due to their higher maneuverability and power, motorized craft are much more capable of mitigating hazards while traveling both up- and downstream. As stated previously, this class will focus on non-motorized boats.

Crew assignments and duties
A typical set-up for a paddled raft would be a four-man team. The "tiller man" sits at the rear of the raft, giving commands:

- "all forward/back"
    - all rescuers paddle in the same direction
- "left/right stop"
    - left/right side seizes paddling, turning the raft
- "left forward, right back"
    - each side paddles in the direction stated, turning the raft on the spot

One of the rescuers in the front points out hazards as stated above.

Broaching and righting of watercraft
Broaching is the term used to describe the effect a current can have on a boat if the boat travels downstream and gets over- (or better under-run) by a wave causing the boat to swamp. No matter the reason why the boat capsized or overturned. Any rescuer must be proficient in the techniques used to try and upright the boat.

One rescuer climbs on top of the capsized boat using previously attached pieces of rope or webbing. Pulling from the opposite side, the rescuer leans back on the webbing, righting the boat, but splashing back in the water himself.

- One or sometimes two rescuers may hang on to the underside of the raft, so they get flipped into the raft and can assist others once the boat is righted.
- One member should be assigned to account for the paddles. A righted raft is almost useless if you can't control and maneuver it.
- You may have to ride or paddle the raft upside down if there is no way or not sufficient time for righting it.
- If you become separated from the raft and have to swim, located it as soon as possible and stay upstream from it, so as to avoid becoming pinned between the boat and an obstacle.

Extricate an incapacitated water-bound victim from the water:

The techniques for extricating a victim from the water follow right along with those for recovering a swimmer covered earlier. This is especially true if the victim is already wearing a PFD. Inflatable rafts seem to work better given their low height to the water line, rounded contours and flexibility. Ridged hulls tend to be much taller and flare outward. In those instances, a victim may have to be brought in over the rear of the boat requiring the motor to be shut off. This is especially true for Jon Boats as they are prone to capsizing when attempting to bring a victim in over the side.

Simple mechanical advantages and lifting techniques
Grabbing the victim under the arms or by their PFD and leaning back as described earlier will create a simple MA, just by the leverage created by the rescuer squatting and then dropping backwards into the boat. Attempts to drag someone by their hands and wrists do not work well. It is also advisable to have the victim face the boat, as that will prevent his back from being hyper extended.

Two- and four-point tethers:

In some situations, it may be desirable to control the raft and maintain its position from shore, rather than having the boat crew tasked with maneuvering the raft AND affecting the rescue. In those situations, a boat tether may be used. These are relatively simple to set up but are limited to relatively narrow, slow moving streams. They do not work well on streams over 200' wide, or on river bends.

Two-point tether: 1 line going to each shore (quicker and easier to rig)
Four-point tether: 2 lines going to each shore (better control of the boat)

One of the main tasks in setting up a tethered boat system, is to get the first line across the stream to the far side. Techniques to accomplish this are covered earlier. Each tether should be at least twice as long as the stream is wide. The boat may be used to ferry the line across, both lines for a four-point tether may be sent simultaneously, or the boat may ferry the second line and additional personnel to the far side, once the first line is set up.

The lines are attached to the upstream side of the boat (two point) or to the front and back (four point). The boat can now be moved up- and downstream by either walking along the shore or by paying out and taking up the rope. During operations, it is important to hold the lines out of the water in order to reduce drag and for the system to work properly. This becomes more difficult as the stream gets wider.

Communication is key and should be run through a control person: one rescuer in the boat signals which way he wants the boat to move. The rescuers on shore need to coordinate who needs to pull tension and who needs to slack their line(s) in order to make it happen.

The operation frees up the rescuers in the boat to focus on directing the operation and to make the rescue, once in position. For best results, the boat should be loaded near the back or downstream side in order to reduce water build up at the upstream side and possibly swamping the boat. Furthermore, the boat crew should be equipped with knives and paddles/oars, in case they need to cut free and take over control of the boat.