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## AERIAL LADDER OPERATIONS AND MAINTENANCE

### SCOPE

This guideline shall apply to all members of the Stoney Point Fire Department and shall be adhered to by all members.

### PURPOSE

To establish the procedures for the safe and proper maintenance and operation of an aerial ladder apparatus by Stoney Point Fire Department personnel.

### DEFINITIONS

**Aerial** – fire apparatus with integrally mounted hydraulically operated ladder and pre-piped waterway with nozzle

**Apparatus** – vehicle designed and equipped for fighting and extinguishing fire

**Collapse Zone** - area extending horizontally from the base of the wall to 1 ½ times the height of the building

**Fly Section** - extendable section of aerial ladder

**Guideline** - a general rule, principle, outline of a policy

**Member** – any career, volunteer, staff, and auxiliary personnel affiliated with the department

**Outrigger** – stabilizers that extend from the apparatus to transfer the center of gravity of the apparatus and prevents it from tipping as the aerial device is extended away from the centerline of the ladder truck

**Scrub** - building area that a positioned aerial can affect with its ladder or elevated master stream

**Shall** - indicates a mandatory requirement

**Turntable** - rotating platform at the base of an aerial ladder usually containing the operator's panel

**Waterway** – pipe or hose attached underneath an aerial ladder for servicing an aerial master stream device

### GUIDELINE

Stoney Point Fire Department is an all hazards emergency response organization. An essential component to structure fire incidents is Truck 1351, the aerial ladder apparatus. The proper maintenance and operation of this apparatus is crucial to the effective department response to automatic aid calls in Fayetteville and in district structure fires. It is important for Driver/Operators, Engineers, and Officers to understand the proper deployment and employment of this specialized apparatus.

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### **Aerial Apparatus Safety**

It is the responsibility of the Driver/Operator, Engineer, Company Officer and Duty Chief to ensure the safe and efficient operation of 1351 at an incident scene. The following measures shall be followed to ensure safe operation of the apparatus:

- Maintain situational awareness at all times
- Avoid positioning 1351 too close to the fire structure or an exposure to prevent the aerial from becoming an exposure
- Ensure all Firefighters working from the aerial ladder wear an approved ladder belt
- Safely position 1351 on a hard surface such as concrete or asphalt
- Aerial operators shall know the capabilities and limitations of 1351
  - maximum tip load limit considers personnel, equipment, and water flow
  - distributed load limit for each fly section varies depending upon the extension and angle of the ladder
  - total load limit varies depending on the extension and angle of the ladder
  - limits decrease as the aerial is in motion
  - follow manufacturer's recommendations
- Do not maneuver the aerial ladder within 15 feet of an overhead powerline
- Complete a 360 degree check of the apparatus and above to identify any obstacles to the aerial ladder
- Avoid moving the aerial ladder while Firefighters are on it
- The Aerial Operator shall not leave the turntable when the aerial ladder has been deployed for firefighting operations
- A Firefighter shall descend the ladder first when assisting or carrying a victim
- Utilize 2 ground guides when moving 1351, 1 in front and 1 in the rear
- Provide a secondary means of egress such as an extension ladder or another aerial device, for the Firefighters working on the roof
- Firefighters shall sound the roof with a hand tool before exiting the aerial device
- Make sure that the roof division team consists of a minimum of three personnel
- Ensure the ventilation team has the correct equipment for the roof structure and covering (rotary saw, pike poles, axe, etc.)
- Avoid disturbing structure ventilation by flowing water into ventilation openings
- Avoid flowing water from the elevated master stream into a structure until Incident Command has accountability of all personnel and gives the "all clear"
- Keep the floor below the ventilation area clear to prevent Firefighters from getting hit by falling glass or debris

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### Response

Upon receiving a call for an incident that requires an Aerial Ladder Truck response, such as a Fayetteville structure fire call, 1351 shall be placed enroute. The apparatus shall respond emergency traffic and the Officer shall contact the Incident Commander. The Officer shall request assignment and deployment information and give guidance to the Driver/Operator or Engineer.

### Determining the Best Position for Aerial

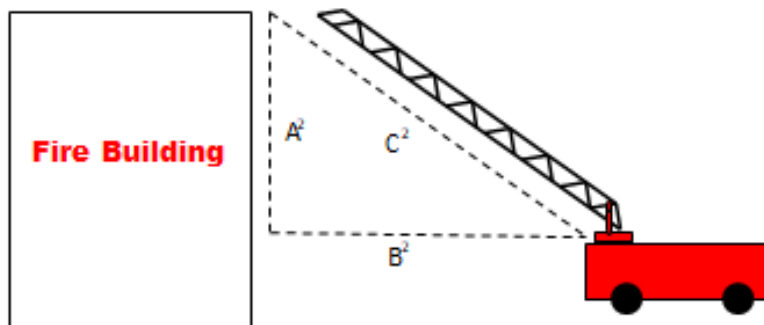
Truck 1351 is a 75-foot ladder. However, the ladder is only 65 feet long, so determining the best position for the employment of 1351 requires some thought by the Incident Commander, Company Officer and Operator. One of the first factors to consider is 1351's reach. For this the Operator shall estimate the height of the target structure. This will give the Operator the "A" part of the equation. Multiplying the "A" by 1.5 will give the Operator the "B" part of the equation. The Pythagorean Theorem equation is A squared plus B squared equals C squared. To determine the reach, find the square root of "C". For example, the height of the building below is 20 feet. So "B" will be 30 feet. The square of "A" is 400, and the square of "B" is 900, so "C" is 1300. The square root of 1300 is just over 36. So the reach required to service this structure would be 36 feet.

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### Estimating Reach and Position



$$A^2 + B^2 = C^2$$

$A^2$  is the distance from the bottom of the turntable to the target

$B^2$  is the distance from the building to the base of the turntable

$C^2$  is the ladder reach from the turntable to the target

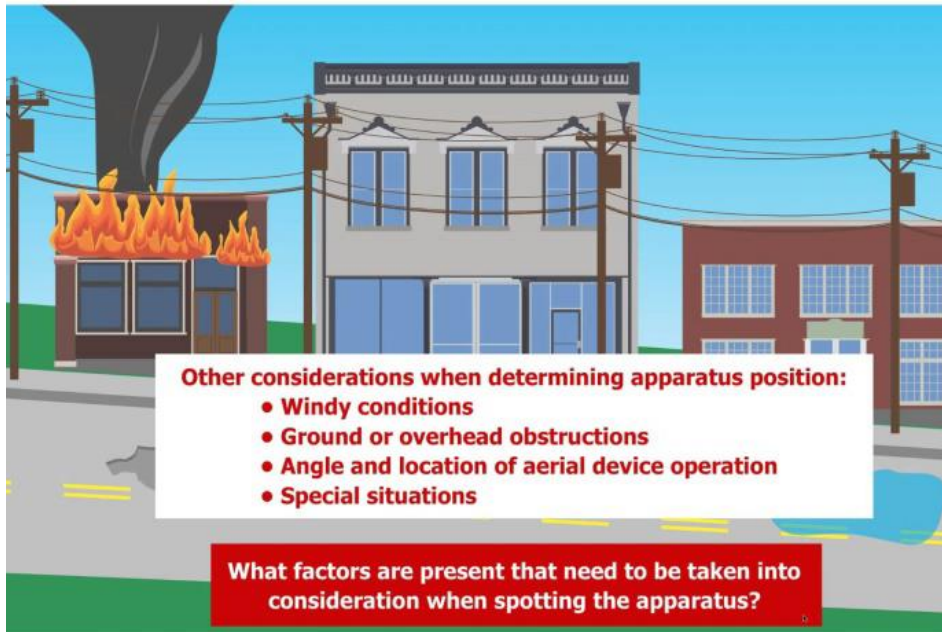


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Other issues that may determine where an apparatus is positioned are the following:

- Wind direction and speed
- Proximity to the fire
- Overhead obstructions

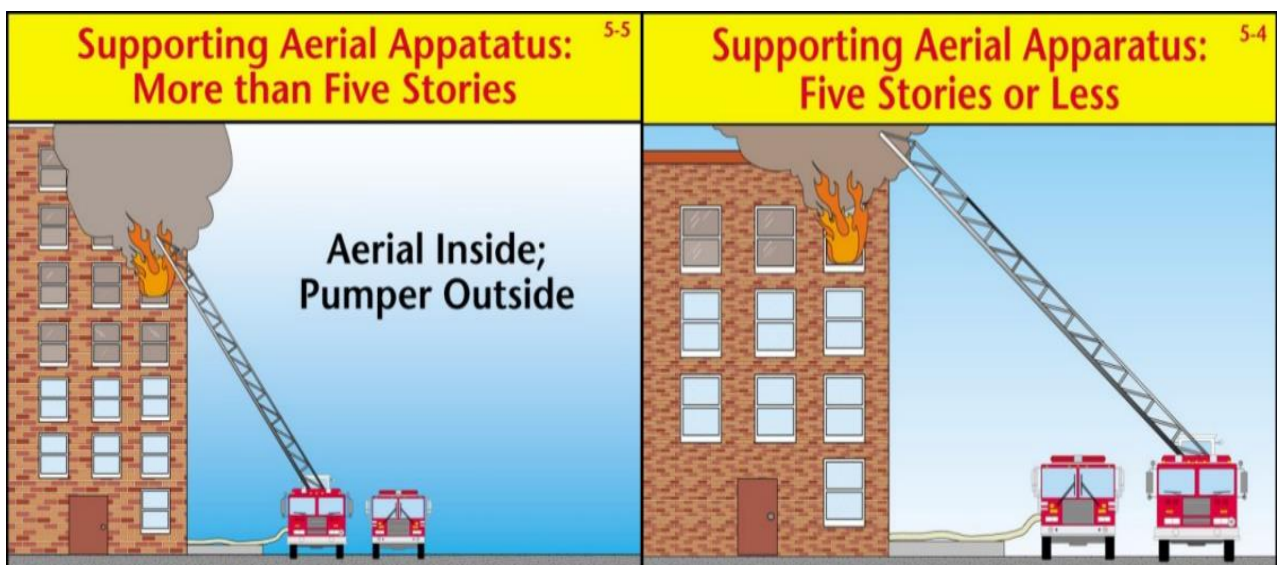


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- Height of the structure

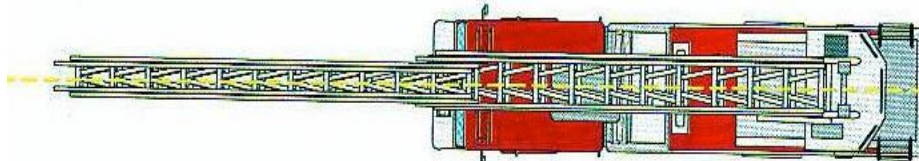




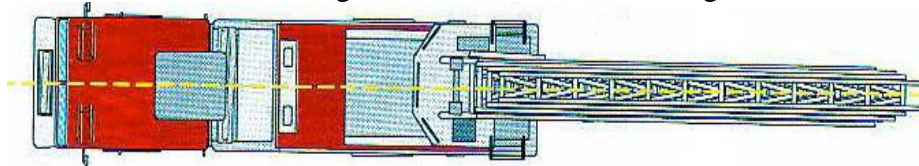
### Positioning

Upon arrival at the scene the Officer shall dismount and assist the Operator in positioning the apparatus in accordance with the Incident Commander's instructions. Only the Driver/Operator shall set up the aerial.

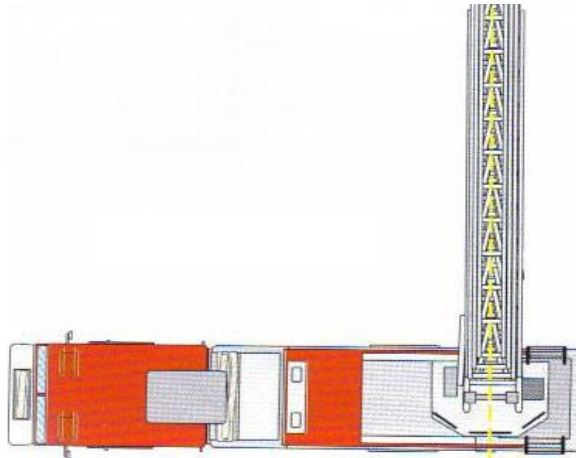
- Position 1351 on a hard, solid surface to facilitate outrigger deployment
  - 1351 shall not leave an asphalt or concrete surface unless directed by the Incident Commander
  - if on a hill, 1351 shall be positioned with the cab uphill
  - if possible position 1351 with the longitudinal axis in line with the structure to provide the most stability
    - longitudinal axis with cab facing the structure



- longitudinal axis with rear facing the structure



- perpendicular axis with apparatus parallel to structure



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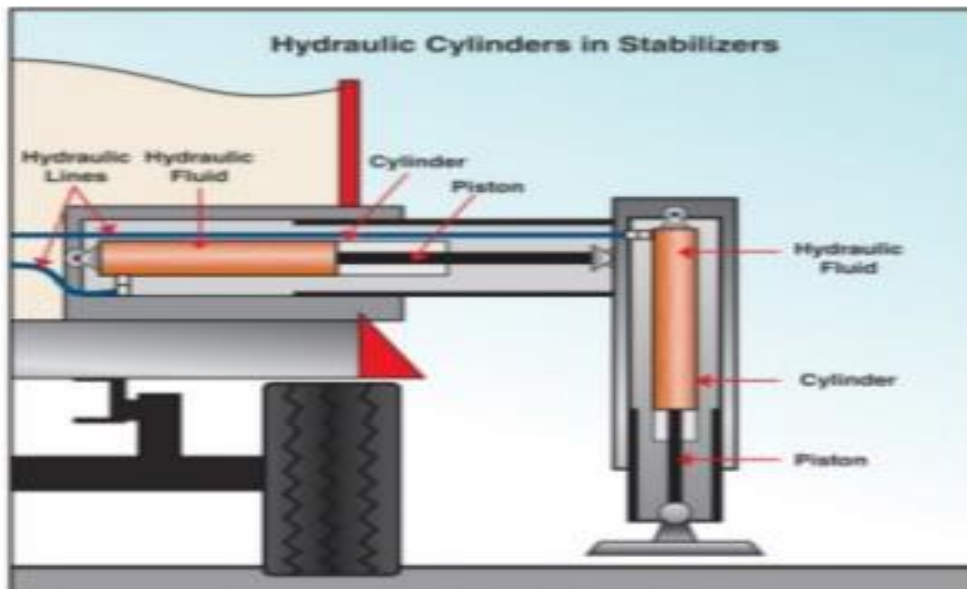
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- Conduct a 360 degree check for overhead obstacles such as trees and powerlines
- Deploy 1351 for aerial operations in accordance with the manufacturer's recommendations
  - place apparatus in neutral
  - engage the parking brake
  - position wheel chocks 2 inches from the front and rear of both front wheels
  - place the apparatus in pump gear
  - engage the Hot Switch PTO
  - position the ground pads on both sides of 1351 with the handles facing in
  - turn on the aerial power at the right rear of 1351
  - place the switch in the "jack" position
  - extend and lower each outrigger until it touches the ground pad
  - lower the high side outrigger first and use the low side outrigger to level the apparatus laterally
  - stair step the outriggers using the levels at center rear of 1351 to ensure a stable and level platform (remain in the green)
  - raise 1351 until the bulges are removed from both rear wheels (remember to monitor the level indicators, remain in the green)
  - switch from "jack" to "ladder" power at right rear switch
- Operator positions themselves either at the pump panel, or at the turntable

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- Conduct operations



### **Moving the Aerial Ladder**

The aerial ladder may be operated from either the pump panel position or the turntable. It is important to remember that the pump panel is the only location to operate the pump, there are no pump controls on the turntable. A decision shall be made on the function of 1351 prior to the Driver/Operator ascending to the turntable for operations. Once firefighting operations have commenced, the Aerial Operator cannot leave the turntable. Moving the aerial ladder shall follow these steps:

- Engage the fast idle
  - faster speed
  - more sensitive controls
  - not to be utilized in close proximity of the target
- Turn on the panel and ladder lights
- Recheck the area for overhead obstacles
- Use smooth controlled movements of the controls
  - avoid sudden starts or stops to prevent sway
- Raise the ladder from the cradle to an angle above the target
- Rotate the ladder in line with the target
  - visibility of the tip is greater when rotating clockwise
- Extend the ladder to the desired height
- Lower ladder to the target, adjusting the length as necessary
  - spotters should be utilized when possible to prevent damage to ladder and waterway, and nozzle from obstacles
- Ladder should always remain 12 inches above walls, parapets, obstacles, or rooves to prevent the waterway or ladder from touching when loaded
- Ensure rungs are aligned (orange light on control panel) prior to allowing Firefighters to ascend or descend the ladder
- Never extend or retract the ladder with a Firefighter on the ladder
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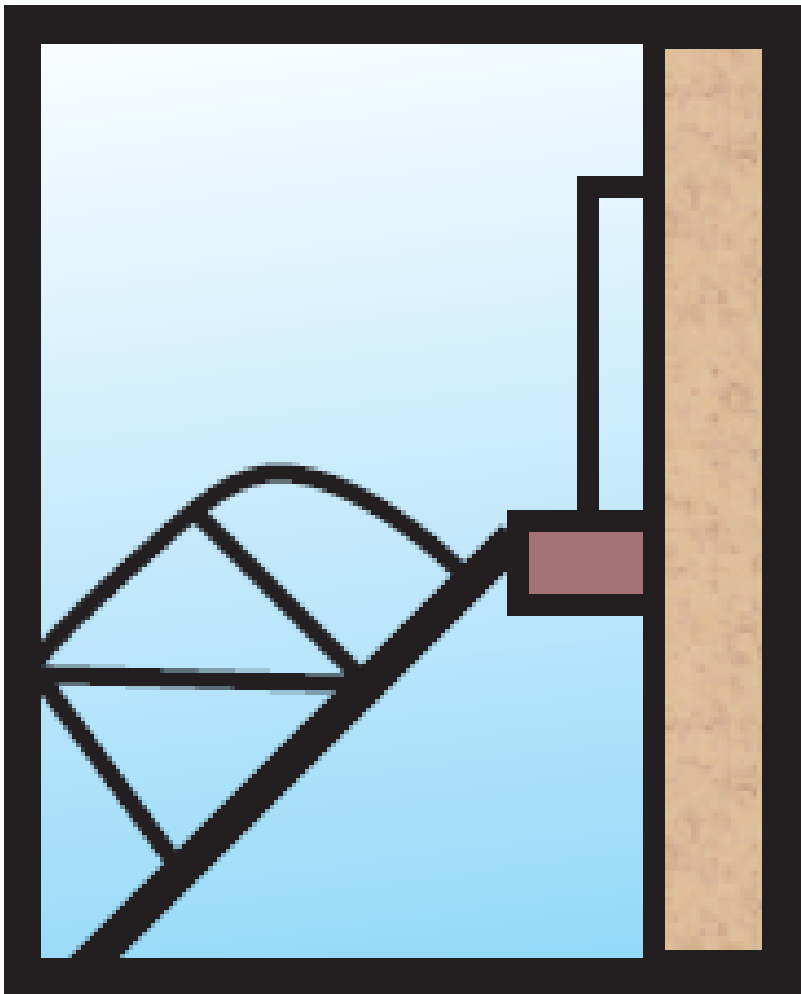


### Rescue Operations

When utilizing 1351 for rescue operations the priority for victim consideration is:

- Individuals closest to the fire
- Largest number of people
- Remainder of the people in the fire area, people in exposed areas

Rescuing a victim from a window is conducted by raising the ladder above the window, extending the ladder to the desired length, and then lowering the ladder to the victim. This prevents the victim from reaching for the ladder before it is in a safe position. The first rung should be positioned level with the windowsill and up to 12 inches away to prevent an accidental strike. Be careful to not block the window.



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### Rescue from or Operations on a Roof

When conducting ventilation, firefighting, or rescue operations on a roof, there are important considerations when utilizing 1351. Among these considerations are the type of roof, and the existence of a parapet surrounding the roof. The following steps shall be followed for roof operations utilizing the aerial ladder:

- Raise the ladder above the target
- Extend the ladder above the target
  - 6 feet above a flat roof (if possible) and far enough away to prevent the waterway from touching the wall or roof
  - 3 rungs over the parapet for a parapeted roof
    - ensure a roof ladder is taken to the roof
- Have Firefighter ascend ladder and sound roof
- Position roof ladder and have a Firefighter foot it for victims
- Conduct ventilation or firefighting operations
  - ensure that a secondary means of egress is provided
    - additional aerial device on a different wall
    - extension ladder on a different wall
- Escort victims from roof, Firefighter descends first

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### **Ventilation from the Aerial Ladder**

When conducting horizontal ventilation operations from the aerial ladder the crew shall follow these steps:

- Firefighter on the ladder shall be in full personal protective equipment
  - structural firefighting gear, self contained breathing apparatus
  - ladder belt
- Intercom is turned on at tip and control panel
- Ladder is positioned upwind and slightly above the desired window
- Firefighter is ordered to ventilate the window by the Incident Commander
- Firefighter is prepared for a rapid expansion of gases, heat, smoke, and flames
- Firefighter descends the ladder or is moved away from the window

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### **Elevated Master Stream Operations**

The use of the elevated master stream for defensive operations requires a sufficient water source to supply 1351. The apparatus shall be positioned to obtain the most efficient use of the elevated master stream. The area of the structure that the elevated master stream can effectively cover without repositioning is called the “scrub”. Traditionally, the best location for an elevated master stream is at one of the corners so that two sides of the structure can be covered without moving the apparatus. The straight stream function of the fog nozzle master stream shall be utilized to obtain the maximum reach and penetration. No elevated master stream operations shall be initiated until all Firefighters are safely accounted for out of the structure.

### **Water Supply**

When conducting elevated master stream operations with 1351 an Engine Company shall be assigned to provide water supply. The water supply operation shall be conducted utilizing a reverse lay from 1351 to the hydrant so that the Engine Company can pump the water to 1351. Large diameter hose shall be utilized to provide the maximum available water to 1351. Stoney Point Fire Department Engines are the only Engines permitted to pump through the waterway of 1351, all others shall supply 1351’s pump. Upon completion of elevated master stream operations, ensure that the waterway drain is opened prior to bedding the ladder.



### **Exposure Protection**

Utilizing the elevated aster stream to protect exposures is another important task for 1351. It is important to understand the hazards affecting the exposure:

- Weather
- Building construction
- Distance between the fire structure and the exposure

The apparatus shall be placed to provide maximum coverage of the exposed building. Attempt to attain the largest scrub area without repositioning the apparatus. Protect the structure by maintaining a large caliber fog pattern to cool the structure and prevent flame impingement. Use a wide sweeping pattern to cover the maximum amount of area.

### **Stowing the Aerial Ladder**

Prior to stowing the aerial ladder following operations it is important to ensure that the waterway drain is completely open. This shall prevent any seals being damaged during the retraction of the ladder. Stow the ladder by following:

- Fully elevate the ladder away from the structure
- Slowly retract the ladder
- Rotate the ladder until the arrows on the right of turntable align
- Ensure that the scene lights are lowered, rotated out and down
- Lower the ladder slowly to the bedded position
- Observe the bed guides to ensure that the ladder is aligned
- Bed the ladder by holding the down control until the ladder seats properly and is locked down

### **Routine Maintenance**

Truck 1351 shall be cleaned on a routine basis to prevent damage to the finish. This washing shall be conducted by hand, utilizing approved truck wash, sponges, and a hose. Brushes and pressure washers are not authorized for cleaning the apparatus. The exterior shall be dried with chamois cloth. Care shall be taken to ensure that grease shall not be washed away from the ladder, turntable, or outriggers.

The interior shall be cleaned by hand using, brooms, rags, and approved cleaners. Care shall be taken with the electronics to prevent water damage.

Truck 1351 shall be waxed quarterly utilizing the approved wax and applicators only.

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### Basic Maintenance

Only designated aerial operations qualified Firefighters are permitted to conduct the preventive maintenance and checks on Truck 1351. This maintenance includes:

- All maintenance not requiring the ladder to be raised or outriggers positioned
- All maintenance not requiring the cab to be raised
- Fluid checks not requiring the above limitations
- Tire pressure checks
- Any Driver/Operator or ISO checks not exceeding the above limitations

Any fluid shortage (oil, radiator fluid, hydraulic oil, etc.) shall be verified by the shift supervisor and the Operations or Duty Chief prior to adding any fluids. Adding fuel shall not be restricted and added on fuel day when the fuel gauge reads  $\frac{3}{4}$  full. Tire pressures shall be checked daily and verified by both the shift supervisor and Operations or Duty Chief.

- Inventory discrepancies shall be addressed to the shift supervisor
- Maintenance issues shall be annotated in Firehouse and immediately referred to the maintenance technician at Station 19
- All maintenance issues shall be mitigated by maintenance personnel
- Specialized maintenance checks shall be accomplished by the maintenance personnel

All daily, weekly, and monthly inspection forms will be properly and legibly completed and submitted to the maintenance Officer.

### References

NFPA 1002

NFPA 1710

Truck Company operations (Firehouse)

Tips for Proper Aerial Ladder Placement on the Fireground (Fire Rescue Magazine)

Aerial Apparatus Scrub Area and Apparatus Footprint (Fire Engineering)

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