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Standard Guide for Swiftwater/Flood Search and Rescue Operations[1]

This standard is issued under the fixed designation F3048; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—**Figs. X1.1 – X1.4** were repositioned editorially in February 2014.

1. Scope

1.1 This guide establishes a framework within which swiftwater/flood Search and Rescue (SAR) operations shall be conducted as part of the National Incident Management System (NIMS)/ Incident Command System (ICS).

1.2 The requirements of this guide shall apply to individuals, agencies, and organizations that respond to swiftwater/flood SAR operations, including those not regulated by government mandates.

1.3 This document does not define the specific training required for personnel involved in swiftwater/flood SAR operations. Refer to local, state, federal, public, and private swiftwater rescue certification and operations courses that satisfy the existing authority having jurisdiction (AHJ) requirements.

1.4 This guide includes references more common to the United States of America, but may be adapted for use elsewhere.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use or as defined within a (regional or geographical) response region or by the AHJ.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1422 Guide for Using the Incident Command System Framework in Managing Search and Rescue Operations

F1768 Guide for Using Whistle Signals During Rope Rescue Operations

F2752 Guide for Training for Level I Rope Rescue (R1) Rescuer Endorsement

2.2 *Other Documents:*

FEMA, National Incident Management System, December 2008[3]

FEMA, National Response Framework (NRF), January 2013[4]

3. Terminology

3.1 *Acronyms:*

3.1.1 *AHJ*—Authority Having Jurisdiction

3.1.2 *EMS*—Emergency Medical Services

3.1.3 *IAP*—Incident Action Plan

3.1.4 *IC*—Incident Command or Incident Commander

3.1.5 *ICS*—Incident Command System

3.1.6 *NIMS*—National Incident Management System

3.1.7 *PFD*—Personal Flotation Device

3.1.8 *PPE*—Personal Protective Equipment

3.1.9 *PWC*—Personal Water Craft (e.g., jet ski, water bike)

3.1.10 *PTB*—Position Task Book

3.1.11 *SAR*—Search and Rescue

3.1.12 *SWFT*—Swiftwater/Flood Technician

3.1.13 *TFL*—Task Force Leader

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *authority having jurisdiction*—an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installation, or a procedure.

3.2.2 *boat-assisted*—swiftwater/flood SAR operations aided by a boat, in which the boat is operated on a tether.

3.2.3 *boat-based*—swiftwater/flood SAR operations conducted from a boat only.

3.2.4 *flood*—a great flowing or overflowing of water, especially over land not usually submerged.[5]

[1] This test method is under the jurisdiction of ASTM Committee F32 on Search and Rescue and is the direct responsibility of Subcommittee F32.02 on Management and Operations.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf

[4] http://www.fema.gov/national-response-framework

[5] http://dictionary.reference.com/browse/flood?s=t Accessed February 7, 2013

3.2.5 *helicopter-based*—swiftwater/flood SAR operations conducted by a helicopter crew, which intends to make direct contact with the subject(s) while remaining airborne.

3.2.6 *in-water contact*—swiftwater/flood SAR operations conducted by rescuers in the water who make direct contact with the subject(s).

3.2.7 *near shore*—the side of the watercourse where operations or Incident Command may occur.

3.2.8 *personal flotation device (PFD)*—a buoyant device suitable for use by one person to stay afloat in a water emergency. This may be a vest, ring buoy, life preserver, cushion, or other special purpose buoyant apparatus. Types include:

3.2.8.1 *Type I*—offshore life jacket

3.2.8.2 *Type II*—near shore buoyant vest

3.2.8.3 *Type III*—flotation aid

3.2.8.4 *Type IV*—throwable device

3.2.8.5 *Type V*—special use device

3.2.9 *recovery*—an operation to retrieve deceased persons from the current position and move them to a designated place.

3.2.10 *rescue*—an operation to retrieve persons in distress, provide for their initial medical or other needs, and deliver them to a place of safety.[6]

3.2.11 *search*—an operation using available trained personnel and facilities to locate persons in distress.[7]

3.2.12 *shore-based*—swiftwater/flood SAR operations conducted from land adjacent to the water.

3.2.13 *swiftwater*—water moving with sufficient force to present a significant life and safety hazard to a person entering it.

3.2.14 *swiftwater/flood search and rescue operations*—actions intended to locate and save individuals caught in, or stranded by, swift or flood waters, conducted using the NIMS/ICS, or equivalent.

3.2.15 *swiftwater/flood search and rescue technician*—an individual trained to perform swiftwater/flood SAR operations.

3.2.16 *type*—a classification series developed to identify an incident's level of complexity ranging from most complex (Type 1) to least complex (Type 5).

4. Significance and Use

4.1 This guide establishes a framework within which swiftwater/flood SAR operations shall be conducted.

4.2 Every person, agency, and organization that responds to, or participates in, swiftwater/flood SAR operations should operate within the framework established by this guide.

4.3 This guide and the framework it establishes should be used in conjunction with established and authorized guidelines and procedures mandated by an AHJ.

4.4 The AHJ shall determine which personnel, agencies, and/or organizations are qualified and authorized to participate in swiftwater/flood SAR operations.

4.5 This guide is to be used by individuals and AHJ that wish to perform swiftwater/flood SAR operations as part of the NIMS/ICS.

4.6 This guide does not stand alone and must be used with the referenced documents to safely and effectively perform swiftwater/flood SAR operations.

4.7 The AHJ will determine the evaluation process to assess the extent to which the requirements of this standard are met.

4.8 Because operations in the swiftwater/flood environment are inherently dangerous, and individuals involved are frequently required to perform rigorous activities in adverse conditions, regional and national safety standards should be included in agency policies and procedures.

4.9 Swiftwater/flood personnel should only perform activities in the swiftwater environment after a thorough risk assessment and appropriate risk mitigation efforts (e.g. use of personal protective equipment (PPE), restricting efforts to shore-based techniques, delaying a recovery until more favorable water conditions exist, etc.) have been performed, or at the very least, should follow the appropriate federal, state, tribal, provincial, and local safety standards as they apply to activities in swiftwater environments.

5. Initial SAR Response to Swiftwater/Flood Incidents

5.1 Determine scene safety.

5.2 Establish command.

5.2.1 The command structure of swiftwater/flood SAR operations must allow for a wide range of incident complexity, the potential for involvement of multiple jurisdictions, incidents that increase in scope and area, and the impact of NIMS incident types on resource requirements. See ASTM F1422 for information on utilizing ICS in a swiftwater/flood ICS.

5.2.2 *Command Personnel Qualifications:*

5.2.2.1 Those directly supervising swiftwater/flood SAR operations, or the personnel conducting such operations, must be qualified, at a minimum, at the level of Swiftwater/Flood Search and Rescue Technician (SWFT) appropriate for the environment and conditions.

5.2.2.2 Personnel that operate within 10 feet of the edge of swiftwater must have basic swiftwater rescue awareness training and be provided with a properly fitted personal flotation device (PFD).

5.3 Perform scene size up.

5.3.1 Determine incident Type (see X1.3 for examples of incident Types).

[6] Land Search and Rescue Addendum to the National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual, Version 1.0, November 2011, http://www.uscg.mil/hq/cg5/cg534/nsarc/Land_SAR_Addendum/Published_Land%20SAR%20Addendum%20%281118111%29%20-%20Bookmark.pdf

[7] Adapted from Land Search and Rescue Addendum to the National Search and Rescue Supplement to the International Aeronautical and Maritime Search and Rescue Manual, Version 1.0, November 2011, http://www.uscg.mil/hq/cg5/cg534/nsarc/Land_SAR_Addendum/Published_Land%20SAR%20Addendum%20%281118111%29%20-%20Bookmark.pdf

5.3.2 Determine the kind of response: search, rescue, or recovery.

5.4 Develop rescue plan.

5.4.1 Prior to initiating swiftwater/flood SAR operations, a contingency rescue plan shall be prepared and briefed to all personnel.

5.4.2 The contingency rescue plan shall state the actions to be taken by all personnel in the event an accident occurs during SAR operations.

5.4.3 The contingency rescue plan shall include provision for the control or rescue of animals.

5.5 Assess risk level of SAR operations.

5.6 Institute personnel accountability program at scene.

5.7 Establish operations communications protocols.

5.7.1 Swiftwater/flood SAR operations shall employ visual and auditory commands.

5.7.1.1 Commonly used visual commands are provided in X1.1.

5.7.1.2 Commonly used auditory (whistle) commands are provided in X1.2.

5.7.2 Radio communication protocols shall be established, including designation of frequencies, for operational and administrative activities.

5.7.3 Backup communications methods and/or protocols shall be established before operations begin.

5.8 Designate a Rescue Group Leader for each swiftwater/flood SAR operation.

5.8.1 The Rescue Group Leader shall be a qualified supervisor with adequate knowledge of swiftwater/flood rescue procedures and safety.

5.8.2 The Rescue Group Leader shall, whenever possible, be positioned such that he or she is in plain sight of any rescuers operating in the water.

5.9 The Incident Commander (IC) shall designate one person to be the Safety Officer.

5.9.1 The Safety Officer shall be properly trained for the operation. The Safety Officer shall be responsible for overseeing the safety of the entire operation, and shall answer directly to the IC.

5.9.1.1 For SAR operations occurring over a large area, the Safety Officer shall assign responsibility for local operational safety to other individuals. Designated local Safety Officers shall answer directly to the Safety Officer.

5.9.2 The Safety Officer shall be responsible for identifying zones and/or areas of operation:

5.9.2.1 *Red (or Hot) Zone*—Any area in the water, or any area where personnel *will* enter the water should they fall. All personnel in the Red Zone must wear PPE.

5.9.2.2 *Orange (or Warm) Zone*—Any area where personnel *may* enter the water should they fall. The Orange Zone includes the immediate vicinity around rescue rigging. All personnel in the Orange Zone must wear PPE.

5.9.2.3 *Green (or Cold) Zone*—All areas not in Red or Orange Zones. For personnel in the Green Zone, PPE shall be optional.

5.9.3 The Safety Officer shall be responsible for assessing hazards.

5.9.3.1 Inform command of hazard(s).

5.9.3.2 Secure hazard(s), if possible.

5.10 Begin initial response with resources on scene.

5.10.1 If subject(s) location(s) are not known, begin investigation and search effort, else;

5.10.2 If subject(s) are visible, assign an individual to communicate with each victim and maintain visual contact, else;

5.10.3 If subject(s) are submerged, evaluate risks and benefits of rescue attempt and, if needed, request dive assets.

5.11 Develop an alternative response plan.

5.11.1 All affected personnel shall be briefed about the plan.

5.11.2 Additional resources, as needed, should be requested for deployment or placed on stand-by.

5.12 Establish staging area, if needed.

5.12.1 An area for staging personnel and equipment for swiftwater/flood SAR operations shall be selected, and its location briefed to all personnel.

5.12.2 A Staging Manager shall be designated. He or she shall oversee the location where resources, teams, and equipment are assembled.

5.13 Establish subject landing area.

5.13.1 A landing area for rescued subject(s) shall be designated and its location briefed to all personnel.

5.13.2 Emergency Medical Services (EMS) support shall be provided at the subject landing area.

6. Swiftwater/Flood Rescue Operations

6.1 *Swiftwater/Flood Rescue Operation Styles:*

6.1.1 Five location-based styles of swiftwater/flood rescue operations shall be employed in Swiftwater/Flood SAR Operations: shore-based, boat-assisted, boat-based, in-water contact, and helicopter-based.

6.1.2 The Rescue Group Leader shall employ one of these rescue styles after considering weather and environmental concerns and the following factors:

6.1.2.1 The number of personnel available;

6.1.2.2 The qualifications of the responding personnel;

6.1.2.3 The equipment available;

6.1.2.4 The physical condition of the victim;

6.1.2.5 The location of the victim (if known);

6.1.2.6 The current and short-term threats to the victim; and

6.1.2.7 The extent of risk for the rescuer(s).

6.2 *Basic Operational Personnel Qualification Requirements:*

6.2.1 All personnel entering the water during swiftwater/flood SAR operations shall be, at minimum, qualified at the SWFT level appropriate for the environmental conditions.

6.2.2 All personnel constructing and using rope rescue systems and rigging during swiftwater/flood SAR operations shall have rope rescue training as defined in ASTM F2752 Guide for Training for Level I Rope Rescuer (R1) Endorsement, or its equivalent.

6.2.2.1 Personnel performing location-based styles of swiftwater/flood rescue operations shall be proficient in techniques and possess qualifications, as determined by the AHJ.

6.2.3 Location-based styles of swiftwater/flood operations require the following personal and team equipment:

6.2.3.1 PPE: wet-suits, dry-suits, type-appropriate PFD, helmets designed for water rescue, knives, whistles, and lights.

6.2.3.2 Rescue Equipment: throwbags, ropes, carabineers, pulleys and various hardware, litters, boats, motors, harnesses, devices (slings, straps), and rescue boards.

6.2.3.3 Communications Equipment: whistles, radios, phones, and bullhorn.

6.3 *Shore-Based Swiftwater/Flood Rescue Operations:*

6.3.1 Each person performing shore-based swiftwater/flood rescue operations shall be, at minimum, qualified at the level of SWFT appropriate for the environment and conditions.

6.4 *Boat-Assisted Swiftwater/Flood Rescue Operations:*

6.4.1 All personnel entering the water during boat-assisted swiftwater/flood SAR operations shall be qualified at the level appropriate for the environment and conditions.

6.4.2 All personnel managing the rope systems during boat-assisted operations shall have, at minimum, a Level I Rope Rescuer (R1) Endorsement. See ASTM F2752.

6.5 *Boat-Based Swiftwater/Flood Rescue Operations:*

6.5.1 All personnel entering the water during boat-based swiftwater/flood SAR operations shall be, at minimum, qualified at the level of SWFT appropriate for the environment and conditions.

6.5.2 All boat operators shall have, at minimum, training in swiftwater/flood boat operations appropriate for the environment and conditions.

6.6 *In-Water Contact Swiftwater/Flood Rescue Operations:*

6.6.1 All personnel entering the water during in-water swiftwater/flood rescue operations shall be qualified, at minimum, at the level of SWFT appropriate for the environment and conditions.

6.7 *Helicopter-Based Swiftwater/Flood Rescue Operations:*

6.7.1 In addition to meeting the requirements of this guide, each person performing helicopter-based swiftwater/flood rescue shall be qualified as determined by the AHJ.

6.7.2 All personnel performing helicopter-based swiftwater/flood SAR operations shall be, at minimum, qualified at the level of SWFT appropriate for the environment and conditions.

7. Victim Assessment and Rescue

7.1 When the subject(s) of a swiftwater/flood rescue operation has been reached, the rescuer shall perform an immediate assessment of the victim's physical condition, basic medical condition, and, if applicable, the method of entrapment.

7.2 If possible, the rescuer shall free the victim immediately and move him or her to safety.

7.3 If not, additional resources shall be employed to free the victim.

7.4 Recovery of deceased subjects is important; however, recovery needs to be done in coordination with a thorough risk assessment to ensure responder safety at all times.

7.5 Rescued subject(s) shall be transported to the subject landing area.

7.6 Further medical aid shall be provided, as needed, by EMS support personnel.

8. Termination of Swiftwater/Flood SAR Operations

8.1 Upon completion of swiftwater/flood SAR operations, the Rescue Group Leader shall report to IC when they have accounted for all personnel.

8.1.1 Those who have performed in-water rescue operations shall be decontaminated, if necessary.

8.2 Upon completion of swiftwater/flood SAR operations, all equipment deployed shall be returned to the Staging Area for assessment.

8.2.1 Used supplies must be identified and listed for replenishment.

8.2.2 Used equipment must be cleaned and inspected for damage and wear.

8.2.3 Damaged or defective equipment shall be identified for repair or replacement.

8.2.4 Equipment ready for redeployment shall be repacked, as applicable.

8.3 When all swiftwater/flood SAR personnel and equipment are accounted for and removed from the area, a final inspection shall be performed to locate and remove any hazards, or hazardous materials, remaining from SAR operations.

8.4 Prior to departure, all swiftwater/flood SAR personnel shall be debriefed.

8.4.1 Debriefing records shall be retained for review of procedures and systems.

9. Keywords

9.1 flood; operations; rescue; search; swiftwater; water

APPENDIX

(Nonmandatory Information)

X1. OPERATIONAL SUGGESTIONS AND CONSIDERATIONS

X1.1 Hand Signals

X1.1.1 *Examples of Swiftwater Hand Signals:*

NOTE X1.1—All images and descriptions in X1.1 have been used with the permission of American Whitewater. These images and descriptions can be found here: http://www.americanwhitewater.org/content/Wiki/safety:start

X1.1.1.1 *Stop: Potential Hazard Ahead*—Wait for "all clear" signal before proceeding, or scout ahead. Form a horizontal bar with your outstretched arms. Those seeing the signal should pass it back to others in the party. (See **Fig. X1.1**.)

FIG. X1.1 Stop: Potential Hazard Ahead

X1.1.1.2 *Help/Emergency*—Assist the signaler as quickly as possible. Give three long blasts on a police whistle while waving a paddle, helmet or life vest over your head. If a whistle is not available, use the visual signal alone. A whistle is best carried on a lanyard attached to your life vest. (See **Fig. X1.2**)

FIG. X1.2 Help/Emergency

X1.1.1.3 *All Clear – Come Ahead*—(in the absence of other directions proceed down the center). Form a vertical bar with your paddle or one arm held high above your head. Paddle blade should be turned flat for maximum visibility. To signal direction or a preferred course through a rapid around obstruction, lower the previously vertical "all clear" by 45 degrees toward the side of the river with the preferred route. Never point toward the obstacle you wish to avoid. (See **Fig. X1.3**.)

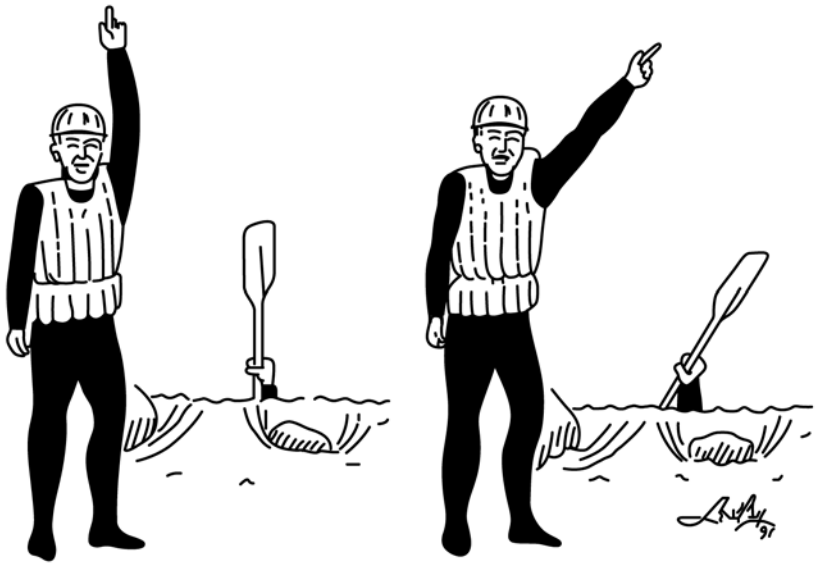

FIG. X1.3 All Clear – Come Ahead

X1.1.1.4 *I'm Okay*—I'm okay and not hurt. While holding the elbow outward toward the side, repeatedly pat the top of your head. (See **Fig. X1.4**)

FIG. X1.4 I'm Okay

X1.2 Whistle Commands

X1.2.1 *Examples of Whistle Command Signals:*

X1.2.1.1 *One Blast*—Stop or Attention, look at person blowing the whistle, if safe to do so.

X1.2.1.2 *Two Blasts*—Look up stream, or move up stream.

X1.2.1.3 *Three Blasts*—Look down stream, or move down stream.

X1.2.1.4 *Three Long Blasts, Repeated*—Emergency, danger, distress, or help needed.

X1.3 Resource Response Examples for Swiftwater/Flood Incidents

X1.3.1 These resource response examples are not intended to prescribe how, or how many, resources should or could be used during a swiftwater or flood incident.

X1.3.2 *Type 5 or 4 Incident Response:*

X1.3.2.1 A typical Type 5 or Type 4 incident is considered a single incident and resource response to a localized flooding event. A typical Type 5 or Type 4 incident consists of a squad, crew, and/or company. Personal protective equipment (PPE) consists of a Type III or Type V personal flotation device (PFD) and helmet as a minimum, and thermal protection, e.g. dry-suit/wet-suit, should be used as needed. Rescue techniques may include, but are not limited to talk, reach, and throw. Simple rope systems such as a stabilization line or the use of throw bags may be utilized. Some shallow water crossing techniques may also be utilized during these types of events. Water craft may be utilized as needed, e.g. a river rescue board or paddle craft or an inflatable raft. Additionally, swiftwater/flood response capabilities include water entry and boat-assisted or boat-based rescues. Agencies that chose to provide water entry and boat-assisted or boat-based rescue capability must ensure that they have a sufficient number of qualified personnel on scene to meet the demands of the incident. Incident management is self-contained and any back-up rescue system is designed and implemented based on event's requirements.

X1.3.2.2 *Example*—A fire department company with personnel equipped with PFD(s), helmets, and throw-bags who respond to a single incident within their normal response area.

X1.3.3 *Type 3 Incident Response:*

X1.3.3.1 A typical Type 3 response is considered to have a single incident/location response. Event conditions are more complex, may involve an area impacted by localized or wide area flooding, and may require more personnel, equipment, or resources. The Authority Having Jurisdiction (AHJ) should establish minimum team size and qualifications but should ensure that there are sufficient qualified personnel to meet the requirements of the incident. Teams should include a designated member to address Incident Command (IC), safety, and logistical requirements. Each team member needs to have a rescue belt equipped with Type V PFD, a helmet, and a throw-bag. Team members also need adequate thermal protection, e.g. dry-suit or wet-suit. Rescue techniques may include, but are not limited to, talk, reach, throw, boat, or water entry, with a probable increased use of the latter two techniques. More complex rope systems are likely utilized, e.g. high lines or other systems that require rope tensioning and/or raising and lowering systems. Water craft may be utilized as needed, including powered craft, e.g. inshore rescue boats. While incident management is facilitated by a designated on scene IC, that IC may be under the command or control of a larger incident management system. There should be a designated Safety Officer who designs, implements, and manages any back-up rescue system based on the requirements of the incident, including decontamination of personnel and equipment after the incident.

X1.3.3.2 *Example*—A mountain rescue team with members trained to the Type I qualification with a designated leader, Safety Officer, and Logistics Officer who have responded to an event inside or outside of their normal response area. The team is equipped with rescue PFD(s), helmets, and throw-bags. The team is also equipped with thermal protection and the required support equipment, e.g. ropes, hardware, paddle craft, and/or power boats.

X1.3.4 *Type 2 Incident Response:*

X1.3.4.1 A typical Type 2 response is considered to have multiple incident/location responses. The event conditions are more complex and may require more personnel, equipment, or resources and may involve multi-day operations. This type of response may be required due to localized flooding in a single urban area, with a response required due to population density or incident complexity. Just the same, this type of response may be required when the flood is affecting a wide area that includes urban, suburban, and rural populations. This team may be coordinating its activities with other teams or entities and is likely working from an Incident Action Plan (IAP). The response team should have the resources to support multiple incident sites or a single incident for 24 hours, and team members should possess the Swiftwater/Flood Search and Rescue Technician (SWFT) level appropriate for the environmental conditions. Designated members serving as the Task Force Leader (TFL)/IC, safety, logistics, communications, and medical leadership positions should be appropriately qualified. Each team member should have a rescue belt equipped Type V PFD, a helmet, and a throw-bag. Each team member should also be communications-equipped. Thermal protection, e.g. dry suit, will most likely be utilized. Rescue techniques employed may be varied and include the ability to: perform or facilitate tasks; talk, reach, and/or throw; perform boat-assisted or boat-based tasks; enter the water; and support helicopter operations. More complex rope systems are most likely utilized, such as high lines or other systems that require rope tensioning and/or raising and lowering systems. Water craft are utilized as needed and include powered craft, e.g. inshore rescue boats (such assets are designated as boat squads). While incident management will be facilitated by a designated on scene TFL/IC, that IC may be under the command or control of a larger incident management system. There should be a designated Safety Officer who designs, implements, and manages back-up rescue systems based on the requirements of the incident, including decontamination of personnel and equipment after the incident. This type of team may be operating from the identified FEMA swiftwater equipment cache for a Type I or Type II swiftwater or flood response team and should be able to self-sustain their operations for three to five days.

X1.3.4.2 *Example*—A pre-identified trained and equipped team that is designated and rostered to respond to these types of incidents. Team membership may come from one or multiple agencies.

X1.3.5 *Type 1 Incident Response:*

X1.3.5.1 A typical Type 1 response is considered to have multiple incident/location responses to a wide area flood. Event conditions are more complex and may require more personnel, equipment, or resources and may involve multi-day operations. The team may be coordinating its activities with other teams or entities and is more than likely working from an IAP and capable of sustaining day and night operations without interruption. Designated members serving as the TFL/IC, safety, logistics, communications, and medical leadership positions should be appropriately qualified. Each team member should have a rescue belt equipped Type V PFD, a helmet, and a throw-bag. Each team member should also be communications-equipped. Thermal protection, e.g. dry suit, will most likely be utilized. Rescue techniques employed may be varied and include the ability to: perform or facilitate tasks; talk, reach, and/or throw; perform boat-assisted or boat-based tasks; enter the water; and support helicopter operations. More complex rope systems are most likely utilized, such as high lines or other systems that require rope tensioning and/or raising and lowering systems.

X1.3.5.2 Water craft may be utilized as needed, including powered craft, e.g. inshore rescue boats (such assets are designated as boat squads). While on scene incident management will be facilitated by a designated on-scene TFL/IC that IC may be under the command or control of a larger incident management system. There should be a designated Safety Officer who designs, implements, and manages any back-up rescue system based on the requirements of the incident, including decontamination of personnel and equipment after the incident. This type of team may be operating from the identified FEMA swiftwater equipment cache for a Type I or Type II swiftwater or flood response team and should be able to self-sustain their operations for a three to five day period.

X1.3.5.3 *Example*—A pre-identified trained and equipped team that is designated and rostered to respond to these types of incidents. Team membership may come from one or multiple agencies.

X1.4 Additional ASTM Standard Resources

X1.4.1 *ASTM International Standards:*

F1730 Guide for Throwing a Water Rescue Throw Bag
F1739 Guide for Performance of a Water Rescuer Level I
F1823 Guide for Water Rescue Personal Flotation Device
F1824 Guide for Performance of a Water Rescuer Level II

X1.5 Additional Definitions

X1.5.1 *buoyancy aid*—a device, which is not U.S. Coast Guard (USCG) approved, suitable for use by one person to stay afloat in a water emergency. A buoyancy aid may be a rescue tube or can.

X1.5.2 *downstream*—the direction of flow in a watercourse.

X1.5.3 *far shore*—the side of the watercourse opposite the Near Shore.

X1.5.4 *wide area flood event*—any flood event by which local jurisdiction resources may be fully utilized and/or exhausted and by which mutual aid or specialized flood response teams/resources are needed and/or required. This includes flood events with extensive flood rescue operations that are simultaneously occurring in, or impacting, more than one jurisdictional area.

X1.5.5 *localized flood event*—any flood event by which local jurisdiction resources can respond and conduct respective operations without the need of non-typical mutual aid or outside of jurisdiction resources. While these events may have simultaneous rescue operations during the course of such, the event and responses are typically within one jurisdiction.

X1.5.6 *jurisdictional linked flood event*—any flood event by which local jurisdictions have pre-identified and assembled a joint management and response system that is activated during the event. These types of events are typically found in urban areas and where rivers, streams, washes, canals, arroyos, or storm-water management systems, including flood control channels, pass from one jurisdiction to another in a limited but well-defined area.

X1.5.7 *flash flood*—a sudden localized or wide area flood event of great volume and short duration typically caused by unusually heavy rain affecting a defined geographical and/or topographical area. A flash flood often features high velocity attributes and can carry large loads of mud, rock, and man-made debris.

X1.5.8 *fluvial flooding*—flooding occurs in the floodplain or water shed of a defined water course (stream, creek, or river) when the capacity of the course is exceeded by rainfall or snow/ice melts in the upstream catchment areas.

X1.5.9 *pluvial flooding*—surface water flooding that is caused by rainwater runoff typically found or occurring in urban areas or areas that possess land with low water absorbency.

X1.5.10 *tidal flooding/storm surge*—flooding as a result of abnormally high tides, strong winds, or significant low-pressure fronts thus causing sea levels to rise above normal levels.

X1.5.11 *rescue basket, also litter or stretcher*—a secure and protected conveyance for the sick or injured victim that is intended for lifting an individual from the ground or water in a safe and secure manner.

X1.5.12 *Rescue Boats and Types:*

X1.5.12.1 *inflatable boat*—a lightweight vessel with a flexible lower hull, a rigid transom, and sides and bow made of flexible tubes containing pressurized gas (usually air).

X1.5.12.2 *rigid hull boat*—a vessel with an inflexible hull and no inflatable components.

X1.5.12.3 *rigid hull inflatable boat (RHIB)/rigid buoyant boats (RBB)*—a vessel with an inflexible lower hull, whose topsides are made of flexible tubes containing pressurized gas (usually air) or a foam-filled collar.

X1.5.13 *Rescue Devices:*

X1.5.13.1 *longboard*—an extra-long surfboard or paddleboard.[8]

X1.5.13.2 *boogie board*—a short, lightweight surfboard often ridden by rescue personnel lying prone; also called bodyboard.[9]

X1.5.14 *rescue hoist*—a mechanical lifting device, which is certified for, and capable of, lowering and raising a human load.[10]

X1.5.15 *river left*—the direction to the left, when facing downstream on a watercourse.

X1.5.16 *river right*—the direction to the right, when facing downstream on a watercourse.

X1.5.17 *short-haul*—to transport one or more persons suspended on a fixed line beneath a helicopter.[11]

X1.5.18 *throw bag*—a length of rope that is stored in a throwable container. The floating rope should be able to withstand a minimum load of 1,000 lb. before breaking. When using a throw bag for water rescue, the life safety line should be the appropriate tensile strength as determined by the AJH.

X1.5.19 *throw coil*—a length of rope that is coiled in a ready state and thus requires no container. The floating rope should be able to withstand a minimum load of 1,000 lb. before breaking. When using a throw bag for water rescue, the life safety line should be the appropriate tensile strength as determined by the AJH.

X1.5.20 *trail line/tag line*—a cord or lightweight rope manipulated from the ground, which is used to guide and control a load hoisted or raised from above.

X1.5.21 *upstream*—the direction opposite to downstream in a watercourse.

[8] Definition adapted from http://dictionary.reference.com/browse/longboard?s=t Accessed February 7, 2013

[9] http://dictionary.reference.com/browse/Boogie+Board Accessed February 7, 2013

[10] Emergency Helicopter Extraction Source List – 2012, http://www.fs.fed.us/fire/aviation/av_library/Revision%205-EHE%20Source%20List%20(01-12).pdf.

[11] Emergency Helicopter Extraction Source List – 2012, http://www.fs.fed.us/fire/aviation/av_library/Revision_6_EHE_Source_List(03-12).pdf.