

20 Ladder Company Operations

20.1 Introduction

20.1.1 The Ladder Tower Truck may be used to effect rescue, entry, search and ventilation. It may also be used to stretch hose lines to upper floors or roof, bridge a gap, operate hose lines from the basket, master stream operations, and as an observation post to assess conditions. When its need is evident, upon arrival, its tower should be raised immediately. When its need is anticipated for later use, the tower shall be positioned and set up as described in this section. The chauffeur (driver) shall remain in the vicinity of the turntable until it is evident that the ladder tower will not be required.

20.1.2 Only members authorized by the Fire Chief or designated Line Officer are permitted to drive and/or operate the ladder tower truck. Members not authorized, may place the lives of fellow firefighters in jeopardy and possible cause damage to this apparatus. All members shall familiarize themselves with this guideline to ensure safe and efficient operation.

20.1.3 The Ladder Tower Truck will respond first to any commercial buildings unless otherwise specified by the IC. Furthermore if the engine is in service from the Church street firehouse, The Ladder Tower truck will respond first, unless otherwise specified by the IC.

20.2 Placement of the Ladder Tower

20.2.1 Generally, placement depends upon conditions encountered on arrival. The OIC should give specific instructions regarding the placement of apparatus and the operations to be performed. In the absence of an OIC, the truck officer must base his/her decision for placement of the ladder tower on the following conditions:

- A) What wall to work on - based on the life factor, is immediate rescue apparent.
- B) Fire conditions, location and extent of fire.
- C) Type of occupancy - time of day.
- D) Type of structure - height and area. (Remember height limitation of apparatus.)
- E) Street conditions - traffic encountered. Overhead wires,

trees, etc..

F) Location of engine companies and fire hydrants.

G) Condition and stability of structure.

H) Ground stability.

20.2.2 The officer of the Ladder Tower shall assist the driver in proper placement of the apparatus before carrying out his other assigned duties. This officer will not assist in set-up, unless exigent circumstances dictate such action.

20.2.3 Arriving first provides the choice of positions best suited for initial operations.

20.2.4 Arriving second requires positioning that will not block out other first alarm units. It may be necessary or advantageous to circle the block and come in from the opposite end of the street, if such action will improve the effective "scrub area." "Scrub area" is defined as that area of a building wall which can be touched by the basket.

20.2.5 Generally the apparatus should be parallel to the building.

20.2.6 Positioning at a corner building affords coverage on two fronts. This enables coverage over a much wider area, permitting greater access and observation points to check stability of building, etc.. Notice shall be taken of location of street lights, traffic signals and electric utility poles and wires. Placement of ladder tower shall be made to retain as much effective operating area of the basket as possible on both fronts of the building. (**See Figure 1**)

20.2.7 Positioning apparatus perpendicular to building will considerably reduce scrub area and should be avoided whenever possible. However, where the ground is of doubtful stability, such as vacant lots or other unpaved areas that may have hidden voids, and ground pads for stabilizers are deemed not substantial enough, it may be more advantageous to position apparatus perpendicular or nearly perpendicular to the fire building. This will tend to equalize pressure on stabilizers resulting from lateral movement of the ladder thereby reducing the possibility of the apparatus "pole vaulting" should the footing of a stabilizer collapse.

20.2.8 Regardless of initial placement, it must be realized that as conditions change, repositioning may be required and may be accomplished quickly and safely with proper training and planning.

20.2.9 During operations at one and two family private dwelling or any structure with an alleyway between the fire building and an exposure, place the tower ladder turntable in line with the alley affords frontal coverage and also coverage into the alley for exposure protections, extinguishment, rescue, ventilation, search and entry. (**See Figure 2**)

20.2.10 During operations at building fires, the OIC should be made aware of the accessibility of vacant lots, alleys or driveways adjacent to or to the rear of the fire building where placement of a ladder tower would facilitate operations.

20.2.11 The positioning of a ladder tower in the courtyard or rear lot of an "H" type building can be used to prevent the spread of fire across the throat of the building, extinguishment of fire on either or both sides of the throat, and depending on space available and positioning of apparatus, afford coverage of throat, rear and a considerable area of exposure B and D sides. The possibility of operating from an adjacent street over the top of the lower buildings into the throat, rear or side of the fire building should not be overlooked. (**See Figure 3**)

20.2.12 Elevated highways. Apparatus should be maneuvered so that it is parallel to the objective and the basket is in line with and close to the target area.

20.2.13 Overhead wires may interfere with ladder tower operations. OIC may need to have wires de-energized by the utility company involved when fire conditions warrant. This should only be done in extreme emergency and is not common practice when dealing with primary lines or high tension wires.

20.2.14 When trees obstruct operations, it is possible to extend or raise boom through light branches. However, retraction or lowering of the ladder through branches may present a problem and some cutting may be required.

20.3 General Features of the Ladder Tower

20.3.1 Turntable

20.3.1.1 The turntable is a rotating platform located at the rear of the truck to which the ladder is pinned.

It contains a control console and hydraulic components. It is the main junction via a common swivel for all hydraulic, water, and electrical (AC and DC) connections.

20.3.2 Stabilizer (out-rigger) Supports

20.3.2.1 The chassis is supported at six points while the tower is in operation, i.e., the two front tires of

the vehicle, and stabilizers forward the tandem rear axle and two stabilizers behind the tandem rear axle. All stabilizers have a direct frame attachment to bypass the apparatus suspension and provide a rigid operating base.

****NOTE: Before stabilizer jacks are lowered, the stabilizer metal ground pads will be placed under the vertical jacks. Handles, of the pads, will be facing up and in towards the apparatus.**

20.3.2.2 When the stabilizer vertical jacks are lowered for boom operation, hydraulic "holding" valves lock the

fluid in each cylinder, thus each cylinder becomes a rigid member to support the apparatus under all conditions of operation.

20.3.2.3 To eliminate any possibility of stabilizer vertical jack collapse brought about by loss of fluid from a cylinder, a mechanical lock (metal pin) is also provided at each stabilizer jack. These metal pins must be inserted manually.

20.3.2.4 All stabilizer vertical jacks must be lowered

until each reaches the end of its stroke. Exception:
If apparatus is not level, lower the jacks on the low side first, then the jacks on the high side until the apparatus is level as possible.

****NOTE: Raising the high side fully before raising the low side, or raising only one side when on level ground, can cause damage to the suspension system.**

20.3.2.5 When encountering streets that are narrow and lined with parked cars, the apparatus may have to be parked so that the stabilizer horizontal beams can be placed between parked cars. A "guide man" may be necessary to enable the driver to position the apparatus so that the stabilizers horizontal beams will clear parked cars or other obstructions. The "guide man" is to remain in position until the stabilizers are fully positioned on the operator's blind side.

20.3.2.6 Stabilizer horizontal beams can easily be placed between parked cars when necessary. Stabilizer jacks must be on firm ground and locked.

20.3.3 Ladder Assembly

20.3.3.1 The ladder assembly consists of three sections which telescope within each other. The main or lower section pinned to the turntable is referred to as the base section. The base section is the structure that the aerial lift cylinders are mounted to for raising and lowering the aerial. It also has cylinders for extension and retraction.

20.3.3.2 The center section or midsection contains cables and pulleys, wires, and lines to extend and retract the fly section. The hydraulic lines and electric cables are protected by a cable track.

20.3.3.3 The last section is referred to as the fly section. This section is extended and retracted by the use of cables attached to the section. The mid and fly move simultaneously. The electrical lines come from

the

cable track on the midsection through the lower rails of the fly section to the platform keeping wires protected throughout the aerial.

20.3.4 Basket

20.3.4.1 The basket has a rated payload of 1000 lbs.. (This payload changes due to wind conditions, whether or not the waterway is charged, and elevation. It is imperative for members to be aware of these payload changes for safety purposes.)

Located in the basket are a set of electric controls for operating the aerial. There is a two man preconnect for breathing air system with filter. The waterway has Two permanently mounted 2000 gpm monitors (one is an automatic and the other is a manual) and an 2" preconnect located at the front of the basket. Under the basket, on the waterway, is a shower nozzle and a 165 psi relief valve. There are receptacles for 110V AC lines in the basket. On the front there are two 12V DC 750 watt quartz Kwik-raze floodlights.

20.3.4.2 For basket controls, refer to pedestal controls, as controls and functions are identical.

20.3.5 Pedestal Controls - Turntable

20.3.5.1 Stability Indicator - indicates current stability conditions.

20.3.5.2 Water Flow Gauge - indicates gallons per minute (gpm) the basket nozzle discharges and total gallons used.

20.3.5.3 Breathing Air Gauge - indicates percent of remaining breathing air with low level warning.

20.3.5.4 Intercom System - the aerial has an intercom system on the control console at the turntable, the pump panel and in the basket. It has a volume control to adjust incoming transmissions. The console intercom

has a pre-to-talk switch, which must be used to transmit messages. The basket intercom is a constant line, which means all the operator has to do is talk to be heard at the turntable console and pump panel.

20.3.5.5 Nozzle Master Switch - provides power to all automatic nozzle controls. There is a red cover on this switch. The switch will remain in the "on" position until the cover is lifted and the switch turned "off".

20.3.5.6 Stream/Fog Switch - controls stream pattern of automatic nozzle, located at the front of the basket.

20.3.5.7 Stabilizer Not Extended Light - indicates any stabilizer beam that is not fully extended.

20.3.5.8 Rung Alignment Indicator light - is a green light which tells the operator that overlapping ladder sections have their rungs in alignment.

20.3.5.9 Extension Warning Light - indicates when aerial ladder sections are nearing full extensions.

20.3.5.10 Do Not Activate High Idle - engine high idle will not function if this light is not on.

20.3.5.11 Up/Down Nozzle Switch - controls vertical movement of automatic basket water monitor.

20.3.5.12 Left/Right Nozzle Switch - controls horizontal movement of automatic basket water monitor.

20.3.5.13 Tracking Light On/Off Switch - supplies power to the spot-lights at the front of the basket and the lower tracking lights.

20.3.5.14 Indicator Alarm Test Switch - momentarily activates all indicator lights and alarms.

20.3.5.15 Emergency Hydraulic Power Switch - activates auxiliary hydraulic system.

20.3.5.16 High Idle Switch - is the same as the switch located at the stabilizer station. When activated, it will take the engine to a preset RPM.

****NOTE: High idle will not activate unless all engine and transmission conditions are satisfied.**

20.3.5.17 System Pressure Gauge - reads system hydraulic pressure. The system standby pressure is 450 to 475 psi. Maximum system pressure is 3000 psi.

20.3.5.18 The functions of the three aerial controllers are from right to left:

Lower/Raise, Swing (Rotation), and Extend/Retract. Each has a locking mechanism in its handle to prevent accidental engagement.

****NOTE: The basket controls function the same as the turntable console controls.**

20.3.5.19 The aerial control red button switch energizes electric controls to operate the aerial when pulled up. This button is illuminated when power is "ON". Pushing this button switch down turns the power "OFF".

20.3.6 Override Controls

20.3.6.1 Aerial Manual Override Controls - All controllers can be overridden by manual controls in the console cabinet in case of electrical malfunction. They

function in the same direction of the panel controllers.

20.3.6.2 Aerial Manual Control Without System Electrical Power - Aerial hydraulic power can be obtained by pulling and holding the hydraulic aerial system emergency override knob on the control panel at the rear of the truck.

20.3.6.3 Emergency Hydraulic Power - When the main hydraulic pressure is lost, the EPU (Emergency Power Unit) will provide sufficient power to store both the aerial and stabilizers. You must engage desired control functions before turning the EPU switch "ON" and turn it "OFF" before disengaging control function.

****IMPORTANT: Do not run the EPU more than seven minutes without allowing thirty minutes for a cool-down between**

operating periods.

20.3.6.4 Stabilizer Extension Interlock Override -
When a stabilizer cannot be fully extended, you can raise the ladder out of the cradle by momentarily holding stabilizer interlock override switch up.

20.3.6.5 Stabilizer Manual Control without System Electrical Power - Stabilizer hydraulic power can be obtained by pulling and holding the hydraulic stabilizer system emergency override knob on the control panel at the rear of the truck.

20.3.7 Basket Leveling

20.3.7.1 Basket leveling is maintained with matched master/slave hydraulic cylinders. Master cylinders are located at the base of the ladder. They monitor ladder elevation changes and supply oil to the slave cylinders attached to the basket.

20.3.7.2 A secondary automatic leveling pump is provided on the turntable to make additional basket corrections when needed. Two switches are located in the turntable control console cabinet. One switch should be in the "automatic" position for normal operating. The manual position and up/down switch are for service.

20.3.7.3 A momentary switch is also provided in the chassis cab to activate the automatic leveling pump. This will allow the operator to level the basket while the ladder is in the bedded position.

20.4 Pre-driving and Positioning Procedures

20.4.1 Pre-driving checks before moving unit.

20.4.1.1 Basket level

20.4.1.2 Ladder stowed

20.4.1.3 Stabilizers stowed

20.4.2 Positioning the unit for operation.

20.4.2.1 Determine if the apparatus is to be used for water tower operation or as a rescue unit.

20.4.2.2 Take notice of ALL overhead obstructions.

20.4.2.3 Position apparatus for your best attack.

****NOTE: For positioning - a corner of a building gives access to two sides of the structure as well as the roof.**

20.4.2.4 The truck can be positioned pointing uphill or downhill, but each method has its advantages. In either condition, the truck must be capable of being leveled

to within safe operating limits as defined in aerial platform set up procedure.

20.4.2.5 Area around the truck must be clear for stabilizer extension. Full extension is required for 360 degree or even 180 degree over the rear for full basket and ladder load.

20.4.2.6 The area where the stabilizers make contact with the ground must be firm and capable of supporting 75 psi. Do not set up over manhole covers, storm drains, septic tanks or cesspools.

20.5 Aerial Platform Set-up, Operation, and Take Down

20.5.1 Aerial Platform Set-Up

- ⇒ Shift Transmission to Neutral.
- ⇒ Apply parking brake and front wheel lock.
- ⇒ Engage Aerial Master and Aerial PTO rocker switches.
- ⇒ Set wheel chocks in place on front wheels.
- ⇒ Place metal stabilizer pads on ground. Handles facing up and in towards the apparatus.
- ⇒ Place diverter valve switch in Stabilizer position.
- ⇒ Engage High Idle, for faster operation.
- ⇒ Fully extend stabilizer horizontal beams. Stabilizer Not Fully Extended indicator light must turn off. If

stabilizers cannot be fully extended on both sides of the truck, you must position the truck to fully extend the stabilizers on the side you will be working. When one side is not fully extended, this is referred to as Short Jacking.

****NOTE: To avoid re-leveling the truck, level low side of apparatus before the high side**

****DANGER: Horizontal beams must be to full extension for 360 degree rotation of the aerial unit. For operations over one side, the horizontal beams on that side must be fully extended. When the beams are not fully extended on the opposite side, the load is reduced from 1000 lbs.. to 850 lbs.., without flowing water. DO NOT take aerial over the centerline of chassis if horizontal beams on the other side are not at full extension. The unit will become unstable and may upset.**

- ⇒ Lower jacks until indicator lights come on. Level truck. Front tires must remain in contact with the ground.
- ⇒ Once jacks are in position, metal safety pins must be installed. Use the highest available hole.
- ⇒ Confirm front wheel chock position.
- ⇒ Disengage High Idle.
- ⇒ Place diverter switch in Aerial position - indicator light should be illuminated. If in short jack mode, to get the ladder out of the cradle, a firefighter must hold the Stabilizer Not Fully Extended switch while the operator raises the ladder out of the cradle.
- ⇒ Close stabilizer control doors. Proceed with aerial operation.

20.5.2 Aerial Operations

WARNING: The operator is responsible for knowing the condition of the aerial device before operating. This should include a quick visual scan of and not limited to pins, cables, cylinders, loose equipment, basket, etc..

- ⇒ An operator must be stationed at the turntable controls at all times during any aerial operation. This "primary" operator is responsible for observing all operations and warning or overriding any potentially dangerous condition or movement of a "secondary" tip operator.
- ⇒ Open the control console cover on the turntable.
- ⇒ Pull up on the "mushroom" switch to energize all electrical functions.
- ⇒ Activate the alarm/indicator test switch for a pre-

operation check.

- ⇒ Turn on switches as required for lighting.
- ⇒ Pull back on the "Raise" control lever to raise the aerial above the boom support cradle and any body or cab mounted lighting or equipment.
- ⇒ Active the "High Idle" switch for increased engine speed and hydraulic flow. This is necessary for full function of multiple control operation but in most cases is not required for single control operation.
- ⇒ Active the rotation and extension controls as necessary for positioning and use of the aerial device.
- ⇒ Switch on the intercom and establish communications with any personnel in the basket.
- ⇒ Turn on the breathing air valves at the air bottles located at the front of the turntable, underneath the ladder and check the gauge on the control consoles for available air volume.
- ⇒ All personnel on the ladder and/or in the basket, must wear safety belts at all times.

NOTE: The suggested procedure for approaching the fire or rescue scene is to raise to the required elevation, swing in the direction of the scene, and then extend out to it. Within 18 inches of full extension, a warning alarm will sound.

20.5.3 Aerial Take Down

- ⇒ Fully retract the ladder.
- ⇒ Rotate the aerial to the center of the chassis, lining up the red arrow on the rear deck of the turntable with the red arrow on the body of the truck.
- ⇒ Lower the aerial slowly, lining up the aerial with the cradle located at the front of the truck.
- ⇒ Within two feet of the cradle, make fine rotation adjustments.
- ⇒ Lower aerial into the cradle with pressure. Failure to fully place the aerial in the cradle, will cause the unit to bounce as the apparatus travels on the roadway.
- ⇒ Turn off the aerial control "mushroom" switch.
- ⇒ Close lid of turntable controls.
- ⇒ Remove stabilizer safety pins and store in brackets.
- ⇒ At lower control station, switch diverter valve to the Stabilizer position.
- ⇒ Bring stabilizer jacks up.

- ⇒ Retract horizontal beams
- ⇒ Close all control compartment doors.
- ⇒ Return metal stabilizer pads to storage brackets with handles pointed down. Return wheel chocks to storage brackets.
- ⇒ Disengage Aerial Master and Aerial PTO rocker switches.

20.5.4 During all operations, the turntable operator shall:

- A) Remain at the turntable until properly relieved by a firefighter trained in turntable operations.
- B) Maintain and monitor all radio communications and relay orders and pertinent information to basket, via intercom. He/She shall also relay information received from basket, via intercom, to the OIC.
- C) Watch movement of ladder and be prepared to over-ride basket controls if ladder is in danger of striking obstacles, e.g., corner of building, light post, wires, traffic sign or body of apparatus.
- D) Be prepared to take over controls should basket controls become erratic or inoperative.
- E) Frequently assess footing of apparatus stabilizers and ground pads for signs of undermining and/or street pavement collapse.
- F) Monitor operating hydraulic pressure for signs of possible hydraulic leak which might cause loss of ladder/basket movement. Loss of fluid from main reservoir due to broken line is rapid and ladder may lock in position.
- G) Advise basket if change in water supply is anticipated, e.g., switching source of supply, burst hose, Engine company apparatus failure, etc..
- H) If firefighters leave basket for search, rescue or roof operations, he/she shall not move ladder unless firefighters are advised of his/her intentions and they in turn give approval, or a visible life hazard should occur.

20.6 Addition of Pump Operations to Aerial Operations

20.6.1 If aerial operations are already being conducted and the IC requests the aerial to be utilized as a master stream or elevated water source, the turntable operator will momentarily stop all aerial functions and aerial device movement.

- ⇒ A Pump Operator must be selected and remain at the pump panel.
- ⇒ Disengage the High Idle.
- ⇒ Engage pump switch to Pump position.

- ⇒ Select the Drive position for the transmission
- ⇒ Continue with aerial and pump operations.

20.6.2 When conducting both water and aerial operations, both the pump operator and the turntable operator will use caution while adjusting the engine speed. The pump operator will have total control of the engine speed and adjust as needed to maintain needed water flow.

20.6.3 When supplying the Ladder Tower, the largest diameter hose is to be used. The supply should be taken from an alternate source than being used by the arriving engine companies. All hose connections shall be spanner tight to avoid leakage. Leaking water could cause the stabilizers to become undermined.

20.6.4 When using an engine to supply water directly to the Ladder Tower, the engine should be placed as close to the Ladder Tower as possible.

20.6.5 When flowing water from the aerial, keep the pump in volume. The relief valve at the basket opens at 165 psi..

20.6.6 When flowing water, drop the pump panel pressure below 100 psi before retracting the ladder.

20.6.7 When completed with flowing water, the Aerial drain, located at the rear of the apparatus, must be opened. This will drain the water pipe and will allow the ladder to retract without built up water in the pipe.

20.7 Large Caliber Stream Operations

20.7.1 In regard to its large caliber stream capability, it must be emphasized that this apparatus does not change normal South Wall Fire Rescue firefighting procedures, which is based primarily on aggressive interior attack. The need for effective exterior streams in certain cases, however, must be recognized whenever conditions, as evaluated by the IC, indicate their use. Only the IC may order the use of the Ladder Tower streams.

20.7.2 Large caliber outside streams generally should not be directed into occupied buildings. Firefighters must be warned and occupants be removed before starting water.

However, in some circumstances fire conditions or life hazard may demand such use.

EXAMPLES:

1. Fire extending via common attic and top floor is untenable.
2. A stream, preferably fog, used at an angle to the building, to protect people on ground ladders because fire is emitting from windows below them. Use of stream at an angle, if possible, reduces forcing fire into building effecting personnel or occupants still within. Stream also used to prevent extension of fire due to auto exposure from floor to floor via windows. Fog streams reduces possibility of causing injury to persons on a ground ladder as opposed to solid stream.
3. In the event hand lines cannot advance due to fire conditions, a fog stream, into floors of certain type occupancies such as office buildings, etc.. These occupancies have many windows that are accessible to a given occupancy, a rapid traverse from window to window effects a quick knockdown of the fire. This allows the Engine Company to move in for final extinguishment. Use of fog reduces structural and water damage as opposed to a solid Ladder Tower stream. It is assumed that all occupants have been removed or are in a protected area prior to the decision to use the Ladder Tower, whenever possible.

20.7.3 The air movement from large caliber stream use must also be considered. This air movement effect of the stream may drive heat and combustible gases into uninvolved area of the building. It is not uncommon to see actual fire being driven into other portions of the building. Officers must take allowance for this contingency.

20.7.4 When the OIC changes strategy from an interior attack to an exterior attack which will require large caliber streams from the Ladder Tower, all units operating within or in close proximity to the building shall be warned by radio. When firefighters are ordered out of the building or an area, they shall inform the officer in command when they have complied with the order. The Ladder Tower pump operator shall not start water until assured that all personnel are cleared of the building unless immediate life hazard deems starting water as soon as possible. If such an event should arise, the stream shall

be used in a manner to minimize affecting personnel not clear of the building, or to protect persons or personnel seriously exposed and/or trapped by fire.

20.7.5 When the fire building is heavily involved on one or more floors, heavy stream delivery should generally start at the lowest level and work upward, effecting a quick knock down on the way up to the top floor and/or attic area. Basket members and the turntable operator shall frequently assess conditions on lower floors. Operation into lower floors may have to be repeated in order to protect members in basket from convecting heat.

20.7.6 During operations, the nozzle should be placed as close to the building as possible. When operating through a window, the nozzle shall be placed as low in the window as possible. This will allow good penetration and open the ceiling, exposing the fire area. This will also allow for maximum stream penetration into the room, pushing the contents out of the way and allowing the stream to attack the seat of the fire.

20.7.7 Increasing nozzle pressure within allowable limits will often allow partition and sidewall penetration.

20.7.8 The Ladder Tower can direct elevated streams at angles and positions that are unobtainable using conventional means. The streams can be directed into windows at close range, at street level and even below grade. The basket can also be placed inside a building via a large window or other opening. This can be useful when the floor area is of doubtful stability or stock is piled high and in danger of collapse.

20.7.9 When heavy water stream is delivered, the OIC and Operations officer should be alert to possibility of collapse. This precaution is especially pertinent when no appreciable run-off is noted, continual observance of the depth of the water accumulating on floors is essential. Upon shutting down the Ladder Tower stream, it shall be the duty of the Operations officer to survey each floor in regard to run-off and structural damage resulting from fire

and/or operation of heavy caliber stream. This information shall be relayed to the OIC for consideration before committing forces for an interior attack, salvage and overhaul.

20.8 Safety and Operations Considerations

20.8.1 Electrical storms can pose a serious hazard to anyone on or near the aerial unit. User discretion is advised.

20.8.2 When using the aerial for rescue operations, try to approach the victims from above to avoid victims jumping down onto the platform, creating an overload situation.

20.8.3 Do not set the basket on the ground, roof, etc.. Any aerial loading or operation of the "lowering" control while the basket is in this condition could cause a back-bending negative load to the aerial sections and may cause serious damage.

20.8.4 While flowing water from 500 to 1000 gpm, it is recommended that any aerial retraction be performed at slow speed to avoid excessive water pressure. Above 1000 gpm, retraction is not recommended.

20.8.5 When using the aerial in extreme cold conditions, be aware of the possibility of ice build-up. Excessive ice build-up may cause overload and/or damage to the aerial.

20.8.6 During operation, continually monitor aerial loading and restrict additional loading and/or any operation that may exceed the limits as shown on the load chart.

20.8.7 Lowering the aerial below horizontal in the front zones may cause crushing damage to the body, equipment or aerial.

20.9 Communications

20.9.1 Truck 3-91 is provided with an intercommunication system (intercom), allowing for basket to turntable to pump panel communications and vice versa, which is the most effective means of communications between basket and turntable.

20.9.2 Difficulty when transmitting orders dealing with

basket movements is due primarily to misunderstood terminology. It is understood that abrupt movements due to exigent or emergent situations may cause the member to use common terms for basket movement. However, if used on a regular basis and whenever members are operating from the basket, certain terms will alleviate any confusion between the basket operator and the turntable operator. To alleviate any problems the following terms shall be used when transmitting orders from basket to turntable operator

- "**Extend Ladder**" - reach out with ladder.
- "**Retract Ladder**" - return outstretched ladder.
- "**Raise Ladder**" - increase angle of elevation.
- "**Lower Ladder**" - decrease angle of elevation.
- "**Ladder Left**" - rotate ladder to turntable operator's left.
- "**Ladder Right**" - rotate ladder to turntable operator's left.

20.9.3 When the basket is being controlled from the turntable, it is most important to keep the turntable operator informed regarding the results of the basket movement, as the turntable operator is incapable of judging the exact distance the basket is from an object. For example, the basket member(s) can direct the turntable operator in the following manner: "Ladder Left some ten feet, now at 8 feet, 6 feet, 4 feet, 2 feet, 1 foot, careful, 6 inches, Stop." These directions through the intercom must be utilized whenever the need arises for accurate, steady movements.

20.9.4 The intercom between the turntable and basket should be used for operations control of apparatus to achieve the desired coordination.

20.9.5 Emergency operations dealing with strategic action and tactical usage of the ladder tower require instant communications between OIC and members in basket. Most effective means is to have the operator at the turntable monitor ALL fire ground communications with the mobile radio at the turntable and relay orders to other pertinent information to basket via the intercom. It may be difficult to hear radio communications due to noise in the basket especially if stream is in operation. At least one firefighter in the basket should have a portable radio for the purpose of leaving the basket for any reason, such as search, rescue, or ventilation.

20.9.6 During maintenance checks of the apparatus and at initial stages of placing the ladder tower into operations, a test of the intercom system shall be made. If results are negative, members shall rely on the turntable mobile radio and portable radios for communications from the basket.

20.9.7 By monitoring ALL radio communications the turntable operator can be continuously aware of changing fire conditions, location of other units during operations, orders issued by OIC or truck officer, or any information regarding safety of firefighters and fire extinguishment that will effect ladder tower operation.

20.9.8 In the event of failure of both intercom and radio communications, members should attempt to relay orders or information vocally or by hand signal.

20.10 General Precautions

20.10.1 For relief of basket firefighters during extended periods of operations or overhauling, the use of the ladder should not be resorted to due to possible rung movement. This, obviously, can be adhered to only if the basket can be lowered to the ground. Firefighters shall watch the green rung alignment indicator and also advise the turntable operator to turn the power to the ladder tower off. Then, and only after power has been turned off, can firefighters descend or climb the ladder.

20.10.2 Firefighters cannot operate on the turntable, unless they are the trained operator of the ladder tower or they have been properly trained on ladder tower operations and have been permitted to do so by a Line Officer.

20.10.3 No firefighter shall operate in the basket unless he/she is wearing a ladder belt or a personal harness which is secured to a substantial part of the basket. If this is too confining, it is possible to provide working room by utilizing one of the two personal rescue webbing loops found in the basket, with a carabineer, and securing it around a substantial part of the basket.

20.11 Ladder Tower Operations

FLAT ROOF VENTILATION

20.11.1.1 The Ladder Tower is a convenient, sure, safe means of access to the roof. In some cases, such as commercial buildings, it may also be the fastest means of access.

20.11.1.2 When used for ventilation purposes, an axe, halligan, power saw, 6' hook and utility type rope must be placed in the basket. Personnel will make full use of ladder belts and/or personal harnesses. When roof is isolated, turntable operator shall make certain the basket is not moved until all personnel are safely back in the basket and maintain radio contact with personnel on roof. If a life hazard should appear, requiring movement of the ladder, the turntable operator shall advised roof personnel prior to movement.

20.11.1.3 When encountering a roof with an exceptionally high and/or steep parapet, judgment must be made as to the stability of the roof and, if doubtful, the use of the "life-ladder" from the basket shall be used to get on to the roof. The "life-ladder" will be installed prior to placing the aerial in the vicinity of the roof and the elements of fire. The ladder will be attached using safety in mind and will remain on the basket until it is deemed no longer necessary for firefighters to access the roof.

20.11.1.4 When operating on roof of questionable stability, with hand tools or power saw, full use of ladder belt and/or personal harness and personal rescue webbing shall be used to limit travel of operator of tool to a radius of no more than 10 feet from the basket. Webbing with a carabineer attached, shall be secured to a substantial part of the basket. This pertains to when ventilation cannot be performed without fully stepping onto the roof of the fire building. A firefighter in the basket shall keep watch of conditions around the tool operator.

PEAKED ROOF VENTILATION

20.11.2.1 On most peaked roofs, effective operations may be performed directly from the basket. There are some situations, however, where because of parapets or set-backs, the basket cannot reach the roof surface. In these cases the use of the "life ladder" in conjunction with the Ladder Tower would be beneficial for roof entry.

20.11.2.2 When instability of the roof is suspected, exercise extreme caution:

- A. Keep basket close to roof level. Secure members to basket with personal webbing. Do not engage in prolonged operations.
- B. Use portable ladder, laid flat on roof, to help distribute weight of firefighter(s) over a greater area.
- C. If condition permits, place basket as close to roof as possible, without touching the roof and have members work from the basket.
- D. When operating on commercial buildings and similar structures with hanging ceilings, ten foot hooks may be used to push down ceilings below roof openings.

POWER SAWS FROM BASKET

20.11.3.1 Power saws can be used effectively from the basket to open up roofs as follows:

- A. Position basket as close to the work area as possible. When working on a peaked roof, this area would be the ridge pole.
- B. The saw, after being warmed up, is held outside the basket when running.
- C. Operator shall wear a ladder belt or personal harness with the personal rescue webbing. This set-up belt has enough play to reach the edge of the platform and have one foot on the roof.
- D. When working on a peaked roof, make the First cut parallel to the ridge pole.
When working on a flat roof make the First cut parallel to the basket, as far out as possible. (**See Figure 4**)
- E. Proceed to remove cut roofing with six foot hooks and push down any ceiling below.

F. Area beneath basket area shall be kept clear to prevent any injuries from falling objects and tools. As an added precaution, a utility rope or cord may be attached to handle of saw to prevent it from falling. This rope or cord should be attached to a secure part of the basket.

BREACHING WALLS

20.11.4.1 Exterior walls can be breached with power tools. Breaching may be necessary to gain access for life saving or stream penetration. This is a strenuous operation requiring frequent relief of saw operator.

A. The power saw must be outfitted with the proper blade. Extra blades and tools should be taken in the basket to change worn out blades. These blades will wear down rapidly.

B. Cuts in brick walls should be triangular in form with vertex angle upward to prevent further collapse. **(See Figure 5)**

C. First and Second cuts should be at brickwork since easiest cut is at mortar joint and blade at this point will be worn. Cut at mortar joint may not be necessary since bricks along this plane can be loosened and removed easily with hand tools.

D. Make opening large enough so saw can be inserted to cut inner wall if necessary.

OVERHAULING

20.11.5.1 The platform of the basket provides a stable and secure area from which to work, and the ladder a maneuverable and effective means of access for exterior overhauling when stability of the building is doubtful or when exterior access is more desirable and efficient. The aerial can also be used for lighting an area which overhaul operations are conducted.

20.11.5.2 The Ladder Tower shall not be used:

A. To force timbers or cornices back into building or onto roof.

B. To pull or push objects.

C. As a derrick. Only the lift eyes at the bottom of the basket shall be used for raising and lowering and the weight rating shall be no greater than 500 pounds. These lift eyes shall not be used for any of the

aforementioned actions except for proper raising and lowering.

20.11.5.3 Basket shall not rest against building wall as the movement caused by members in basket may cause chafing action that could damage basket and/or waterway.

20.11.5.4 During overhaul operations in buildings where the stability of stairways is questionable, or stairs are missing, severely damaged or obstructed, interior hose line placement on various floors may be accomplished by use of the Ladder Tower. Use of one length from the 2" outlet of the basket is possible for wash down. However, water supply must be controlled at the pump panel and the nozzle left cracked open until the waterway is drained on completion of the operation. If the nozzle is closed during retraction of the ladder and waterway is not drained, the waterway could be damaged.

20.11.5.5 The stream from the Tower Ladder can also be used for the removal of shingles, siding, roofing, brickwork or possible demolition if building condition persists serious hazard.

20.12 Rescue and Removal Procedures

20.12.1 The full capability of the Ladder Tower can be realized when there are many persons to be removed, and/or victims are unconscious, incapacitated or obese.

20.12.2 Rescue via basket is effectuated in several ways. Entering and exiting from basket shall be through the inward opening basket doors. Initially the basket is elevated to a point where the middle of the basket is level with the window ledge. Middle of basket positioning permits placement of basket flooring at a level where a person can easily step onto it without the usual straddling of window sills. To facilitate the removal of an incapacitated or obese victim, position the top of the basket rail level with the window sill.

20.12.3 Positioning of basket must be such that the manual and automatic nozzles don't interfere with the rescue operation. This may require angular approach that will permit ease of entering and exiting from the basket.

20.12.4 To expedite placing the basket at a window, place apparatus parallel to the objective so that the basket is in line with the window or target. This position will shorten horizontal travel distance, reduce time required to reach target and insure angular approach, if one is desired.

20.12.5 Parapetless roofs can be safely approached by actually placing the bottom of the basket as close to the roof, if possible, especially when ice conditions are encountered, to effect removal of persons trapped thereon.

20.12.6 When many trips of the basket are required to remove a great number of occupants, safe removal need necessitate delivery directly to the street level. Where time is crucial, the ladder tower may be used as a stairway, however, consideration must be give to victim or occupant mental and physical condition, elevation and angle of ladder, weather conditions, etc.. This is not preferred, but is an option and may be suitable in certain situations where multiple people need to be removed.

20.12.7 In order to facilitate operations and maximize safety of firefighters, where feasible, consideration should be given for using the Ladder Tower basket to return personnel and equipment to ground level from upper levels of buildings. This is especially appropriate at extensively damaged buildings where visibility is limited and stability of stairs are a problem.

20.12.8 When removing victims that have been placed on a backboard or a stokes basket, the "LYFE basket" brackets will be used. The operation will be conducted as following:

- ⇒ The "LYFE basket" brackets will be secured onto the basket.
- ⇒ The basket will contain one firefighter and one firefighter/EMT. In the absence of a firefighter/EMT, an outside agency EMT will be permitted.
- ⇒ All operating personnel will wear the proper safety harnesses.

- ⇒ Equipment in the basket will include an oxygen kit and first aid kit.
- ⇒ The stokes will be placed onto the "LYFE basket" brackets and strapped securely.
- ⇒ The turntable operator will perform the lowering

operation to ensure smooth lowering process.

20.13 Ladder Tower Operations During Winter Months

20.13.1 During extreme cold weather, certain precautions must be applied to the operation and use of the ladder tower.

20.13.2 When operating the ladder in cold temperatures, continually use the aerial functions to circulate the oil, delaying the ambient cooling effect. Slow attentive operating after a period of non-use will be less harmful on the device and may allow the operator time to react to problems.

20.13.3 Use the hydraulic oil pressure gauge to warn of excessively high pressures building in order to operate a function.

20.13.4 Pay particular attention to electric cables and hoses running up the aerial sections. These will become stiff and will want to take a "set", causing them to track improperly.

20.13.5 Before shutting off the flow of water through the aerial waterway, raise the aerial to an elevation that will allow for quick evacuation of the water in the tubing before retracting the aerial sections. Retract the aerial slowly and watch for excessive hydraulic pressure to retract. Ice in tubing may cause damage, requiring waterway reconditioning.

20.13.6 Keep greased slide areas of the ladder sections clean and not excessively greased. In extreme cold weather, the grease will become solid and will offer a greater resistance to aerial extension and retraction. Operating at a slow speed is recommended.

20.13.7 During extreme cold weather, the OIC should allow for periodic relief of members in the basket to prevent over exposure to the element.

20.14 Unusual Occurrences - Live Wires on Apparatus

20.14.1 Live overhead wires can present a problem if they fall on the apparatus. It is possible for the apparatus to become energized, particularly if the stabilizers are down

in place.

20.14.2 If a live wire should fall onto the apparatus, no firefighters shall touch the apparatus. Touching the apparatus will electrocute the individual, causing serious injury or death. Also, safeguard civilians from touching the apparatus.

20.14.3 IC must be notified immediately and the apparatus will be considered out of service.

20.14.4 Notify the utility company to respond and cut the wire from the apparatus.

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