



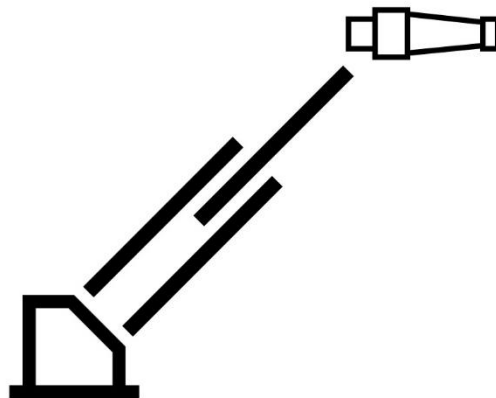
## FAMA BUYER'S GUIDE

### TC031

# AERIAL APPARATUS

Prepared by FAMA Aerial Subcommittee

This guide does not endorse any manufacturer or product





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## Overview

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The purchase of a new aerial fire apparatus involves a major investment and should be treated as such. A purchase should be made only after a detailed study of the fire departments apparatus needs. The study should look not only at the current operations and risks to be protected but also at how these things might change over the life of the fire apparatus. Be aware of the impact NFPA (National Fire Protection Association) has on the device you wish to purchase. Make sure you have the latest copy of the standard and understand the requirements described. It is your responsibility to specify an NFPA compliant apparatus.

The intent of this Aerial Buyers Guide is to provide an overview of items to consider when specifying and purchasing an aerial or aerial platform apparatus. The following guide is separated into the major categories of topics that should be evaluated, considered, and thoroughly researched prior to purchasing an aerial apparatus.

There are numerous resources available, in addition to this Buyer's Guide, that can prove to be useful in the justification as well as provide items and issues to consider in the decision making process. This guide is intended as a compliment to those other resources that are available. Other suggested resources include the following, many of which will be referenced throughout this buyer's guide:

- NFPA 1901 National Fire Protection Agency (NFPA) 1901 Standard for Automotive Fire Apparatus
- NFPA 1451 Standard for a Fire and Emergency Service Vehicle Operations Training Program
- NFPA 1901 Annex B Standard for Specifying and Procuring Fire Apparatus
- NFPA 1911 Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus
- ULC S515 Canadian Standard for Automobile Fire Fighting Apparatus
- Insurance Services Office (ISO) Fire Suppression Rating Schedule (FSRS)
- FAMA Apparatus Safety Guide



## Aerial Device Purchase Justification

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The "old school" rule governing whether a fire district required an aerial device, or not, was based on when the portable ground ladders within a fire department would no longer reach the upper windows or the roof of buildings in the community, then an aerial device was needed. This is a simple but yet often overlooked way of justifying your purchase, for the rule still stands true. As sufficient as that may be, there are still other justifications to consider. The following are a few additional consideration:

- It typically takes 3 or more firefighters to raise and place a long ground ladder. If at any given time a department has insufficient personnel to achieve this task safely and without exposure to injury, while issuing an attack and laying out hose lines, then an aerial device is needed.
- If the terrain and topography within a community make using ground ladders unsafe, an aerial device is needed. Terrain and landscape oddities may make it impossible for firefighters to gain access to two or three story structures with ground ladders. Under this condition, an aerial device is needed to perform necessary rescue or ventilating operations.
- An aerial device can significantly improve a fire district's ISO rating, lowering a community's property insurance premiums. This benefit will be presented in greater detail later in this buyer's guide.
- Consideration needs to be given to the demographics of the population of your community. Increasing levels of obesity, aging, and disabled population may make it impractical to rescue a certain percentage of those you serve safely from even a second story window, without a platform apparatus.
- Communities with large square footage buildings, such as warehouses, large department stores, etc. require a safe means of delivery fire suppression from an elevated position. This can increase firefighter safety by minimizing the need for dangerous interior attacks.
- Communities with standing or running water that pose drowning hazards will benefit from increased reach capabilities that an aerial device will provide during rescue operations.



- Communities with industrial facilities where fire suppression requires high flows through a single elevated discharge will require an aerial device.
- Consider the existence of aerial apparatus in surrounding communities. A mixture of capabilities is always smart and by sharing resources, communities may make choices based on available mutual aid options.

## Budget

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An important and necessary element for a fire district to assess and decide upon is their budget. The amount of money you have for the purchase of a new aerial device has a lot to do with the choices you have. Obviously, the larger the budget, the larger, more optioned the aerial device. While well-funded departments may spend a significant amount on a single piece of apparatus, there are many creative ways that other departments can significantly increase their capability economically. This guide describes many aerial configurations that may meet restricted budgets while still providing the required capabilities.

## Insurance

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Before a specification can be written for an aerial apparatus, the requirements dictated by coverage area need to be identified and incorporated into the decision making process. It is important to be aware of the ISO fire services rating schedule for your community pertaining to aerial devices, and how it would benefit your community. These requirements are presented in greater detail later in this buyer's guide under the ISO Considerations and Requirements section.

## Residential Districts

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### SET-BACKS

Vertical height is an important decision when it comes to choosing an aerial device. But in communities with single family housing, the horizontal reach is just as important. Homes can be located a considerable distance from the street.



Horizontal reach will determine the effectiveness of the aerial device for ventilating and rescue operations.

## **ACCESSIBILITY**

Landscaping and extreme slope conditions can make it unsafe for ground ladder placement. An aerial device will provide much safer access for firefighters.

## **AGE OF BUILDINGS**

Older homes were typically constructed of heavier structural members that provide longer burn times before collapse. Newer construction materials burn faster and may place firefighter at greater risk during interior attack operations, justifying the capability of an aerial device to provide fire suppression from an elevated master stream.

## **TYPE OF ARCHITECTURE**

Certain types of residential architecture present a much greater challenge to accessibility using ground ladders. Steep roofs, metal roofs, and multiple roof lines are examples where an aerial device will provide much safer access for firefighters during rescue and ventilation operations.

## **Commercial Districts**

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### **RETIREMENT FACILITIES AND HOSPITALS**

Hospitals and facilities serving senior citizens contain persons with special requirements which may preclude rescue using ground ladder. An aerial platform is an ideal tool in these situations to provide safe and secure rescue operations.

### **HIGH OCCUPANCY BUILDINGS**

If your community has densely populated multi-story buildings, you will need an aerial device with wider ladder sections and higher tip loads to help evacuate large amounts of people.



## Industrial Districts

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### **CHEMICAL PLANTS OR REFINERIES**

Some departments require large water flows because of large scale chemical or refinery fires. Aerial units designed with larger diameter waterways and increased flows are required. The aerial device will be designed to accommodate the increased water and nozzle reaction forces.

## Infrastructure Considerations

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### **STREET CONFIGURATIONS- DRIVING**

Depending on your community's street configurations, you may need to consider an apparatus with shorter wheelbase, tighter turning radius, and shorter rear overhang. Tiller apparatus may be another means of dealing with tighter streets and traffic congestions.

### **STREET CONFIGURATIONS- SETUP**

Outrigger configuration and spread is an important consideration when you purchase an aerial device. An aerial with a short jack feature or a narrower outrigger spread may be necessary to set-up in a narrow street.

### **SLOPE AND GRADE CONSIDERATIONS**

Know the apparatus leveling capabilities you will need based on the grade of the roadways you will need to set the unit. Ensure the apparatus you are selecting will allow you to setup in necessary locations. The load chart will define the slope and grade requirements of the prospective apparatus.

### **TOPOGRAPHY**

Understand the horsepower required to have the truck perform as your needs require. Engine and transmission choices are available to match your needs. Be aware that NFPA has top speed limitations based on gross vehicle weight.

### **TRAVEL HEIGHT RESTRICTIONS**





Due to the travel height of aerial apparatus, verify that the unit can fit through all tunnels, under all the bridges, and fit into the fire station. Also be aware if the unit would ever need towed that it does not contact an overhead obstruction. The area may include low hanging tree limbs that cannot be pruned due to historical significance.

## Fire Station Considerations

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### **DOOR OPENING**

Measure your door opening. If you have a height restriction, be sure to include that in your specification. Clearly identify the maximum over-all height of the unit and state that this is a no exception item.

### **ARCHED DOOR**

In some cases the height of the door is not the issue but the shape of the door is the issue. Some of the older fire stations were built with an arched doorway. The truck will fit in the center but not at the edges. Always verify that the aerial turntable control console, turntable handrails and the platform will fit through the door opening.

### **ANGLE OF APPROACH**

Unless the approach angle into your station is flat, the travel of the unit up and through the door opening could cause a clearance problem. If you believe this may be a problem, review the need for a station layout to be generated by the manufacturer or another qualified person.

### **DEPTH OF BAY**

The length of the unit is critical when you have limited station bay depth. The overall length of the apparatus will need to be reviewed. You may also need to verify if there is adequate room in the station to walk past the front and the rear of the unit.

### **INTERIOR OVERHEAD OBSTACLES**



Some stations will have exposed heating and plumbing in the ceiling of the apparatus bay. Depending on the building construction, exposed support beams may also be present. The location of these or any other items that protrude down from the ceiling must be identified and verification must be done to make sure an interference with the aerial device does not occur. Verify that none of the mechanical parts of the garage door opener are lower than the door when in the open position. This could create an interference with the aerial device.

## **STATION FLOOR CAPACITIES**

The in-service weight of the completed aerial device must be compared to the capacity of the fire station floor. If the building is configured in such a way that there are rooms or crawl spaces below the apparatus bay, then you will need to identify the capacity.

## **SNOW PACK**

If you live in a cold climate, you need to be aware of the effects of snow and ice. Ice and snow on the apron will reduce the station door clearance.

## **DRIVING THE TRUCK IN AND OUT OF THE STATION**

The turning radius and tail swing required to get the unit out of the station needs to be verified. Narrow streets, sidewalks and other obstacles can provide difficulty getting in and out of the station.

## **ISO Rating Considerations & Requirements**

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ISO evaluates fire-protection efforts in communities throughout the United States. The Public Protection Classification (PPC) program is based upon a Fire Suppression Rating Schedule (FSRS). The Fire Suppression Rating Schedule (FSRS) is a manual containing the criteria ISO uses in reviewing fire prevention and fire suppression capabilities, of individual communities, or fire protection areas. The schedule measures the major elements of a community's fire protection system and develops a numerical grading for the Public Protection Classification (PPC). One of the major elements of providing credits within the FSRS is credits provided by having one or more aerial devices within a fire district's apparatus fleet.



Sections 540-542 of the FSRS manual outlines in detail the criteria and formulas necessary for calculating the ISO credit allocation for a department's aerial device. ISO's FSRS manual states that a Fire Department must have an aerial ladder if their response area has five or more buildings, of three stories (or 32 feet) or more in height (ground to eaves), or with five buildings that have a "Needed Fire Flow" (NFF) greater than 3,500 gpm (*reference ISO FSRS section 300-340 for NFF calculation criteria*), or with at least five buildings meeting any combination of those criteria. Throughout the ISO FSRS manual, it references the NFPA 1901 standard. It is advised that an aerial purchasing department become very familiar with the NFPA standard, prior to evaluating what beneficial impact the ISO rating may have on their fire district. There are many factors that contribute toward an aerial's ISO points rating. Some of the evaluated criteria are as follows:

- Section 540A – Number of needed ladder companies
- Section 541A – Number of existing ladder companies
- Section 541C – Number of existing automatic aid ladder companies
- Section 542 (Table 542B)– Equipment carried on a ladder company
- Section 548 – Credits for automatic aid ladder company service
- Section 550 – Number of needed reserve ladder service trucks
- Section 551 – Credits for equipment on reserve ladder and service trucks
- Section 553 – Credits for reserve ladder and service trucks
- Section 561 – Credit for deployment analysis
- Table 542C – Aerial ladder/elevating platform testing program

## Aerial Device Selection

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### AERIAL LADDER

An aerial ladder is the basic tool for rescue, ventilation, and extinguishment in the fire service. It has the ability to perform all three basic functions at the basic level. An aerial ladder will include a ladder tip capacity of 250 lbs., 500 lbs., 750 lbs or more.

Aerial ladders are generally more compact in size than aerial ladder platform units and will often be the best choice between the two types if limited space is a concern. Also, the tip of an aerial ladder is far smaller than a platform and will



enable better and more consistent access capability among trees, overhead electric lines, balcony railings, and closely spaced buildings.

## **AERIAL PLATFORM**

An aerial ladder platform will provide expanded capacity for rescue, ventilation, and extinguishment. It is the absolute ultimate rescue and firefighting tool. All three basic functions can be performed at a higher level. An aerial ladder platform will include a minimum platform capacity of 750 lbs.

Higher weight carrying capacity will enable it to rescue more people with better support from firefighters. Where there is a higher concentration of people living or working in elevated locations, the aerial ladder platform will be the ideal choice.

The integral work platform provides a stable place from where ventilation operations can begin. The platform will support firefighters as well as ventilation equipment and bring them under power to elevated locations. Thus, ground ladder climbing and the associated hazards are minimized.

Water flow capacity can be brought to the highest level with an aerial ladder platform. These can be equipped with single or dual platform mounted deck guns and can safely deliver flows in excess of 1,500 gpm. Where large fire potential exists, or where large buildings or hazardous industrial installations are present, the aerial ladder platform offers the highest level of performance available.

## **WATER TOWER**

If elevated fire suppression, without rescue capability, is your main criteria for your aerial apparatus, a Water Tower may be a good choice. Water Towers range from 50 feet to 130 feet operating heights and are capable of delivering water flows in excess of 2,000 gpm. Water Towers, particularly those with high water flow capability, are more common to the industrial fire service.

## **Aerial Vertical Operating Height & Horizontal Reach**

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Aerials are available in a variety of models offering a broad range of vertical operating heights and horizontal reach choices. Available operating heights



range from as low as 50 ft to in excess of 100 ft, within each of the mounting arrangements described in the following “Aerial Device Mounting Arrangement” section. Typically, the greater the vertical operating height rating, the greater horizontal reach capability. There are exceptions to this “rule of thumb” however. If the aerial product incorporates operation envelope control systems, the aerial device may provide greater vertical operating height capabilities but the horizontal reach capabilities may be limited in order to achieve stability requirements. Criteria used in determining the appropriate aerial operating height and horizontal reach ratings are predominately based on the community the aerial device will be covering. A thorough assessment needs to be conducted of the community. This assessment should include, but not limited to, the following:

- Structure heights
- Building setbacks
- Building construction styles

## Aerial Device Mounting Arrangement

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### REAR MOUNTED ARRANGEMENT BENEFITS

- Rear mounted aerials are generally less expensive than their mid mounted counterparts.
- Generally, the overall apparatus height will range from slightly under 11 feet to slightly over 12 feet. This being the case, it's necessary to confirm whether any overall height restrictions exist. These restrictions can be due to several factors.
- A low profile cab option is available that will enable packaging an aerial ladder without a telescopic waterway to an overall travel height as low as 10' – 10"
- The low profile cab option will enable packaging an aerial ladder with a telescopic waterway to an overall travel height as low as 11' – 4"
- The low profile cab option will enable packaging a platform to an overall travel height as low as 11' – 6"
- Generally, rear mounted aerials are shorter in overall length than their mid mounted counterparts and fitting inside the fire station is a concern.
- Improved range of aerial operation over the front of the apparatus.



- Generally tail swing is reduced.
- Available as an aerial ladder or a platform configuration.

## **MID MOUNT ARRANGEMENT BENEFITS**

- A major advantage of the mid-mount arrangement is that it's inherently low in travel height. Overall travel heights of less than 10' can be obtained.
- Mid mounted aerials are typically comprised of four or five telescoping sections providing a shorter retracted length. This shortened retracted length provides a greater ability to maneuver the aerial in congested areas. It also will enable the operator to place the ladder tip or platform closer to the ground or to the face of a building.
- Available as an aerial ladder or a platform configuration.
- Placement of the platform at the rear of the apparatus provides improved visibility through the windshield.

## **TRACTOR DRAWN BENEFITS**

- The tractor drawn aerial is the most maneuverable type of aerial on the market today. The articulating design and the rear steering capability of the rear trailer axle enable the tractor drawn aerial to make turns around tight corners on narrow streets that are simply impossible to make with "straight" trucks. Also, the ability to use the rear trailer steering axle to position the aerial while moving forward or in reverse is a tremendously useful capability in congested areas, on narrow streets, and in alleyways. These factors explain why the tractor drawn aerial is still an extremely popular choice for inner city applications.
- There are other environments where the tractor drawn aerial is the best possible choice. Older communities where roadways were laid out and established by the turning radius of an oxcart or horse drawn wagon cannot be serviced with "straight" trucks. Historical districts, trailer parks, retirement villages, and apartment / condominium / townhouse complexes are best served with tractor drawn aerial apparatus
- Another major consideration influencing the decision to select tractor drawn aerial apparatus is the greatly increased storage capability they can provide. Tractor drawn units can be packaged to include nearly twice the storage space of their rear and mid mounted counterparts.



More enclosed compartments can be provided to store more firefighting accessories and equipment. The long trailer has space for a greater selection of portable ground ladders. Longer ground ladders and special application ground ladders such as a 50' two-section extension ladder or a 32' wall ladder can only be carried on a tractor drawn unit.

- In certain rare cases, tractor drawn aerial apparatus is selected due to the requirement of the additional manpower to operate it. It's a tactic used to preserve the number of firefighters assigned to the truck company and represents one of the few remaining sacred traditions still in existence in the modern era.

## Quint Configuration

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Be sure to identify the expected function of your aerial device. NFPA 1901 has definitions of what a non-quint fire apparatus requires compared to a quint fire apparatus. By declaring the type of vehicle, it will identify what chapters in NFPA will apply to your unit.

### **TRUCK COMPANY (NON-QUINT)**

A non quint apparatus will not include a fire pump, water tank, or supply hose. In this case the apparatus will be relied upon to provide ground ladders and a larger selection of rescue, firefighting, overhaul, and salvage equipment.

The decision to package the apparatus as a non-quint is based on the intended service for the apparatus and or operating crew. If the apparatus and crew are intended to operate as a "truck company" where rescue, salvage, and overhaul is the primary mission, then a non-quint is the best choice. A non- quint is also a logical choice where an organized multiple company response capability is present and available. Most career agencies rely on the specialized and more closely defined duties and capabilities a non-quint can provide.

### **QUINT**

A quint apparatus will include a fire pump, water tank, and supply hose in addition to the aerial device. In rare instances, the water tank may be



eliminated and substituted with more hose, ground ladders, or equipment storage compartments.

The decision to package the apparatus as a quint is based on the intended service for the apparatus and or operating crew. If the apparatus and crew are intended to operate as an "initial attack engine" where fire suppression is the primary mission, then a quint is the best choice. A quint can be a logical choice where limited manpower is a limiting factor. Many volunteer agencies rely on the versatile capabilities a quint can provide.

## GROUND LADDER CONSIDERATION

Whether specifying a quint or non-quint aerial device, additional consideration needs to be given toward ground ladder requirements. NFPA 1901 requires a minimum of 115' of ground ladders on an aerial fire apparatus. If the unit is a quint, NFPA requires a minimum of 85' of ground ladders. Due to housing and building construction, some departments may have special ladder requirements or specify an ISO ground ladder compliment. Be sure to clearly identify this in the specification. Special requirements may be necessary to fit the specified ladders.

## Single or Tandem Rear Axle

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### SINGLE REAR AXLE

- Single rear axle aerial apparatus inherently contain limitations but can also provide benefit if the gross weight can fall within single axle limitations. Currently the maximum rear axle rating available is 35,000 lbs. Single axle apparatus typically provide decreased turning radius, enabling the apparatus to be more maneuverable in congested fire districts.
- A negative to single axle aerial apparatus is decreased stopping power and decreased service brake like.

### TANDEM REAR AXLE

- Most aerials require the use of a tandem rear axle for weight carrying capability and simply cannot be built with a single rear axle...especially platform apparatus. In certain cases, there is a need to package an





aerial apparatus with more water, hose, portable ground ladders, and storage compartments.

- A tandem rear axle apparatus will include an additional set of rear brakes. The additional set of brakes will reduce the stopping distance of the vehicle, inspire greater driver confidence, improve overall driving safety, and dramatically increase the life of the service brakes.
- In areas where there are steep grades, sustained downhill grades, and hilly terrain... an apparatus with a tandem rear axle will be the better choice.
- The tandem rear axle apparatus also delivers a smoother and more stable ride with less body roll, again...inspiring greater driver confidence.

## Chassis Cab Length and Seating Capacity

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Many custom cabs have different length from the front axle to the rear of the cab. These lengths influence the wheelbase and vehicle maneuverability. The longer the wheelbase the less maneuverable the apparatus will become. Also the wheelbase length impacts the weight and balance of the vehicle and needs to be considered carefully. Current custom fire chassis cabs provide seating arrangements accommodating from 4 to 10 man cabs.

## Summary

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Purchasing aerial fire apparatus is a major responsibility that requires a substantial long term investment of community funds. Performing a detailed evaluation of your community's needs and performing thorough investigative research into all available aerial products will help ensure the acquisition of the appropriate aerial product that's best suited