



Burlington Fire Department



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Section: 04 - Special Operations	
SOG Number: 04.15	Effective Date: 10.6.2017
Subject: Rope Rescue	
By Order of Fire Chief Steven A. Locke	

I. Purpose:

To address operations at incidents requiring the rescue or recovery of individuals from hazardous areas with limited access by means of rope rescue systems. Rope rescue operations are a high-risk undertaking that places both victim(s) and rescuers in jeopardy. Therefore, when a decision has been made to perform a rope rescue, qualified personnel shall perform it.

II. Scope:

This guideline provides operational guidance for the safe and effective use of Burlington Fire Department (BFD) personnel and equipment at incidents that involve rope rescue operations. This guideline is used in conjunction with NFPA 1006, 1670, and 1983. Because of the infinite number of potential sites and scenarios that could be encountered, these guidelines will not define a specific procedure to use, but will give guidelines to follow for conducting safe and effective operations.

III. Definitions:

Rope Rescue – Any rescue attempt requiring rope and related equipment to safely gain access to, and remove patients from hazardous geographic areas with limited access including, but not limited to; steep embankments, cliffs, high rise buildings, above or below grade structures. Rope rescues can be divided into two general categories; Low Angle and High Angle.

Low Angle – Often defined as “less than vertical”. The load is partially supported by the rope. Falls or system failure would not likely result in serious injury or death. Example: Class 1, 2, and 3 terrain.

High Angle – Refers to an environment in which the load is predominantly supported by the rope rescue system. Falls would likely result in serious injury or death. Example: Class 4 and 5 terrain.

Mountain Terrain Assessment System (Class 1-5) – Classifies terrain from easiest with the least hazards to most difficult with the most hazards. The terrain is defined as follows:

- Class 1: hiking, little to no risk or consequence of a fall
- Class 2: simple scrambling with occasional use of hands, little risk with minimal consequences
- Class 3: scrambling, with regular use of hands, moderate risk with moderate consequences
- Class 4: simple climbing with some exposure, dependency on use of hands, high risk with severe consequences
- Class 5: climbing requires use of rope, falls could prove fatal

Rescue Load – the combined weight of a rescuer, victim and all associated rigging.

Single Person Load – the weight of a single person, be it rescuer or patient.

TTRRS – An acronym for Two-Tensioned Rope Rescue System

CMC Clutch – a device manufactured by CMC Rescue, utilized by the Burlington Fire Department for rope rescue, which has been UL Classified to NFPA 1983 Standard as a general use pulley, general use descent control device, and general use belay device.

Autoblock – a friction hitch that is wrapped around a host rope and often used to back up the brake hand on a rappel. Examples of specific auto-blocs include the prusik hitch and guide’s rappel back-up (GRB).

IV. Guidelines:

A). PERSONNEL POLICY

1. No person shall engage in rope rescue operations unless they currently meet the requirements of NFPA 1670.
2. No personnel are permitted to operate at a level above which they have been trained.

B). GENERAL GUIDELINES

1. Factors to consider during a risk/benefit analysis include but are not limited to; slope angle, exposure to hazards above or below, surface conditions (snow, rock, ice, mud, wet grass, etc.), footwear, appropriate manpower, rescue vs. recovery.
2. All personnel shall report and work through the Incident Command System.
3. The Incident Commander shall assign a qualified Rescue Technician to serve as the Rescue Group Supervisor. The Rescue Group Supervisor will make position assignments in accordance with the BFD Guidelines as required by the needs of the incident. The following assignments listed below should be filled by Rescue Technicians:
 - a. Rescue Group Supervisor – Coordinates rescue operations and the associated activities within the rescue area. This individual serves as on-site competent person and reports to the Incident Commander.
 - b. Safety Officer – Responsible for monitoring safety at the rope rescue site and shall report to the Rescue Group Supervisor.
 - c. Rig Master – Responsible for planning and directing technical rigging operations and shall report to the Rescue Group Supervisor.
 - d. Edge / Entry Team Leader – Responsible for controlling access to the hazard zone and shall Supervise Entry Team and Edge personnel. Reports to the Rescue Group Supervisor.
4. The following zones will be established for rope rescue operations:
 - a. Hot Zone – The hot zone is defined as the area within six feet of the working area with an established perimeter between the hot and warm zone.
 - b. Warm Zone – The warm zone is defined as the area outside of the Hot Zone where operational tasks are conducted.
 - c. Cold Zone – The cold zone is defined as any area outside of the Hot and Warm Zone where support personnel and equipment may be staged.
5. Low angle incidents are defined as “less than vertical” where a serious injury or death will not occur if the system fails. Example: Class I, II, and III terrain. In general, these incidents may be handled by operations level personnel.
6. High angle incidents are defined as situations where rope or system failure would result in serious falls and injuries to rescuers. Only Technician Level Personnel shall conduct high angle and vertical rescue operations. Example: Class IV & V terrain.
7. All rope rescue systems shall be safety checked prior to use.
8. Personnel having operations level training in low angle rappelling and lowering operations may attempt to gain access to victims using a single rope system in low angle situations in order to treat and stabilize an injured victim. Example: Class III terrain.

9. Personnel should use appropriate verbal commands and minimize all unnecessary communications during rope rescue operations.
10. Helmets will be worn at all times in the working area. Gloves will be worn when handling moving rope.
11. All rescue rope carried on in-service apparatus shall be inspected after each use and at a minimum of every 6 months. After inspection, the rope use / inspection shall be logged in the rope history card which is kept with the rope. NFPA 1983 (current edition) shall be used as a guide as to when to replace software. Rescue ropes should be retired from service after 10 years from date of manufacture, or per the manufacturer's recommendation, as long as it is properly marked and records kept on its use. Each rope will be labeled with a number corresponding to a rope history card. Rope ID labels will be attached to both ends of the rescue rope. Regardless of age, any rope that is damaged, shock loaded, or exposed to caustic chemicals shall be taken out of service and referred to the departments rescue equipment manager for evaluation.

C). OPERATIONAL GUIDELINES

1. First Arriving Units
 - a. Establish Command
 - b. Size Up
 - c. The first arriving units will attempt to gather the following incident information and report to the Incident Commander:
 - (1) rescue vs. recovery
 - (2) number and location of victim(s).
 - (3) if the victim is suspended/hanging or supported.
 - (4) if the patient(s) is injured.
 - (5) if the victim can be reached by means other than a rope rescue system.
 - (6) if the victim can self-rescue.
 - (7) identification and control of witnesses, if present.
 - d. Request the appropriate technical rescue response through dispatch if the information gathered indicates that a rope rescue is the appropriate rescue method. Establish a staging area for incoming resources.
 - e. Isolate the scene to minimize further danger to victim, bystanders, and emergency personnel. Only essential personnel should be allowed in the working area.
2. Site Safety
 - a. Provide rescue site security.
 - b. PPE: Helmets and appropriate footwear will be worn at all times in the working area. Gloves will be worn when handling moving rope.

- c. A travel limiting device will be used when personnel are 6' or less from the edge. The Rescue Group Supervisor (RGS) may change this distance as the situation dictates. The device should be attached to a harness.

D). RESCUE AREA OPERATIONS

1. OPERATIONS LEVEL PERSONNEL

- a. In low angle situations (class 2, 3, and some class 4 terrain) operations level personnel may:
 - (1) Access victim using single rope technique where appropriate following a risk/benefit analysis.
 - (2) Package patient in a stokes litter.
 - (3) Serve as litter / edge attendants to assist with patient movement.
 - (4) Assist rescue technicians within the scope of their training.
- b. In high angle rescue situations, operations level personnel may:
 - (1) Establish two rope system anchor points for main line and belay lines.
 - (2) Attempt to get a rope to the victim.
 - (3) Assist rescue technicians within the scope of their training.

2. TECHNICIAN LEVEL PERSONNEL

- a. Personnel should report to and work through the Incident Commander. The IC will send responding Rescue Technicians to report to the RGS. All stages of the rescue operations shall be communicated to the Incident Commander for coordination and logging of time.
- b. Conduct size-up, if not already completed.
- c. All victims (in high angle scenarios) will be on two separate rescue rope systems whenever possible.
- d. All victim transport systems (i.e. stokes basket, patient extrication devices, class II or III harnesses etc.) will be securely attached to the victims. When moved through a hazardous area where there is risk of injury by a fall, the victim will be attached to a belay or braking system.
- e. Ropes should be protected against chafing and abrasion.
- f. Two-rope systems should be utilized except when the delay in securing and manning a second rope will likely create a negative outcome for the victim. In this case, a rappel- based system may be used when done in conjunction with a secondary braking system (guides rappel back-up [GRB]) on the rescuer's rope.
- g. When a two-rope system is used, a Two-Tensioned Rope Rescue System (TTRRS) using the CMC Clutch is the preferred method. In lieu, of the CMC Clutch, a CMC MPD may be utilized. When either of these devices are unavailable or when rope diameter dictates a different device, a traditional main and belay system will be used.

- h. When a two-rope system is used with a tandem prusik belay, 100% of the load will be on the mainline, and the belay line acts as a non-tensioned safety line (preferably with a pre-tensioner).
- i. A Rescue Technician will supervise packaging and will be responsible for litter tending and safely transporting the victim out of the hazard zone.
- j. Belaying of single person loads on a lower may be done as follows: munter hitch, tandem prusik, or a BFD approved commercial belay device. The munter hitch is the preferred method as it is simple and can be quickly added or removed from the rope. An XL carabiner must be used with 12.5 mm rope.
- k. Single person rappels may be belayed as follows: munter hitch, or tandem prusiks. It is acceptable to self-belay with a GRB (autoblock or prusik autoblock is the preferred method).
- l. All belay lines will use a direct tie-in connection and will go through the front upper chest connection on their Class III harness.
 - (1) Except when entering a Confined Space or for Water Ops. In these instances, a carabiner will be used to attach the belay line to the harness or extraction device.
- m. Rescue load (2 person) lowering systems will be belayed as follows when a Two- Tensioned Rope Rescue System is not being utilized: Tandem prusiks (8mm on 12.5mm rope, 7mm on 11mm rope), preferably with a pre-tensioner.
- n. Rappel pick-offs will be performed using a BFD approved G rated rescue device. Rappel pick-offs will be belayed as a two-person load unless the victim has a separate belay.
- o. Two-person load lowering systems will be lowered using a BFD approved G rated Descent Control Device (DCD). The CMC Clutch, CMC MPD, 6 bar brake racks with a hyper bar and 4 bar brake racks with dual hyper bars are BFD approved devices.
- p. Mechanical advantage systems will use soft interface rope grabs (prusik loops) or BFD approved device. Frozen or muddy rope may require the use of mechanical rope grabs.
- q. A stokes basket and one litter attendant may be lowered on a single rope if the terrain meets low angle guidelines; the basket is empty, and a DCD is used. Example: Class III terrain.
- r. If rigging a stokes basket in a vertical configuration the upper litter spider shall have two individual bites going from the litter to the main litter attachment point (steel rigging ring).
- s. Rescue rope lines should attach to the main litter attachment point (steel ring) in the following configuration:
 - (1) Attended Litter / TTRRS
 - (a) Rope 1 – Long tail bowline

- (b) Rope 2 – Bowline w/backup knot
- (2) Attended Litter / Main & Belay
 - (a) Main – Long tail bowline
 - (b) Belay – Bowline w/backup knot
- (3) Unattended Litter / TTRRS
 - (a) Rope 1 – Bowline w/backup knot
 - (b) Rope 2 – Bowline w/backup knot
- (4) Unattended Litter / Main & Belay
 - (a) Main – Bowline w/backup knot
 - (b) Belay – Figure-8 follow through
- t. When litter attendants are attached to the litter, a belay line must be used on the litter.
- u. In Class V (vertical terrain) litter attendants will have two points of attachment. No more than 2 attendants will be used.
- v. In Class IV (less then vertical terrain) litter attendants must have two points of attachment to the system. An adjustable stretcher strap and a AZTEK kit or similar is the preferred method.

E). ROPE RESCUE COMMANDS

Command – TTRRS	Explanation
<i>On rope!</i>	Rescuer informing MPD operators that he or she is now tied into both ropes.
<i>Ready on "red"?</i>	Leader asking if MPD operator on "red" rope is ready to lower.
<i>Ready on "red"!</i>	MPD operator on "red" rope is ready to lower.
<i>Prepare to lower (or haul)!</i>	Leader to MPD operators indicating that they should prepare to lower (or haul). (i.e. unlock the parking brake, and if lowering, use the release handle to disengage moveable brake.)
<i>Down slow!</i>	Leader to MPD operators to lower slowly.
<i>Down fast!</i>	Leader to MPD operators to lower quickly.

<i>Haul team ready?</i>	Leader asking if haul team is ready.
<i>Haul team ready!</i>	Haul team confirming ready to haul.
<i>Haul slow!</i>	Leader to haul team to haul slowly.
Command - Traditional Lower	Explanation
<i>Ready on the main?</i>	Leader asking if main line operator is ready.
<i>Ready on the main!</i>	Main line operator is ready.
<i>Ready on the belay?</i>	Leader asking if belay operator is ready.
<i>Down slow!</i>	Leader to main line operator to lower slowly.
<i>Down fast!</i>	Leader to main line operator to lower quickly.
<i>Slack on main!</i>	Leader to main line operator to increase slack on main line.
<i>Slack on belay!</i>	Leader to belay line operator to increase slack in belay line.
<i>Tension on Main!</i>	Leader to main line operator to increase tension in main line.
<i>Tension on Belay!</i>	Leader to belay line operator to increase tension in belay.
<i>Stop!</i>	Everything stops; all team members stop, hold position and await further instruction.
<i>Rock!</i>	Called any time anything falls or is dropped.
Command – Traditional Haul System	Explanation
<i>Ready on the belay?</i>	Leader asking of belay operator is ready.
<i>Ready on the belay!</i>	Belay operator is confirming ready.
<i>Haul team ready?</i>	Leader asking if haul team is ready.
<i>Haul team ready!</i>	Haul team confirming ready to haul.
<i>Haul!</i>	Leader directing haul team to pull.
<i>Set!</i>	Leader is telling haul team to set progress capture prusik.
<i>Set!</i>	Team member confirming the haul progress capture is set.
<i>Slack!</i>	Leader is telling haul team to slack haul line.
<i>Reset!</i>	Leader is telling haul team to reset the MA system.
Command – Rappelling	Explanation

<i>On Belay!</i>	Rescuer informing belay operator that he/she is now attached to the belay.
<i>Belay on!</i>	Belay operator confirming with the rescuer that the belay system is ready.
<i>On Rappel!</i>	Rescuer informing the belay operator that he is attached to the mainline and prepared to rappel.
<i>Rappel away!</i>	Belay operator confirming the belay is ready and the rescuer can begin his/her descent.
<i>Locking off!</i>	Rescuer informing belay operator that he/she is locking off the descent control device.
<i>Unlocking!</i>	Rescuer informing belay operator that he/she is unlocking the descent control device.

F). TERMINATION

1. Rehab personnel as needed through the incident.
2. Stage, clean and inventory all equipment.
3. Inspect and log rope usage on rope history cards.
4. Consider debriefing.

V. Responsibility:

It is the responsibility of all members to read, understand and follow this Standard Operating Guideline

Revision History			
Revision Date	Section	Summary	Principal Author
10.6.2017	All	Complete update of Rope Rescue SOG 07.1 released on 10.21.2008	S. Petit & M. Speier -(Colchester Technical Rescue)
03.24.2022	All	Updated to reflect use of CMC Clutch	S. Petit

ROPE RESCUE GROUP SUPERVISOR OPERATIONAL CHECKLIST

DATE _____ TIME _____

_____ Assign Rescue Group incident management positions as needed

Rescue Group Supervisor:		Tech Rescue Safety Officer:	
Rig Master:		Edge/ Entry Team Leader:	
Main:	Belay:	Rigging:	
Edge:	Entry 1:	Entry 2:	

- _____ Perform a risk assessment
- _____ Determine whether operation will be a rescue or recovery
- _____ Confirm a S.O.R.T. response with minimum of 6 Techs
- _____ Establish operational control zones (Hot, Warm, and Cold)
- _____ TR Safety Assigned
- _____ Determine terrain type (Class 1, 2, 3, 4, 5)
- _____ Safety check all systems prior to use
- _____ Gain access to patient
- _____ Establish communications
- _____ Implement the tactical action plan
- _____ Provide updates to the Incident Commander
- _____ Re-evaluate the tactical plan to verify the plan is effective
- _____ Rehab personnel as needed
- _____ Provide EMS as needed