	Cincinnati Fire Department Fire Training Supplement DRILL BOOK	SECTION #1 Ladder Company Operations
Date: January 2006	**TOPIC TITLE:**	Total # of Pages: 6
Section #: 4	Stokes Basket Rescue	Topic #: 2

TOPIC #2 STOKES BASKET RESCUE

EQUIPMENT NEEDED

- 1 - Stokes basket with body straps, webbing, and lifting harness.
- 2 - Blankets
- ½" - Diameter 200 foot Lifeline, Blue
- 1 - Rappelling rack
- 3 - Steel locking carabineers
- 4 - Loops of 1 inch tubular webbing
- 2 - Prusik cords different lengths.
- 2 - Ladder pipe control ropes
- 1 - E-One pulley system for tip of ladder.
- 2 - Ladder pipe control ropes

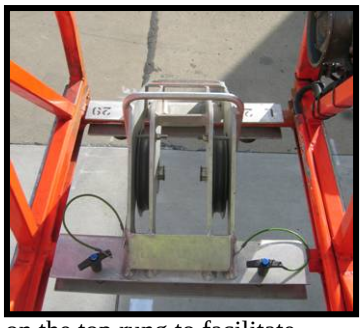
INSTALL PULLEY

Equipment needed

- E-One pulley system

The E-One pulley system supplied with the E-One ladder trucks is the only pulley system that should be used for rope rescue operations involving stokes baskets. This pulley system has been designed for the rung spacing and rated for victim loads. There are two sides to the pulley system with one marked for **UTILITY** and one for **RESCUE**; during this evolution only the "**RESCUE**" side of the pulley system will be utilized.

> **Note:** the utility side of the pulley system is used for non-life saving events or for any rope that is not "life safety". (Dirt, glass and or other foreign objects could get imbedded in the utility sheave and damage a life safety rope if it were to be used on this side of the pulley system.)



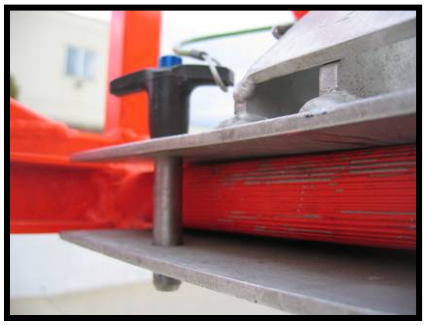
The E-One pulley system has three main parts used for mounting on the ladder.

- The handle located between the two pulleys
- The hook or top of the mounting plate
- The "U" channel or bottom of the mounting plate.

The pulley system is installed by first removing the two pins from the "U" channel located on the bottom edge of the mounting plate.

> **Note**: The pulley system may be mounted in any location on the E-One ladder. It is recommended that the pulley system be mounted on the top rung to facilitate threading the rope through the rungs and to allow for maximum reach.

Grasp the pulley system by the handle and slide the mounting plate over the top rung allowing the hook of the mounting plate to engage the top rung and at the same time the "U" channel of the mounting plate to engage the second rung. When both hook and "U" are engaged correctly, the holes for the mounting pins should be accessible in the area of the mounting plate located just past the second rung, engage the pins to lock in the pulley system and prevent it from falling off the ladder.



INSTALLING THE ROPE

Equipment needed

- 200 foot, ½ inch, Life Safety Rope, Blue
- 1 - steel locking carabineer

The bag of "Life safety rope" should be in the area where the pulley is installed. First locate the "RESCUE" side of the pulley system and feed the rope over the top of the pulley and down between the rungs. Tie a figure 8 knot with an overhand safety into the working end of the rope to keep it from being pulled back through the pulley as you carry the rope bag to the base of the aerial. One carabineer should be clipped into the loop in the figure 8 knot and then attached to the metal ring on the stokes basket lifting harness.

ATTACHING THE LOWERING SYSTEM

Equipment needed

- 4 - one inch tubular webbing straps tied, with a water knot, into loops of the same length
- 2 - steel locking carabineers
- 1 - rack
- 2 - prusik cords of different lengths
- 2 - ladder pipe control ropes

Anchor Point

An anchor point will be created on the E-One aerial by first wrapping 2 of the 1 inch tubular webbing loops (of the same length) around the bottom rung of the ladder, then bringing them back together so a carabineer can be attached. At the point where the carabineer attaches there should be four pieces of webbing on which to clip the carabineer. Do not allow the webbing to cross over or loop through itself forming a girth hitch. Attach the carabineer to keep the anchor system in place.

Prusik

A set of Prusiks will be installed in the lowering system as a safety in the event there is a problem with the operation of the rack and the victim starts to fall. Prusiks are a type of automatic safety system designed to take over and stop the rope from moving if the lowering operation becomes out of control. When lowering the basket one rescuer must control or "ride" the prusik to keep them from locking up. The prusik safety system is in place in the event of an emergency or the rack/rope system gets out of control and can't be stopped by the rescuer operating the rack. To install the prusik system, attach the shorter prusik to the life line first then the longer prusik should be attached above the first (closer to the pulley).

Note: It's very important to wrap and keep the prusik tight around the life safety rope when attaching and operating. A prusik operates by friction on the rope, if it is allowed to loosen it will not be effective in an emergency.

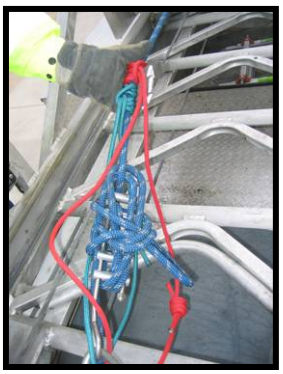
Rack

The rack shall be attached to the rope below the prusik using all 6 bars, hard locked with a wrap and an overhand knot.

Attaching rack and prusik to the anchor

The rack and prusik should be attached to the anchor system in the following order.

- The short prusik should be placed in the carabineer first sliding to the spine side of the carabineer
- Attach the rack
- The long prusik
- lock the carabineer gate.



Rope lifting system

When the rack and pulley system is loaded, the rack is pulled tight against the aerial and becomes difficult to operate.. A system has been designed that would allow the rope to be lifted off the rungs permitting the rack to be operated easier. At a point 3 rungs from the top of the rack / prussic system, wrap the top rail of the beam on each side of the ladder with a loop of webbing in a girth hitch. These loops should be long enough to meet in the middle of the ladder but not too long as to hang down and touch the ladder. Attach these two loops together with a carabineer then bring the life safety rope up and clip it into the carabineer as well. This process will lift the Life Safety rope and the rack / prussic system up off the rungs and allowing easier operation of the rack system.

Ladder pipe control ropes

Attach the ladder pipe control ropes to the head and foot end of the Stokes basket. These lines will have complete control of the basket as it is being lowered.

NOTE: A slight pull on the ground can cause an incredible swinging and jerking motion for the victim in the basket. The purpose of these ropes are to keep the basket from striking buildings, obstacles and to keep it from swinging and turning.

<u>OPERATION</u>

Overview/Plan

A stokes basket rescue is one of the most dangerous operations to perform regarding victim movement. Rescuers are taking the victim, strapping them down, attaching the victim to a rope extended from an aerial ladder and moving them through the air under rescuer control. If there is a mistake at any point in the system there could be a catastrophic failure resulting in the victim's death or serious injury. All stokes basket rescues should be planned in advance of the actual movement of the victim. Direction of travel, obstacles, wires and personnel location should be observed and coordinated before any movement is attempted. If at all possible the ladder should not be moved once the victim is loaded into the basket and attached to the life line. The victims movement to the ground should be managed by slowly releasing the rope with the rack.

Control firefighter / Safety

After the move is planned and before the operation begins the officer and the FAO should designate one person to direct all the movement of the ladder and the rope system, this person will be known as the "Control" person. Once this person is so designated the FAO and the person operating the rope lowering system will proceed with movement upon the direction of the "Control" person ONLY. As with any life safety operation, ANY PERSON on the scene can use the command of "STOP" if they see an unsafe or unplanned act that may injure the victim or any firefighter working on the scene. Remember all firefighters on the scene have a responsibility and a duty to STOP any unsafe act.

Loading the System

When the victim is loaded in the basket and placed on the rope system, ready to be lowered, the first thing that needs to happen is the removal of slack in the rope. When directed by the "control" person the FAO can extend or raise the ladder *slowly* and with *extreme* caution. There is no way for the FAO to feel if the rope system is experiencing stress or if the basket is caught on something and about to experience a failure. Aerial ladder hydraulics are very powerful and the forces are not transmitted back to the operator; this can allow great forces to build up in the system without the operator's knowledge.

The FAO should follow a few simple guidelines;

1. *The Officer, FAO and Control person should have a plan for the movement of the basket from victim location to ground.*
2. *Movement of the ladder should be kept to a minimum.*
3. *If movement of the ladder is required, it should be slow and controlled*

Lowering the stokes by the Rope system

Once the victim's weight is fully transferred to the ladder/rope system the victim should be lowered to the ground by the rope system instead of the hydraulic ladder system.
Lowering by rope requires four people to operate the system: one to operate the rack, one to control the prussic safety system and two to man the ladder pipe control ropes attached to the basket.

1. *Lock off the Ladder Hydraulic system*
2. The first rescuer should remove the "hard lock" on the rack while keeping the 6 bars close together and the rope from moving.
3. The second rescuer should control the two prusiks to prevent them from locking up on the rope.
4. Upon command of the control person the rescuer controlling the rack will allow the rope to slide through the rack. To assist in controlling the speed of the descent the rescuer can keep one hand on the rack and slide the bars up tight or down loose on the rack to increase or decrease the speed.

5. The second rescuer should "ride" or control the prusik system to keep it from grabbing or locking on the rope unless it's an emergency.
6. If for some reason the rack system starts moving to fast and can't be controlled the FF controlling the prusik system will need to release the prusik to allow them to grab the rope and lock the system up stopping the rope from moving.

Prusik system locking on rope.
In the event the prusik system becomes locked on the life safety rope because there was loss of control on the rack system or by accident. Follow these steps to unlock the prusik.

Accidental application of prusik

1. If the prusik system is activated by accident the knots usually don't set tight enough to prevent them from being easily released. Sometimes the prusik knots can be slid down the rope allowing the load to transfer back to the rack system and lowering can continue as before.
    a. Remove all the slack between the prusik and the rack making the rope as tight as possible between these two pieces. Hard lock the rack ending with an overhand knot.
    b. Attempt to pull the prusik down toward the rack by sliding your hand down the rope striking the top prusik driving it down releasing its grip on the rope. If this doesn't work go to (c.)
    c. Have one or two FF pull on the rope as it comes down from the pulley system just above the prusik this will allow the prusik to slack up. Attempt to pull the prusik down to get them to release.

If you are unable to get the prussic to release lower the basket following the instructions under "loss of Control".

Loss of control

1. Once the rope has stopped moving, the FF controlling the rack should gain control of the rope, insert all bars and hard lock the rack ending with an overhand knot.
2. The stokes basket can be lowered to the ground by retracting the ladder.

NOTE;

a. There was just an out of control situation with the life safety rope and rack system. The whole system, life safety rope, stokes basket, prusik system and rack has been shock loaded. In a shock load parts of the system can be stressed beyond their working limits and can sustain damage that is not visible to the naked eye.
b. The victim in the basket could have received additional injuries and should be evaluated as soon as possible.
c. The lowering of the basket by retracting the ladder is very dangerous and should be conducted in a very controlled manner. All parts of the system should be checked and the whole operation should be under the direction of the control person
d. All system components involved in a shock load situation must be inspected by one of the rescue companies.

During a stokes basket rescue the safety of the victim should be the highest priority. Every move should be planned, every connection checked and every safety precaution in place.