**FDNY APPARATUS**

**OBJECTIVE:**
- To familiarize members with the apparatus used in the FDNY

**CONTENTS:**
- Engine company apparatus
- Ladder company apparatus
  - Rear mount Aerials
  - Tiller Aerials
  - Tower Ladders

**SOURCE:**
- FDNY Tactics and Procedures
- FDNY Training Bulletins
- FDNY Chauffer Training School Manual

**FDNY REFERENCE:**
- FDNY Tactics and Procedures Ladders 2, Ladders 6
- FDNY TB Apparatus
# PART ONE

## ENGINE COMPANY APPARATUS

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In carrying out its mission of fire protection and response to countless types of emergencies, the FDNY utilizes several types of apparatus. Since circumstances can develop at an operation which requires quick and decisive action, it’s necessary for FDNY members to have an understanding of the apparatus in service. The two basic units of the FDNY are the Engine Company and the Ladder Company. The following chapter will introduce the primary apparatus of these units. The first section will focus on Engine company apparatus.

**PART 1: ENGINE COMPANY APPARATUS**

1. **INTRODUCTION:**

1.1 The function of engine apparatus (operated by the Engine Company Chauffer) is to deliver engine company personnel, hose, appliances, and an assortment of tools to the scene of an operation. Additionally, this rig is to be positioned to utilize the various available sources of water and pump the water needed in operations. FDNY engines carry an onboard supply of water- but this supply is only enough to start operations at an involved incident.

1.2 Since utilizing properly positioned hoselines (which are supplied adequately and operated efficiently) is one of the major factors to a successful operation, it is essential that all members have an understanding of pumping operations and how to use the pump of an FDNY engine.

1.3 Although the FDNY employs several manufacturers and models of pumphers the same general procedures apply in pumping operations regardless of make or model of apparatus.
2. BASIC PUMPING OPERATIONS:

2.1 The function of an engine in a pumping operation is to function as the pump: water is taken from a source of supply and delivered through hose to a point of operation (or to another apparatus). To ensure adequate flow, a predetermined pressure must be delivered to the point of operation. In order to avoid computation of complex mathematical formulas at a fire scene simplified rules of thumb, or “street hydraulics” are used to determine required pump pressures.

2.2 The sizes of hose used by the FDNY and the desired flows to achieve an effective stream are as follows:

- 1 ¾”: 180 gpm
- 2 ½”: 225-250 gpm
- 3 ½”: >400 gpm

2.3 To achieve the above desired flow the pump must deliver a pressure which will provide the necessary pressure at the operating point. To do so the pump must provide a pressure which will compensate for the effects of gravity and friction in flow reaching that operating point. Factors which influence the necessary pump pressure include:

- The amount of water being pumped.
- Diameter of hose.
- Length of stretch
- Any appliances attached to the hose. For the nozzle, the type, inlet diameter, and tip diameter
- Desired nozzle pressure
- Elevation

3. PUMP CONTROLS, PUMP PANEL, AND SUPPLY/DISCHARGE OPTIONS:

3.1 In order to operate the engine at a pumping operation it is necessary for the pump operator to have an understanding of the pump and be familiar with the pump controls and pump panel, as well as the various supply and discharge options.

3.2 Most pumpe rs in the FDNY are two stage pumps. This means that there are two impellers, and the operator has the ability to operate these impellers in series or parallel, depending on the needs of the operation. All pumps are driven by the engine’s driveshaft. When setting up to pump, after positioning the apparatus the ECC switches the pump shift (see photo 3-1) in the cab from “road” position to “pump” position. The steps in this process are as follows:

- upon positioning engine, switch transmission to neutral
- engage maxi brake
- Transfer Pump Shift from road to pump position
- Switch transmission to drive
Properly completing the above procedure effectively switches the driveshaft from powering the drive train to driving the pump impellers. The ECC is now ready to flow water and regulate the discharge pressure.

NOTE: If the pump is not engaged properly, the only pressure that can be discharged is that of the supply coming into the pump.

3.3 To flow water it’s necessary to have a supply of water. This supply can be one of the following:

- Connection to a hydrant
- Drafting
- Supply line from another apparatus
- Booster tank water

Photo 3-2 shows a typical pump panel which an ECC would operate.
♦ Intake Gauge: indicates the pressure of the water supplying the pump. With no water flowing this is **static** pressure. When water is flowing what’s indicated is **residual** pressure. As more water is pumped (i.e. additional lines) this residual pressure drops. When residual pressure drops below 15psi augmentation to the water supply is required.

♦ Master Pressure Gauge: indicates the pressure the pump is putting out. Equals supply pressure plus the pressure imparted by the impellers.

♦ Pro Pressure Governor: Computer which controls engine RPM, and consequently the discharge pump pressure. As the throttle, this control brings up pump RPM to deliver the desired pressure. As the governor, this control over RPM maintains pump pressure so that hand lines do not receive pressure surges when nozzles on other lines are opened and closed. On older engines which do not have this governor, these engines instead have a manual throttle, which is used to set pump pressure. Additionally, these older engines have a Ross Relief valve, which, when set prevents pressure surges.

♦ Booster Tank Fill: A valve which, when opened allows some of the incoming supply water to be directed through piping to fill the booster tank, which on most engines is 500 gallons.
♦ Booster Tank Gauge: provides illumination of level of water in the booster tank in ¼ increments.

♦ Tank to Pump Valve: valve which, when opened allows contents of booster tank to flow to the suction side of the pump.

♦ Prime Valve: operates primer pump to inject water into the pump chamber. Doing this expels air from the pump chamber, thus enabling the pump to generate the necessary suction to operate. Priming the pump must be done at any hose line operation before increasing pump pressure and opening any discharge outlets.

♦ Transfer Valve: Position of this valve determines whether the pump impellers work in series (PRESSURE) or parallel (VOLUME). When the transfer valve is in the PRESSURE position all water flow is directed across one impeller, with the discharge directed toward the second impeller. Effectively, the pump discharge has had two bumps in pressure- therefore it’s possible to quickly develop pressure in discharges off the pump...however, because the pump discharge is off one impeller (all flow is from the 2nd impeller), the volume for higher flows is limited. In the VOLUME position the incoming flow is split- some incoming is directed to one impeller and the rest is directed to the other impeller. The discharges of both impellers are joined to create the overall pump discharge. Effectively, in this configuration the pump discharge has had only one bump in pressure (from either of the impellers). It therefore takes longer to develop discharge pressure. However, because the discharge is from two impellers, higher flows are possible.

IMPORTANT: Standard operating procedure is to pump in the VOLUME position. Only in an operation where head pressures are to be overcome (i.e. standpipe operations) should the transfer valve be changed to the PRESSURE position.

♦ Inlets: Most engines in service in the FDNY have 5 inlets- (3) 4 ½” inlets and (2) 3” inlets. Gated inlets are those which have a valve between the inlet connection and the pump chamber. When one of these inlets is used the valve must be fully opened in order to ensure adequate supply to the pump. Flow-through-inlets are those which have no valve between the pump chamber and the inlet connection. These inlets must be capped when not in use.

♦ Discharges: Most engines in service in the FDNY have 6 discharges plus a deck pipe. The discharges are numbered 1 to 6 starting with the front discharge and proceeding counter clockwise around the rig. These discharges are also color coded. 2 of the discharges are 3” and the other 4 are 2 ½” discharges.
4.0 CONCLUSION

In assigning the engine company position of ECC, most engine companies assign a senior member or at least a member with additional training regarding apparatus safety and pumping operations. All members must realize that this does not preclude the rest of the ranks from having basic knowledge in pumping operations. At an incident it’s not inconceivable for an ECC to suffer an injury serious enough that he can’t initiate or continue a pumping operation. In this case another available member would have to step in and either initiate or continue the pumping operation- because regardless of the situation in the street, the operations in the fire area must continue. It’s been proven throughout the history of the FDNY that the most effective life saving tool is a properly positioned and adequately supplied hose line.
## PART TWO

**LADDER COMPANY APPARATUS**

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PART 2: LADDER COMPANY APPARATUS

1. INTRODUCTION

1.1 Until the 1970s, the New York Fire Department placed primary reliance on the use of aerial ladders as an exterior means of access to the upper floor of buildings. It also placed full reliance on metal aerials for developing elevated large caliber streams when water towers were phased out. Today, almost 60% of our ladder companies are equipped with metal aerial ladders; the remaining companies have tower ladders.

1.2 The two types of aerial ladder apparatus currently in service are the REAR­MOUNT and the TILLER. Both types are equipped with a 100’ aerial ladder. The difference is that the tiller is a tractor trailer rig with maneuverable rear wheels - this allows for easier maneuvering around tight turns.
1.3 The third type of ladder apparatus currently in service is the TOWER LADDER. The Tower Ladder (TL) was introduced to the fire service several years ago. Its full potential is still being developed. The effectiveness of this apparatus in ladder company operations on the exterior of buildings for access to the interior, and for rescue purposes is without question. In addition, it also provides a superior elevated large caliber stream capability.

Tower Ladder

2. TERMINOLOGY

2.1 Tormentors: Hydraulic supports, with direct frame attachment. When lowered and locked each becomes a rigid member, to provide a rigid operating base bypassing the apparatus suspension.

♦ Rear mount: (2) tormentors adjacent to turntable at rear with controls on rear of apparatus.

♦ Tiller: (2) tormentors adjacent to turntable at center of apparatus (front of trailer section). Controls are on pedestal.

♦ Tower Ladder: Chassis supported at (6) points. (4) jacks- one at each corner of apparatus and (2) outriggers alongside turntable.

2.2 Aerial: 100 foot, 4 section ladder made of Corten Steel. Bed ladder is the base section, which is fixed (does not extend or retract). Upper 3 sections are moving (sliding) sections. Each section has a handrail, which tapers to beam at top.

2.3 Rungs: Cross members between beams which are used for climbing. Rungs are spaced 14” apart.

2.4 Turntable (pedestal): Platform at the base of the aerial or tower ladder. On aerial ladders this platform is used to mount and dismount the aerial. On both aerial and tower ladders the turntable contains the pedestal controls, from which the operator can operate the aerial or tower ladder.
Rear mount Pedestal Controls
3. **AERIAL LADDER USE**

3.1 Aerial ladders may be used to effect:

- Ladder pipe operations
- Observation post to assess conditions
- Ventilation (member on ladder or lower tip through window)
- Entry
- Rescue
- Search

3.2 They may also be used to stretch hose lines to upper floors or roof; bridge a gap; and operate hose lines from the ladder. When their need is evident upon arrival, they should be raised immediately. When their need is anticipated for later use, the ladders shall be positioned and set up.

3.3 **Apparatus Set Up and Operation:**

- In Cab Engage Power Take Off (PTO) to transfer power from the drive train to powering the apparatus supports and aerial controls:
  1. Once apparatus in position place transmission in NEUTRAL.
  2. Engage Maxi-Brake (rear brakes). Push to apply.
  4. Place transmission to DRIVE.
  5. Flip PTO lever to IN position.
  6. Return transmission to neutral. Look for PTO light Illumination.
  7. Place Throttle Switch to ON position. NOTE: On some apparatus this switch may be on the pedestal.
# AERIAL CONTROL PANEL OPERATIONS

<table>
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<tr>
<th>ITEM</th>
<th>SWITCH/LIGHT</th>
<th>FUNCTION</th>
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<tr>
<td>1.</td>
<td>Stabilizer Not Nested Light</td>
<td>When lit, indicates stabilizers are not completely retracted into the body for road travel.</td>
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<td>2.</td>
<td>Aerial Hourmeter</td>
<td>Indicates total hours aerial has been operating.</td>
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<td>3.</td>
<td>Hydraulic System Indicator light</td>
<td>Indicates when hydraulic filter should be changed</td>
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<td>4.</td>
<td>PTO Light</td>
<td>When lit, indicates PTO is engaged.</td>
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<td>5.</td>
<td>PTO Control Switch</td>
<td>Used to start/stop PTO for aerial hydraulics</td>
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<td>6.</td>
<td>Front Brake Light</td>
<td>When lit, indicates front brakes are engaged.</td>
</tr>
<tr>
<td>7.</td>
<td>Front Brake Lock Switch</td>
<td>Used to set front wheel brakes during aerial ladder operation (not to be used for parking)</td>
</tr>
<tr>
<td>8.</td>
<td>Auxiliary Pump Light</td>
<td>When lit, indicates auxiliary electric hydraulic pump is activated.</td>
</tr>
<tr>
<td>9.</td>
<td>Normal/Emergency Hydraulic Switch</td>
<td>Selects normal PTO pump or auxiliary electrically operated pump.</td>
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<tr>
<td>10.</td>
<td>Generator Switch and Run Light</td>
<td>Switch to activate generator. Light “ON” indicates generator has been turned on.</td>
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Stabilizer Controls (also called tormentors)

1. Hydraulically operated "H" frame stabilizers (tormentors) are located behind each rear wheel.

2. The controls for these tormentors are located in rear compartment (stabilizer control compartment), one control handle for each side. On tillers, controls for stabilizers/tormentors are on the pedestal.

3. Tormentors can be placed in operation by one man pulling handle out slightly (towards operator) and then to down position; one side at a time.

4. Before operating tormentors on rear mount apparatus, check for 5' 2" clearance at each side to insure that area on operating side is clear of members, civilians, hose, or obstructions.

5. With hand on lever, it is possible for member to view tormentor in motion. This is not true for all members, however, due to differences in individual reach.

6. If member cannot view tormentor in motion with one hand on lever, he will proceed to lower tormentors by placing lever in down position. Lever will remain in down position unattended. Momentarily, step to side and witness tormentor in motion until operator determines tormentor is properly positioned. Lever is returned to NEUTRAL position at that moment. Repeat procedure for other side.

7. Shifting the feet a few inches as described above, will permit member to operate efficiently without sacrificing safety.

8. Under extreme emergency conditions, where both tormentors cannot be lowered due to obstructions, it is permissible to lower first the tormentor on the side of the apparatus that ladder will be used. The other tormentor shall be lowered as soon as practicable.

9. Before leaving controls, be sure both handles are in NEUTRAL. Engine speed must return to idle.

♦ Operate Aerial:

1. Raise Bed Ladder.
   - Depress AERIAL ENABLE FOOT SWITCH at the base of the pedestal.
   - Raise the ladder by pulling back slowly on the hoist lower lever.
   - Release HOIST/LOWER lever when sufficiently elevated.
2. Rotate Ladder.
   - Depress AERIAL ENABLE FOOT SWITCH at the base of the pedestal
   - Rotate ladder by moving ROTATION LEVER as required for proper direction
   - Release ROTATION LEVER when ladder has reached desired rotation

3. Extend Fly Sections.
   - Depress AERIAL ENABLE FOOT SWITCH at the base of the pedestal.
   - Push the EXTENTION/RETRACTION lever to extend to the desired length.
   - Release EXTENTION/RETRACTION lever when ladder has reached desired length
   - If possible make sure RUNG ALIGNMENT INDICATOR light is ON before permitting personnel to climb ladder

♦ Placing Ladder.

1. Depress knob on top of Bed Ladder Control and push handle away, directing ladder toward objective. Return handle to NEUTRAL position when underside of beam is about 2" to 6" from objective. It is expected that the weight of the men climbing ladder will place ladder in the supported position.

2. Aerial Ladder Placement:
   - **To The Roof:** Extend the ladder so that the tip is at least 5 feet above the point where the ladder comes in contact with the building.
   - **To A Window:** Placement must allow for unimpeded access and egress at this window. Therefore, the ladder tip should be less than 6" over the window sill. Recommended distance of the tip from the objective is 2" to 6". In case of rescue, use the 2" positioning so that the ladder will rest against the window sill after weight is put on it.
   - **Alongside a fire escape:** Against the building (2" out) with the tip about one to three feet above the balcony railing. This affords easier access to the ladder.

**Note:** Remember the loss in height resulting from retracting the ladder to apply ladder locks.
3.4 Climbing and Descending the Aerial:

♦ Coordination: Always face the aerial when climbing or descending. Eyes should look up or forward—this will provide better balance. Avoid looking down. If necessary to look down, look over shoulder without leaning backwards.

♦ Hands—must have one hand in contact with the aerial at all times unless secured to aerial with leg lock or with personal harness/life belt hook to rung. Hand movement should be coordinated with foot movement—left hand with left foot; right hand with right foot. On steep angles it may be necessary to grab rungs.

♦ Feet: Stand on rung with ball of foot, avoiding driving heel of boot into rung. Each foot positioned to avoid cable.

♦ Body Position: Body should be perpendicular to ground to allow for best balance and best support of weight carried. Climbing too close to aerial will impede climb. Leaning back will cause too much weight to be supported by arms and you are more likely to fall.

3.5 Dismounting the Aerial

♦ Stop climbing at roughly the third rung from the tip and keeping the left hand on the handrail, transfer the right hand to the rung near the left beam.

♦ Pivoting on left foot, lean to left to butt right shoulder to building with head and body outside the window.

♦ Right leg is brought up and over the right side handrail so the climber is now straddling the top rung and facing left.

♦ Left hand is moved to top rung, palm down. Right hand is then turned around so that the top rung is grasped in a trapeze fashion.

♦ While maintaining grip on top rung with both hands bring left leg into room and gradually ease weight over sill into room to test floor area. Let go of aerial only when certain that floor area is secure.
3.6 Mounting the Aerial from a Window

♦ Place left hand at top of right handrail (facing the aerial).

♦ Grasp the top rung with the right hand palm up.

♦ Swing left leg out of window to second rung.

♦ Straddle top rung, and then shift weight and move left foot to third rung.

♦ Pushing up with left hand pivot body on ball of left foot to swing right leg out and put right foot on third rung.

♦ Place right hand on right handrail (facing the aerial) and begin descent.

3.6 Dismounting the Aerial at Roof

♦ Stop climbing at rung nearest top of parapet. Bring both feet to same rung.

♦ Grasp handrail on dismount side in a baseball grip and bring feet together.

♦ Maintaining grip, bring outboard foot to parapet and test stability while supporting weight with leg still on the aerial.

♦ Bring other foot off the aerial to the parapet

♦ Move outboard hand to underside of rung then follow with the other hand.

♦ Supporting body weight with two hands, test integrity of roof with feet

♦ DO NOT RELEASE BODY WEIGHT TO ROOF UNTIL ASSURED THAT THE ROOF IS SECURE.

3.7 Mounting the Aerial At the Roof

♦ Grasp overhead rung, place feet on parapet and pull up. (this step not necessary if there is no parapet or cornice)

♦ Move grip from underside of rung to baseball grip on handrail.

♦ Turn body to face roof.

♦ Place one foot then the other onto rung level with parapet.

♦ Bring hand to the other handrail and begin descent.
3.8 OPERATIONS FOR REMOVAL OF VICTIM OR VICTIMS BY AERIAL LADDER

Never remove people via aerial ladder when they may be calmed and held safely at that location or removed via a safer means of egress. The preferential order for removal of people is via: INTERIOR STAIRS, HORIZONTAL EXITS, FIRE ESCAPES, LADDERS, LIFE SAVING ROPE.

Observe the building continuously while chauffeur is operating the ladder. Someone may appear at another window or the trapped person may move to another location.

Prepare for a rapid ascent as the trapped people may attempt to climb onto ladder without assistance. Climbing the ladder while it is being extended or retracted exposes members to severe injury and may jeopardize the rescue effort.

Ascend the ladder followed by the chauffeur. Climb into window and assist victim out feet first to the chauffeur and then search the area. Firefighter must realize that other victims may be inside and the victim may be unable to inform him about other occupants.

Note: The chauffeur following in ascent on the aerial will keep the chauffeur closer to the controls. (Only in an extreme emergency such as direct exposure to flame or great heat will the movement of the ladder with the firefighter and the victim on it be justified).

Always carry small children down ladders.

To descend with an ambulatory victim, place yourself one rung below the rung the victim is standing on. Descend in unison, i.e., right foot for right foot and left foot for left foot. Keep the victim between you and the ladder at all times and maintain physical contact with him. At steeper angles, have the victim grasp the rungs. This will facilitate your control. Talk to your victim. Constantly reassure the victim and praise his actions. Try to talk him into looking straight ahead or up and not down, as he might freeze on you.

If the victim panics, take control by pressing him against the ladder with your body. Do not resume the descent until he is capable of continuing, if the descent is difficult or tiring, another firefighter should 'back up' the member carrying or assisting persons down the ladder.

Removal is not considered complete until he has been assisted all the way to the ground. Do not leave him on the turntable.

If required, render first aid until relieved. Assist him to an ambulance if necessary. These actions shall not be taken if you are needed to assist in additional rescue operations.

When there are two victims to be removed, the order of removal is dependent on variables difficult to predetermine.
• In many instances, one of the people will have climbed out on the ladder before a member has reached this position and there will be no need to make a preferential determination as to removal.

• Occasionally one of the occupants will be aged, infirm, extremely heavy or hysterical and the other one ambulatory and less trouble to remove. The removal order should be based on the length of time needed to completely affect this rescue and the seriousness of the exposure to victims and members.

• A serious fire in the front might cut off ladder descent in a short period of time. Both members assist the most helpless victim onto the ladder and the chauffeur assists the victim below the point of danger and then to the street. While the chauffeur is slowly descending, the OVM climbs onto the ladder and assists the more ambulatory person onto the ladder and complete descent is made. In this instance, time is the prime consideration, in effecting a complete removal of victims below the danger point and preventing the possibility of your retreat being cut off.

• A serious fire in the rear, cutting off interior descent and no available front fire escape, presents another problem. Since the fire is not pushing out the front windows the time required to effect removal of victims is less critical. In this case, consideration can be given to the simple removal first and then concentrate on the difficult removal which will require two members.
4. TOWER LADDER USE

4.1 GENERAL FEATURES OF TOWER LADDERS (TL)

♦ Stabilizer Supports

- The chassis is supported at six points while the boom is in operation, i.e., two hydraulically operated jacks are located at the front and two at the rear of the vehicle (total of four), and two outrigger type jacks in the middle of the apparatus. All supports have a direct frame attachment to bypass the apparatus suspension and provide a rigid operating base.

- When the stabilizer supports 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.

- To eliminate any possibility of stabilizer support collapse brought about by loss of fluid from a cylinder, a mechanical lock is also provided at each jack and outrigger. These locks (pins) must be inserted manually.

- All jacks and outriggers must be lowered until each reaches the end of its stroke before raising the boom. Tower ladders are not designed to operate with outriggers and jacks down on one side only. Exception: If apparatus is not level, lower the jacks and outrigger on the low side first, then the jacks and outrigger on the high side until unit 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.

- Outriggers can easily be placed between parked cars when necessary. Jacks and outriggers must be on firm ground and locked.

- To judge that outriggers will clear all obstructions, a 6-ft. hook may be used as a gauge.

- Tower ladders have indentations in the turntable to accept outriggers. This necessitates that outriggers must be moved clear of the turntable before operating the boom AND boom must be returned to its original position (turntable arrow markings aligned) before outriggers are bedded.

- Any member operating a tower ladder must personally verify the placement of all outriggers and jacks prior to raising the boom from the bedded position. If a member commences to set up a tower ladder apparatus for an operation and then decides to abort the operation, the member must:

  o properly place all outriggers and jacks for operation

  or

  o return all outriggers and jacks to the pre-setup position
Boon Assembly:

The boom assembly consists of four box sections which telescope within each other. The first section is alloyed steel and the three telescope sections are aluminum alloy. The extension mechanism consists of two double acting cylinders which provide power in extension and retraction. The boom hydraulic system has hydraulic "holding" valves, which will prevent the boom from moving in the event of a hydraulic line failure.

Basket

The basket is constructed of alloy aluminum and has a floor area of approximately 15 sq. ft. Permanently mounted on the front surface of the platform is a Stang Intelligiant Nozzle, permitting flexibility in water tower operations. The underside of the floor and the front railing of the basket may be covered with a fire resistant shield.

Pedestal controls - Turntable

Whenever a tower ladder operation is in progress, the pedestal position must be staffed. This provides an extra pair of eyes to warn of impending danger and override basket controls in an emergency.

- Three controls similar to those on a metal aerial ladder are provided on the turntable. These controls are for raising and lowering, extending and retracting, and rotating the boom assembly. Operating controls at the pedestal allow for smoother positioning than the controls in the basket.

- Master Power Switch - Supplies electrical power for the Master Control Valve, Master Console panel lights, engine start, deadman control and platform (basket) controls.

- Engine Start Button - allows engine to be re-started in case of stall from the Master Control Console.

- Platform Control (Basket) - Activates the basket control station.

- Deadman Control - Depressing the foot pedal at base of console (pedestal) activates the system and the engine throttle control. This movement also deactivates the basket controls by activating the hydraulic system in case of electrical failure. The use of the platform control switch is necessary whenever members or civilians enter or leave elevated basket. This is to insure against movement of basket by accidentally touching the platform control handle.
CAUTION:

1. There is a possibility that a malfunction in one or more of the three boom movements e.g., 1) lower-raise, 2) extend-retract, 3) rotation, can occur in the operating controls of the Tower Ladder causing the elevated boom (basket) to move in the direction of the malfunction. The release of either of the "deadman" controls (foot switch on pedestal, trigger on basket assembly) will immediately halt all boom movement.

2. In the area at the base of the boom and turntable are three sets of manually operated isolation valves, one pair for each hydraulic circuit, e.g., 1) raise-lower, 2) extend-retract, 3) rotation. Should one of these 3 control valves malfunction for any reason, the isolation valves for the particular function can be closed leaving the other systems operable.

- Accessories - Controls light on Master Console front and optional accessories.
- Pressure Gauge - Indicates system pressure during operation.
- Communication Switch - Controls intercom system between basket and pedestal.

♦ Basket Controls (Platform)

- Single handle controls all functions: with a "Dead Man" trigger in the handle, which must be depressed before the system operates.
- Intercom - Open circuit, controlled from pedestal.
♦ Escape From Basket

When no other solution is possible, member may escape from the basket by means of the fixed telescoping ladder mounted on top of the boom sections or by life saving rope in conjunction with the Personal Harness, which ever is most appropriate for the situation.

**Note:** There exists under some conditions of partial elevation and extension, a possibility of boom section adjustment, gradual shifting with one section extending and another section retracting the same distance with no effect on the position of the basket. This results in rungs moving in relation to each other. Because of this possibility, utmost caution must be exercised while using the escape ladder.

♦ Water System

- Boom rotation permits water system coverage of 360 degrees.

- A specially designed water manifold is located on the rotation axle. The water system consists of four telescoping sections of stainless steel pipe, operating through conventional "U" cup seals and packing glands. Diameter of smallest section is 3 ½". Suitable swivel elbows, fittings, and additional pipe connect this telescoping system, from the basket mounted Stang, through the rotating swivel in the superstructure, to the waterline connections on either side of the apparatus frame.

- The water system hook-up consists of a 3" x 3" gated siamese on the left side and a 4-½" inlet on the right side.

**Note:** There are various model TLs in the field and companies involved must refer to their manuals for specifics.

♦ Communications

- The TL is provided with an intercommunication system (intercom), allowing for basket to pedestal communications and vice versa, which is the most effective means of communications between basket and pedestal.

- In some models, the basket control man faces the opposite direction in relation to the pedestal man. It is for this reason that the reference point is the pedestal and not the basket position.

- When the Basket is being controlled from the pedestal, it is most important to keep the pedestal man informed regarding the results of the basket movement. Directions through the intercom must be utilized whenever the need arises for accurate steady movements.
Since the pedestal controls allow smoother movements, the pedestal man should, in most cases, perform delicate operations if visibility permits.

Emergency operations dealing with strategic action and tactical usage of TL require instant communications between officer in command and members in basket. Most effective means is to have man at pedestal monitor all the Handie-Talkie communications and relay orders or other pertinent information to basket via intercom. Handie-Talkie is difficult to hear due to noise in basket especially if stream is in operation.

By monitoring Handie-Talkie transmissions the pedestal man can be continuously aware of changing fire conditions, location of other units during operations, orders issued by officer in command of fire or company officer, or any information regarding safety of members and fire extinguishment that will effect TL operation. He can relay these communications via intercom to basket or, from basket to officer in command of operation should Handie-Talkie at basket be ineffective.

In the event of failure of both intercom and Handie-Talkie communications, unit should have a preset plan by which pedestal man can relay orders or information vocally or by hand signal, e.g., tap boom with tool or move boom slightly to attract attention to the pedestal.

♦ General Precautions

For relief of basket man during extended periods of operations or overhauling, the use of the escape ladder shall not be resorted to due to possible rung movement.

Detailed members cannot operate on pedestal unless they are presently assigned to a Tower Ladder Unit or are qualified Chauffeur-Tillermen (QCT, School Trained).

No member shall operate in the basket unless he is wearing the installed safety belt or a life belt or Personal Harness which is secured to a substantial part of basket. If this is too confining, it is possible to provide working room by forming a loop, one foot in diameter, in a life saving rope around a substantial part of the basket using a bowline to secure the loop, and then hook the life belt or Personal Harness onto this loop.
4.2 POSITIONING OF APPARATUS

♦ General

- Generally placement depends upon conditions encountered on arrival. The Officer in Command of a fire should give specific instructions regarding the placement of apparatus and the operations to be performed. In the absence of a superior, the TL officer must base his decision for placement of the TL on the following conditions:

1) What wall to work on - based on the life factor.

2) Fire conditions location and extent of fire.

3) Type of occupancy - time of day.

4) Type of structure - height and area. (Remember height limitation of TL.)

5) Street conditions - traffic encountered. Overhead wires, trees.

6) Location of pumper and hydrants.

7) Condition and stability of building.

8) Ground stability.

- Generally the apparatus should be parallel to the building. Occasionally the scrub area of the bucket will be reduced by the cab of the apparatus. "Scrub area" is defined as that area of a building wall which can be touched by the basket. This condition can be corrected by parking the apparatus with the front end angled about 15 degrees from the building line. This will put the cab portion of the apparatus farther away than the rear portion, and in this way the boom can be operated the full extent of its scrub area.

- Regardless of initial placement, it must be realized that as conditions change, repositioning may be required.
Specific Details

- A properly positioned TL provides wall coverage from grade level or below, up to a maximum basket floor elevation of 70' (approximately), at the maximum 75 degree angle.

- The basket while touching a point 32 feet horizontally from center of turntable can reach a basket floor elevation of 65 feet.

- TL scrub area covers the front of a building 60 feet high and 50 feet wide, and will cover a 100 foot frontage on the lower three floors of a building.

- It has a scrub area of approximately 7750 square feet when the center of the turntable is 32 feet from building wall and cab is at a 15 degree angle to the building line.

- The basket can also reach points 10 feet below grade.

Positioning on Hills:

- Position apparatus parallel to the direction of slope so that boom operations will be in the "up-hill" direction. If possible, apparatus should be facing "down-hill", e.g., if facing downhill, turntable past the objective. If facing uphill, turntable before objective.

- All operation of boom should be performed at low speed and delicately while on steep inclines. Sudden stops in maneuvering can cause damage to apparatus and/or cause apparatus to "skip" downhill.

**Note:** Sudden starts and stops should be avoided under all operating conditions.
4.2 USE OF TOWER LADDER FOR RESCUE AND REMOVAL

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

♦ Rescue via basket is affected in several ways. Entering and exiting from basket shall be through the double-acting swinging gates. Initially the basket is elevated to a point where the middle railing of basket is level with the window ledge, or level with the top railing of the fire escape.

  ▪ Middle basket railing positioning permits placement of basket flooring at a level where a person can easily step onto it without the usual straddling of window sills or fire escape railings.

  ▪ To facilitate removal of incapacitated or obese victims, position the top basket rail level with the window sill or top rail of fire escape.

♦ Positioning of basket must be such that the Stang nozzle will not interfere with the rescue operation. This will require an angular approach that will permit ease in entering or alighting from basket.

♦ Parapet-less roofs can be safely approached by actually placing the basket directly on the roof, if possible, especially when ice conditions are encountered, to effect removal of persons trapped thereon.

♦ When many trips of the basket are required to remove a great number of occupants, safe removal need not necessitate delivery directly to the street level. Occupants may be placed at lower levels of the fire building or any other area of refuge.

4.3 TOWER LADDER STREAM OPERATIONS

♦ Authority and Responsibility for Use of TL Streams

  ▪ Only the officer in command of operations may order the use of TL streams.

  ▪ Large caliber outside streams generally should not be directed into occupied buildings. Members must be warned and occupants be removed before starting water. However, in some circumstances fire conditions or life hazard may demand such use.

EXAMPLES:

  o Fire extending via cockloft and top floor untenable.

  o A stream, preferably fog used at an acute angle to building, used to protect people on the fire escapes because fire is emitting from windows below them.
In the event hand lines cannot advance due to fire conditions, a fog stream, into floors of certain type occupancies where many windows are accessible. A rapid traverse from window to window affects a quick knockdown of the fire. Use of fog reduces structural and water damage.

- The air movement resulting from large caliber stream use must be considered. This air movement effect of the stream will drive heat and combustible gases into uninvolved areas of the building.

Employment of Streams

- Developments requiring the use of TL streams shall be anticipated. Preparations for such usage shall be made as early as possible.

- When fire building is heavily involved on several floors, heavy stream delivery should generally start at the lowest level and work upward, effecting a quick knock-down on the way up to top floor and/or cockloft area. Prevention of fire spread upward or extension via cockloft is the prime objective.

- Positioning the nozzle close to and low in the window will insure:
  - Opening ceiling with stream to expose fire area or cockloft and extinguish fire therein. Operating into cockloft, work stream from party wall of most serious exposure toward center of building then from party wall of other exposure toward center or a roof opening.
  - Maximum stream penetration.
  - Good deflection off ceilings and walls.
  - In extreme situations the stream through attic window of peaked frame dwelling can be used to ventilate by literally blowing off the roof.
  - Removal of partitions with stream and/or moving stock to reach seat of fire.
  - Initially reduce members in basket being exposed to escaping heat at higher level of window operations.
Primary consideration must be given to the safety of members, particularly in commercial buildings. The TL should be positioned and the boom maneuvered in such manner that damage from falling cornices and collapsing buildings will be avoided. Where stability of the building is in doubt, the basket shall be placed at least the same distance horizontally from building as it will be vertically below the top of the wall to minimize the effects of falling materials.

♦ Water Delivery

For optimum effectiveness of TL streams, the following guidelines are to be considered:

- Supply water to base of TL at 200 to 250 psi. Satellite Water Unit is the best source of supply, if available with largest diameter hose used.
- Relief valve of TL should be set at 250 psi.
- Generally only one source at base of TL is used.
- Conventional pumpers should be placed as close as possible to the TL. If necessary, relay operations should be employed to achieve desired placement of pumper adjacent to TL.
- When necessary to shut down or to regulate pressures, do so at the relay pumper and not at the TL base gated Siamese.
- Be prepared to move TL for greater effectiveness as conditions change. With proper teamwork the relocation can be accomplished within minutes.
- Unless operations can be greatly facilitated, do not use TL as a standpipe. This immobilizes the unit for other services. TL could be used to stretch line up exterior with Engine Co. personnel, line lashed into building and engine operations commenced, freeing TL for other operations.
- When stretching 3-1/2" line to TL Siamese, stretch male end to TL whenever possible to avoid need of extra fittings and time loss.
- Whenever possible and conditions permit, water supply to TL shall be from pumper and water source other than that supplying the 1st due companies hand lines.
- All hose connections at TL shall be spanner tight to avoid leakage.
5. CONCLUSION:

This section introduced the primary apparatus of ladder companies currently in service. At any incident one of the initial objectives is to properly position the incoming ladder company apparatus due to the aerial/tower ladder capabilities and the need for portable ladders and tools to be in proximity of the incident. Since it’s so important to achieve this objective, it’s equally important that the members operating are familiar with, the operation, as well as capabilities and limitations of this apparatus.