		MUKWONAGO FIRE DEPARTMENT OPERATING PROCEDURES	
Truck Company Operations		Approved by: Chief Jeffrey R. Stien	
SOG #12	Draft Date: 09/25/14	Revision Date:	Effective Date: 10/30/14

PURPOSE: The purpose of this policy is to outline safe truck company operations for the Mukwonago Fire Department.

SCOPE: This policy is to be followed by all officers and members of this department. Authority to deviate from this policy/procedure rests with the Chief of the Department who will be responsible for the results of any deviation.

Definitions:

Aerial Types:

Mid-Mounted Aerial Ladder
Rear-Mounted Aerial Ladder
Mid-Mounted Aerial Platform
Rear-Mounted Aerial Platform

Base-Section – the lowest most section on an aerial
Mid-Section – is any of the sections used between the base section and the fly section
Fly-Section – the top most section on an aerial
Short-Jack Operation – allowing aerial to operate in predefined zones with outriggers/stabilizers not fully extend
Torque Box (tube) – part of an aerial attached below the turntable to transfer torsion loads to the chassis and outriggers.
Turntable – part of the aerial device attached to the base ladder section designed to articulate the position for rescue or firefighting
E-Tracking - a flexible track utilized to protect electrical, communication and control wires in aerial extension/retraction
Soft-Touch Control - electric control of aerial functions through the use of a remote manual control programmed to slowly start and stop aerial functions
Auto-Bedding Control – automatic aerial bedding when aerial is in predefined zone

Dead Load – weight of aerial and attached mechanism and equipment

Live Load (Tip Load) – weight and forces exerted on the aerial by payload, and water stream reactions.

Outrigger/stabilizer – a hydraulic lifting mechanism designed to prevent aerial overturn and transfer loads to the ground

Rated Capacity – total weight of payload at the outermost ladder rung or platform according to ladder load chart

Cab-Body Collision Protection – program preventing aerial device from collision with chassis and equipment mounted on the body

Pinable Waterway – manual device designed to place the waterway at the tip or next lower section

Modified Warren Bridge – design of aerial structure to transfer loads up and down the aerial device.

Bolt-On Egress – outermost extension device designed for personnel to climb on/off the end of the aerial

Yield Strength – point at which the material exhibits a permanent deformation or set

Water Load – stress produced by water weight and nozzle reaction overhead to the side and below stream applications

Hot Dipped Galvanized – a process for treating steel ladder and stabilizers to prevent corrosion and oxidation on the inside and outside of all the ladder parts

Dead load Stress – stress produced by the aerial structure weight and any permanently mounted or manufactured equipment

Rated Capacity Stress – stress produced by the aerial rated capacity applied to the tip of the fly section

Water Reaction Stress - weight of the water and nozzle reaction force

Material Yield Stress – the stress at which a material exhibits a distortion or permanent set

Load Limit Indicators (Load Charts) - a load indicator or instruction plate, visible at the operators position, showing the recommended safe load at any condition of the aerial's elevation and extension

Positioning of the Truck for Operation:

1. Determine if the aerial will be used as a water tower or for rescue.
2. Make sure to note ALL overhead obstructions.
3. Scan scene to position the truck for best attack.

NOTE: For the best positioning, a corner of a building is highly suggested. This gives the operator access to two sides of the structure as well as the roof. The front of the apparatus must be positioned uphill.

REMINDER: The operator should always observe the placement of the fire fighting vehicle to be sure that there is enough space for the stabilizers to be set and the aerial to be operated without any obstructions.

Obstructions to be most aware of include, but are not limited to: adjacent buildings, curbs, drop-offs at road edges, man holes, vehicles, trees, overhead electrical wires, ditches and culverts.

When setting up the stabilizers the ground must be firm. It is highly recommended that the operator uses the outrigger pads provided. Setting up over manholes, underground parking facilities or storm drains could cause serious damage to the operator and/or serious damage to the truck. The area must be able to support 75 PSI or the weight of the vehicle.

Safety around the Vehicle:

EXHAUST FUMES

- Be conscious of exhaust fumes when working around the vehicle.
- Ensure that there is adequate ventilation.
- DO NOT alter emission controls.

COOLING SYSTEM

- Ensure there is adequate clearance between fan and shroud.
- DO NOT alter fan ratio, spacers or position.
- Observe fan clutch operation to ensure fan is disengaging when cooling is not necessary.

AIR INTAKE SYSTEM

- DO NOT alter any intake piping or filter locations.

UNDERCARRIAGE

- Notify others when working underneath the vehicle.
- Keep away from moving parts.
- Avoid hot areas such as engine, transmission, exhaust and pumps.
- Avoid ports that may eject steam or other hot fluids.

COVERS AND DOORS

- DO NOT sit, stand, climb or hang on open doors.
- Some doors are spring loaded. Use caution when opening doors.
- Use care not to get fingers and hands caught in pinch points such as hinges.

- Do not drive with doors partially closed.

TIRES AND WHEELS

- DO NOT operate vehicle with damaged or improperly inflated tires.

Vehicle Operational Safety:

VEHICLE BACKING

- Use a spotter when backing vehicle.
- Establish hand or verbal communication prior to backing.
- During periods of low light use spotter with wands and reflective vests.

VEHICLE CONTROL

- Ensure proper tire inflation before operating vehicle.
- A neutral safety switch prevents vehicle from being started in gear.
- Allow starter to cool for one minute if vehicle doesn't start within 15 seconds.
- Familiarize yourself with gauges, switches and on-board accessories prior to operating vehicle.

Cab Tilt Procedures:

- Before tilting cab check the following:
- Front bumper storage lid is closed.
- No equipment on front bumper.
- Inside cab -all loose equipment removed such as air packs, books, portable radios, helmets, etc.
- Must set jacks and raise the aerial before tilting the cab.
- Raise the aerial to 20 degrees.
- Shut the engine down.
- Leave the battery switch on.
- Connect the switch to the driver's side pump panel and raise cab.
- Make sure safety bar is set.
- To lower make sure area is clear to lower.
- Raise cab up fully.
- Pull cable until safety lock is away from the cab cylinder and hold.
- Hold switch down.
- Cab will automatically lock down.

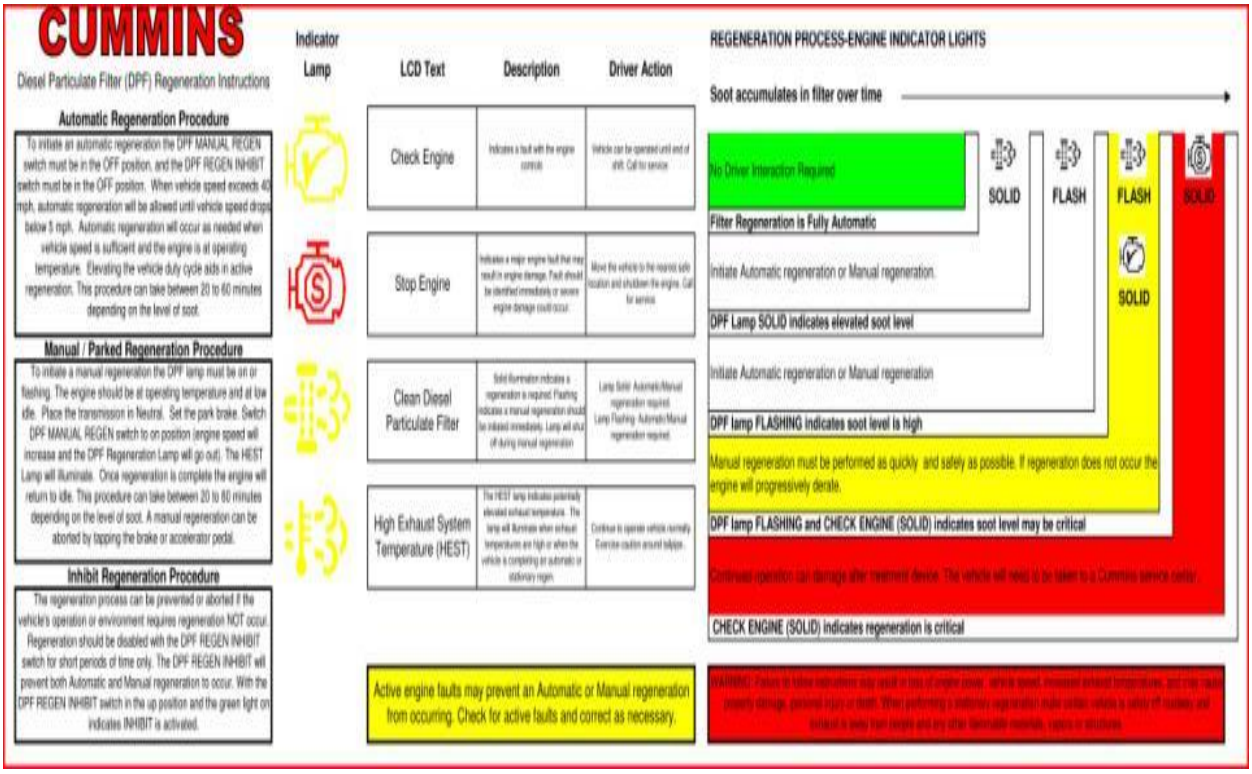
Anti-Electrocution Platform:

- The pump control panel operator should stand on anti-electrocution platform when the aerial is being operated.
- Standing on the anti-electrocution platform will raise the pump operator off the ground and keep the operator from being a pathway to ground for electrical current if the aerial contacts and energized line.

Pump Engagement:

- Neutral
- Switch road to pump
- Shift to 4th gear

Engine Indicators



Outrigger shortjacked reach restriction description:

- While an outrigger is extended 15 inches or less, the aerial will be blocked from rotating over the area the outrigger is designed to support. The aerial will be permitted to rotate back the other way. The alarm will activate when the capabilities are reached within the following limitations:
- While an outrigger is extended 26% to 50%, reach of the aerial will be limited to approximately 40 feet while over the short jacked outrigger
- While an outrigger is extended 51% to 75%, reach of the aerial will be limited to approximately 45 feet while over the short jacked outrigger.
- While an outrigger is extended 76% to 95%, reach of the aerial will be limited to approximately 50 feet while over the short jacked outrigger.

Setting up the cab for aerial operations:

1. Shift transmission from drive into neutral.
2. Apply the parking brake.
3. Switch on the aerial master. When the aerial master is switched on there is electrical power to the aerial system. At this time flashing lights on the outriggers will begin to operate.
4. Switch on the Power Take-Off (PTO), pump switch if going to use.

Note: It is important to note that step # 4 cannot be performed before step # 3 has been completed and step # 2 cannot be completed until step # 1 has been completed. Some trucks will have the aerial master and PTO switch combined.

The transmission must be in neutral or 4th gear for the water pump to be engaged. The parking brake must be set before the ladder power will operate. If the water pump is engaged, the high idle of the aerial will be disengaged.

Outrigger operation set up:

- Once the ladder power is activated, the flashing light on the inside of the outrigger jack tubes will begin to flash and the outrigger jack scene lights will come on.
- Outriggers are ready to operate.
- With tire chocks set the operator will proceed to the outrigger station. The Outrigger Not Extended Light will be illuminated. This light will stay illuminated until all outriggers have been fully extended and are making contact with the ground.
- Move Outrigger On/Off Switch to the ON position. This will cause the high idle to engage and the warning alarm will begin. The alarm alerts all other personnel the outriggers are being positioned. If the water pump is engaged the high idle of the aerial will be disengaged.
- The outrigger controls are located to the back, outside of the truck to provide the operator a good clear vision to set up the outriggers.
- The controllers are designed to move in the same direction as the corresponding outrigger.
- Position outrigger pads under jack locations
- Lower outrigger jacks. The controllers are designed to move in the same direction as the corresponding outrigger. (Example: To lower the right outrigger you would push down on the controller.)
- Take the bulge out of the truck tire or level truck as much as possible.
- As the truck is leveled or the bulge is taken out, each Jack Indicator Light will respond according to how the outrigger is set (see different setting under Jack Indicator Light description on the control panel).

- Once all outrigger beams are fully extended and making contact with the ground the Outrigger Not Extended Light will go out.
- When outriggers are set move the Outrigger On/Off Switch to the OFF position.
- Install outrigger jack safety pins. Safety pins are not required for operating the aerial. However, we strongly recommend installing them as an additional backup safety feature.
- Outrigger operation set up is completed.

Should any two outriggers at any point come off the ground the aerial will come to a feather-soft stop. The operator will need to retract and raise the aerial out of the unsafe position; once the aerial is in a safe position the aerial can continue operations as normal.

If a case arises where the aerial needs to be overridden, activate the momentary Aerial/Outrigger Override Switch up to Aerial Override. A second operator will then need to adjust the aerial to the desired location using the manual aerial controls (extend/retract, left/right, raise/lower). Extreme caution must be taken when using the overrides. **This has to be cleared by truck officer or IC!**

Outrigger Control Panel:

- Outrigger Jack Lights

  The Jack Lights are provided for each outrigger jack to indicate when an outrigger makes contact with the ground. Each individual outrigger status Jack Light has four conditions to provide, at a glance, the position of each outrigger's condition.
  - The Jack Light will remain unlit when the outrigger is fully retracted and the jack is not set on the ground.
  - The Jack Light will flash rapidly (five flashes per second) if the outrigger is extended and the jack is not set on the ground.
  - The Jack Light will flash slowly (twice per second) if the jack is set on the ground but the outrigger is not fully extended.
  - The Jack Light will remain lit solidly if the jack is set on the ground and the outrigger is fully extended.
  - The Outrigger Not Extended Light will be lit solidly if any outrigger is not fully extended
  - The Outrigger Not Extended Light will be lit solidly if any jack is not set on the ground.
  - The Outrigger Not Extended Light will flash rapidly (5 times per second) if the aerial is out of the bed and the outrigger switch is turned on preventing outrigger operations.

Short Jacking:

A red warning light (outrigger not extended light) at the outrigger and aerial operator's control consoles will warn the operator that one or more outriggers have been short jacked. The jack lights on the outrigger panel will indicate to the operator which outrigger is short jacked.
Using the Programmable Logic Controller (PLC), it is possible to safely operate over short jacked outriggers. The PLC takes continual readings of the load, extension, elevation and rotation of the aerial. The PLC allows the aerial to rotate over the short jacked outrigger. If the aerial is moved over an area with a short jacked outrigger the permitted extension and elevation is controlled by the distance the short jacked outrigger is extended.

The operator can rotate the aerial over the short jacked outrigger as long as it is within the safe operating parameters. If the aerial is not within the preset parameters, the PLC system will automatically ramp the aerial to a feather-soft stop. The only way to rotate out of this position is to retract or raise the aerial and rotate it to the side of the truck where the outriggers are fully deployed. If the aerial is lowered or extended too far when rotated into a short jacked area the rotation will come to a smooth feather-soft stop. Retracting or raising the aerial will return it to a safe operating condition.

Emergency Back-Up Pump:

The sole purpose of the Emergency Back-Up Pump is to stow the aerial in case of hydraulic failure.

To Use Emergency Back-Up Pump

- Select the operation required (outrigger or aerial) and move switch to the on position.
- Engage the outrigger or aerial control handle.
- Activate momentarily the Emergency 12V Back-Up Pump
- To ensure that the Emergency Back-Up Pump doesn't over heat, it can only operate 5 minutes out of 60.

Aerial Control Panel:

- Indicators (left disabled, down disabled & right disabled) will illuminate when their respective function of the aerial has been disabled. Should the aerial enter an overload situation the down disable and right and/or left disable light will illuminate indicating the aerial will need to be retracted and raised in order to continue operations. If the aerial is lowered at a preprogrammed position over the cab or body the aerial will come to a smooth stop and the down disabled light will illuminate. If right or left rotation light is on, the aerial is restricted from operating in that direction. With the ladder in the bedded position both left and right disabled indicators will appear and the down disabled indicator will not.
- <u>Rung Alignment Indicator:</u>
  The rung alignment indicator will illuminate when the rungs are aligned. While extending or retracting the aerial this indicator will flash on and off in accordance with

the rungs being aligned. It is recommended that the rungs be aligned when personnel are climbing the aerial for personal safety.

- Emergency Stop Switch:

  Should the operator come into a dangerous situation and need to stop the aerial immediately push down on the emergency stop button at the control station and the aerial will come to an immediate stop. The operator will need to pull up on the emergency stop button in order to reactive the aerial operation controls. When the emergency stop is engaged an indicator will appear on the screen indicating so.

- Aerial Load Monitor:
  The screen will continually indicate the state of the load on the aerial. The green indicator states that the load is within load limits. The yellow indicator states caution, alerting the operator that the load is getting closer to overload the red indicator states overload when the rated load capacity is approximately 100 less than the rated live load. The red indicator will flash between the red and the red with the yellow cautionary symbol over it when the rated capacity is exceeded by more than 100 pounds of the rated live load. A horn will also emit at this time.

- Outrigger Not Extended Indicator:
  The outrigger not extended indicator will be illuminated if any outrigger is short set of doesn't have solid contact with the ground. When any outrigger is preventing the aerial from moving the outrigger not extended indicator will flash with the cautionary symbol.

- Auto Bedding Switch & Indicator:
  When auto bedding icon indicator is displayed auto bedding is enabled. The auto bedding indicator will be moving display on the screen picturing the ladder in the ready to bed state and then bedded. The auto bedding switch is a momentary switch. The aerial needs to be approximately 20% extended 20 degrees to the right or left of the ladder bed and below 20 degrees elevated. Activate on the momentary auto bedding switch and the aerial will automatically bed itself. If the switch is released the aerial will stop moving.

- Radio Remote Control Switch:
  In order to operate the aerial from the Wireless Radio Remote push the button to turn it on. The operator at the turntable control stand or seat can override the Wireless Radio Remote at any time by placing the radio remote switch to the off position. When the indicator is green I is on and when it is black it is off.

- Flow Meter Button:
  The flow gauge will give a continuous reading of the water flowing from the monitor and the pressure. If you press the button you will see total gallons flowed.

The next 4 switches can be controlled at the turntable seat and the platform

- Tracking Lights Switch:
  To activate the tracking lights, (lights located on the base section in front of the elevation cylinders) the button will need to be pushed to activate the lights on and off. This button will activate all AC and DC tracking lights as well as the panel lights and operational rung lighting. The indicator on the screen will display a grey light when lights are off. The indicator on the screen will display yellow when the lights are activated. Most AC and DC light provided also include a switch on the lamp head itself. If personnel switched the switch on the lamp head to the off position the operator will not be able to override it from the control panel. The switch will need to be reengaged from the lamp head.

- Tip Lights Switch:
  To activate the tip lights, (lights located on the front of the platform) the button will need to be pushed to activate the lights on and off. This button will activate all AC and DC tip lights. The indicator on the screen will display a grey light when lights are off. The indicator on the screen will display yellow when the lights are activated. Most AC and DC light provided also include a switch on the lamp head itself. If personnel switched the switch on the lamp head to the off position the operator will not be able to override it from the control panel. The switch will need to be reengaged from the lamp head.

- Scene Light Switch:
  To activate the scene lights (lights located under the platform) push the button to the on position. The indicator on the screen will display a grey light when the lights are off. The indicator on the screen will display a yellow light when the lights are activated.

- Platform Warning Light Switch:
  To activate the warning lights (lights located on the side of the platform) push the button to the on position. The indicator on the screen will display a grey light when the lights are off. The indicator on the screen will display a flashing red light when the lights are activated.

- Platform Breathing Air:
  The Smart Aerial air will be continuously monitored and displayed on the screen. The green indicator states that there is enough air in the bottle. The yellow indicator states that there is only 30% air left in the bottle. The red indicator will start flashing between solid stated. The red with cautionary symbol indicating there is less than 20% of air in the bottle. At this time a horn will sound. The percentage of air in the bottle will continually be displayed on the indicator.

Wireless Radio Remote:

In order the use the wireless radio remote the radio remote switch needs to be turned to the on position on the turntable control console.

- Turn the on/off switch to the on position
- Push the enable switch and operate one of the aerial functions within two seconds. If the aerial functions have ceased for more than 5 seconds the enable switch must be pushed again to start aerial operations.

  NOTE: If no aerial or monitor operation occurs, release the enable switch and move it to the frequency side to find a new frequency and then back to enable to operate aerial or monitor function.

- If you want to run the aerial at 100% speed turn the 100%/50% switch to 100%. If you want to run it at approximately half speed switch it to 50%.
- Use the aerial extend/retract, clockwise/counterclockwise and lower/raise joysticks to operate the aerial to the desired location.
- For monitor controls the radio transmitter must be turned on and the monitor switched will be activated. The monitor controls run the monitor stream/shape, clockwise/counterclockwise and raise/lower momentary switches.
- The feedback screen will give the operator continuous readings of aerial position including extension, rotation, elevation, aerial load, outrigger deployment and breathing air levels.
- If you want to run the aerial at 100% speed turn the 100%/50% switch to 100%. If you want to run it at approximately half speed switch it to 50%.
- Use the aerial extend/retract, clockwise/counterclockwise and lower/raise joysticks to operate the aerial to the desired location.

  For monitor controls the radio transmitter must be turned on and the monitor switched will be activated. The monitor controls run the monitor stream/shape, clockwise/counterclockwise and raise/lower momentary switches.

  The feedback screen will give the operator continuous readings of aerial position including extension, rotation, elevation, aerial load, outrigger deployment and breathing air levels.

Water Flow:

- From main pump through Aerial Devise
- From external source to Aerial Devise
- From main pump and use waterway inlet as a large diameter discharge.
- To discharge water from the main fire pump through the aerial devise:
    - Open the Aerial Discharge valve at the pump panel
    - Open the Aerial butterfly valve at the turn table.

- To discharge water from relay operations through the aerial devise:
    - Close the Aerial Discharge valve at the pump panel
    - Open the Aerial butterfly valve at the turn table.
    - Connect incoming water source to Waterway Inlet at rear.
- To discharge water from rear aerial waterway / discharge connection:
    - Open the Aerial Discharge valve at the pump panel
    - Close the Aerial butterfly valve at the turn table.
    - Connect discharge hose to Waterway / Inlet at rear.

Ladder Truck Positions and Qualifications:

- Driver will have taken and passed or be state certified in aerial and motor pump operations
- Officer should be the senior most firefighter or hold rank
- Tool Firefighter should be minimum WI FF 1
- Nozzle Firefighter should be minimum WI FF 1

All positions will adhere to the firefighting procedures taught at Mukwonago Fire Department

Apparatus Positioning

- Position apparatus to allow other apparatus to pass when possible.
- Apparatus should always be chocked when driver is out of the cab.
- Apparatus should not be taken off road unless directed to by the Incident commander. This can be allowed when ground is firm enough to support the vehicle. Examples of this would be during drought and hard freeze conditions. Apparatus should never be taken off the road is current weather has recent rain or during spring thaw.

- Positioning near structures the apparatus should be out of collapse zones, one and a half the height of the building, when possible. The turn table should be put in-line with the corner of the building to give access to 2 sides of the building. The ideal working position is off the rear of the apparatus.

Aerial Setup:

- Driver will control all cab functions and switchovers from aerial to outriggers.
- Officer will confirm correct placement and work on task assignments
- Tool Firefighter sets pads on the passenger side
- Nozzle Firefighter sets pads on the driver's side

Aerial Operation Positions

- Driver will be at pump panel of apparatus when if using pump. When aerial is being used with no pump the driver is to be at turntable seat.
- Officer will be in the platform as leader. This can be delegated to senior firefighter to allow officer to be mobile.
- Tool Firefighter will be in the platform to conduct any ventilation, or rescue. During water operations Tool firefighter will be at the turntable seat if MPO is at pump panel.
- Nozzle Firefighter will be in the platform during water operations, rescue, and ventilation.
- There will be no more than 2 firefighters in the platform when flowing water.

Ventilation using ground ladders

- Driver stays with apparatus to handle functions and assist in getting equipment to the scene.
- Officer lead the crew bring pike pole and saw to the structure
- Tool Firefighter carry axe and assist with ground ladders
- Nozzle Firefighter assist with ground ladders

Ventilation using the platform

- Driver operate turn table seat
- Officer leader of crew
- Tool Firefighter start and carry saw to platform
- Nozzle Firefighter assist with equipment in the platform

Working platform around power lines

- No water will be flown from aerial over power lines unless confirmed d-energized by Power Company.
- There will always be an operator at the turntable seat when aerial is working under or near power lines. At no time should the remote control be used to operate the aerial near or under power lines as there is no emergency shut off switch to override actions.

- Aerial will not be used to remove any type of wires at incidents. All wires will be considered energized and removed by the power company.

High Angle Rescue

- Aerial truck is equipped with high angle rescue equipment.
- High angle equipment must be used by certified staff and will operate under the department's ropes guideline.

Working in Cold Temperatures

- When temperatures are below freezing the apparatus pumps will be stored dry and should be monitored for pump, aerial, waterway, and hose lines from freezing.
- Should water be flowed through the pump or aerial when temperatures are below freezing the water needs to remain flowing constantly.
- Ice buildup should be checked for every 15 minutes.
- Keep the aerial moving back and forth up and down to help with ice buildup.
- When the apparatus has been in cold weather and ice has built up or the pump has been used, nothing should be forced open until the truck has thawed. The apparatus will remain out of service until the apparatus can put back together correctly.

Greenstar will be used at any incident when the aerial and pump will not be required to operate. This will prevent wear and tear on the main engine and save on fuel consumption.

When climbing the aerial ladder the firefighter will wear a ladder belt or gut belt with webbing that is located in the compartment left of the ladder to the turntable.

When climbing the aerial ladder the emergency shutoff button will be applied to secure the ladder will not move. Should the firefighter stop on the aerial ladder he/she should lock in using the ladder belt hook or gut belt with webbing to a ladder rung.
The aerial has a 500 lbs. tip load when flowing water. No more than 2 firefighters should be in the platform when flowing water.

The aerial has a 1000 lbs. tip load when not flowing water. There should not be more than 3 firefighters in the platform when not flowing water.

The aerial will not be used as a crane to lift any mechanical or structural object. It can be used to lift people in rescue operations.