

## FAMA Apparatus Improvements

Category	Feature	Feature Change	Benefit	NFPA 1901 2003 Edition Requirement	Approximate Year Introduced	Safety	Service	Durability	Performance
Aerial	Breathing Air	Aerial Mounted Breathing Air Standards	Uniform construction standard. Low air warning system. Air duration improved. Serviceability improved.	Chapter 25	1999	X	X		X
Aerial	Controls	Aerial Multiplex Systems	Aerial information display. Serviceability improved. Envelope control avoids collision damage.		1999	X	X	X	X
Aerial	Controls	Aerial Tip Controls	Control ladder at tip for better firefighter control.	20.5.4	1999	X			X
Aerial	Controls	Short Jack Limitation	Range of operation defined. Narrow street and alley accommodation. Tip-over potential reduced.	20.17.5	1999	X			X
Aerial	Ladder Testing	Expanded aerial and ground ladder testing standards	Uniform test standards. Third party test recommendations. Documentation and verification of performance.	20.22	1996	X		X	X
Aerial	Load Chart	Overload Documentation	Informs operator of potentially unsafe operating conditions.	20.3.4	1996	X			
Aerial	Operation	Slide Mechanism	Smoother operation. Serviceability improved. Durability improved.	20.5.3	1999	X	X	X	X
Aerial	Operation	Tip Camera	Remote aerial observation possible. Observation of remote controlled fire streams. Safer observation of fire ground scene.		1999	X			X
Aerial	Plumbing	Pinable Waterway	Protects waterway in rescue operations.		1991	X		X	X
Aerial	Plumbing	Remote Waterway Nozzle Controls	Remote control of tip mounted water nozzle. Risk to firefighters reduced.	20.6.1	1999	X			X
Aerial	Plumbing	Waterway Performance	Improved range of stream. Faster fire knock down. Fewer appliances required.	20.6.1	1996	X			X

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Aerial	Safety Interlocks	Aerial Interlocks	Interlocks to reduce possibility of operator error. Safety ensured.	20.17	1996				
Aerial	Safety Interlocks	Safety Interlock Expansion	Unsafe operating conditions avoided. Automatic operation.	20.17.5	1991	X			
Aerial	Slip Resistance	Rung Surfaces	Firefighter Safety Improved. Consistent footing service. Slips during inclement weather avoided.	20.2.5	1999	X			
Aerial	Strength	Tip Load Standard	Uniform performance standard established. Increased minimum performance.	20.3	1991	X			X
Aerial	Structure	Structural Safety Factors	Testing and inspection definition improved. Welding and weld inspection standards specified.	20.22.3	1999	X			
Aerial	Warning Device	Aerial Stabilizer Warning	Provides audible and visual warning of stabilizer movement and deployment.	20.21.4.1.1 20.21.4.1.2	1996	X			

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Body	Body Mounting	Body Mounting Isolation	Body life extended by decreasing stress, vibration, and shock.		1991		X	X	X
Body	Hose Storage	Hose Storage Security	Prevents hose from falling off of truck during road travel.		2005	X			
Body	Compartment Doors	Powered Doors and Door Locks	Security, reliability, and durability improved.		2003	X			X
Body	Equipment Mounting	Equipment Storage Devices	Organization of tools for rapid deployment.		1991			X	X
Body	Compartments	Ventilation	Equipment kept drier. Equipment life extended.		1991			X	
Body	Access	Handrails and Step	Access improved with build-in steps. Three-point access provided.		1999	X			X
Body	Access	Lighted Handrails	Safety improved for night operation.		2004	X			X
Body	Command Centers	Slide-Out Sections	Command center room increased.		1996	X			X
Body	Body and Tank Integration	Shaped Tanks	Equipment storage space improved. Special equipment storage possible. Through-tank ladder storage.		1999	X			X
Body	Multifunctional Bodies	Rescue-Pumper Combinations	Rescue response efficiency improved.		1991				X
Body	Hose Storage	Lower Hose Bed Height	Ergonomics improved. Risk of injury reduced.		1999	X			
Body	Hose Storage	Extendable Hose Storage	Improved ergonomics. Risk of injury reduced. Faster re-packing time.		2003	X			X
Body	Breathing Air	Enclosed SCBA Bottle Fill Station	Improved safety during cylinder refills.	25.9	1999	X			

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Body	Compartment Doors	Compartment Door Hardware	Increased reliability, durability and safety.		1991	X		X	X
Body	Compartment Doors	Door Seals Improved	Weather resistance improved.		1991		X	X	X
Body	Compartment Doors	Rollup Door Offerings	Equipment access improved. Door damage risk reduced.		1996	X	X		X
Body	Equipment Mounting	Powered Equipment Racks	Ergonomic access to ladders, suction hose, etc... Compartments free for other uses.	15.4	1999	X			X
Body	Equipment Mounting	Through-Tank Ladder Storage	Ergonomic access to ladders. Allows high-side compartments both sides.		1999	X			
Body	Material	Stainless Steel Bodies	Corrosion resistance improved.		1991		X	X	X
Body	Material	Composite Bodies	Plastic, polypropylene, and composites. Corrosion resistance. Lighter Weight.		1999		X	X	X
Body	Service Access	Pump Enclosure Access Panels	Ease of maintenance and serviceability.	15.6	1991		X		

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Chassis	Audible Warning Devices	Noise Levels Reduced	Sirens, speakers, and air horns off roof. Noise levels in the cab reduced. Crew communications improved.	13.9.2	1991	X			X
Chassis	Occupant Protection	Roll Over Protection	Risk of roll-over during cornering reduced.		2003	X			
Chassis	Occupant Protection	Side Roll Protection	Risk of injury reduced during roll event.		2003	X			
Chassis	Occupant Protection	Red Seat Belts	Visibility of belts increased. Seat belt compliance enforcement simplified.		2003	X			
Chassis	Occupant Protection	Seat-Integrated Seat Belts	Can improve ease of use		2003	X			
Chassis	Visibility	Rear Vision Monitors	Safety during backing improved. Blind spots reduced.		1999	X			
Chassis	Conspicuity	Door Reflective Material	Conspicuity of vehicle increased with doors open. Visibility of door access improved.		2003	X			
Chassis	Brakes	ABS Mandated	Vehicle control improved during emergency braking.	12.3.1.1	1996	X		X	X
Chassis	Brakes	Air Disk Brakes	Stopping distance reduced. Brake fade eliminated.		1990	X	X	X	X
Chassis	Brakes	Auxiliary Brake Mandated	Stopping capability improved. Operator control improved. Brake life increased.	12.3.1.7	1996	X	X	X	X
Chassis	Cab	Aluminum Cab Construction	Weight reduced. Payload increased. Durability improved.		1991	X		X	X
Chassis	Cab	Electric Windshield Wipers	Performance consistency improved over air driven units.		1991	X	X	X	X

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Chassis	Occupant Protection	Enclosed Cab	Crew safety. Firefighter rehabilitation area. Working conditions improved. Crew comfort improved. Communication improved.	14.1.1	1991	X			X
Chassis	Cab	Noise Levels	Communication improved. Crew comfort improved.	14.1.7	1991	X			X
Chassis	Cab	Tilt Cab Design	Maintenance access improved.	14.2	1991		X		
Chassis	Engine	Electronic Engine Controls	Electronically controlled pressure governor possible. Maintenance intervals increased. Higher horsepower and torque possible. Mechanical throttle linkage eliminated. Service diagnostics provided. Emissions reduced. Fuel economy improvement.		1994				X
Chassis	Engine	Mid-Engine Chassis	Cab noise level reduced. Cab room improved.		1990	X			
Chassis	Safety Interlocks	Chassis PTO Interlock	Improved safety with consistent performance of interlock functions.	12.2.1.4	1996	X			X
Chassis	Seating	Head Clearance	Head clearance for suspension seats increased. Head clearance for fixed seats increased. Safety improved.	14.1.8	2003	X	X		X
Chassis	Seating	Seat Adjustment	Seat adjustment criteria. Seat adjustment time criteria.	14.1.8	2003	X			
Chassis	Occupant Protection	Shoulder Harness Seat Belts	Type II shoulder harness required for outboard seating positions. Safety increased during crash.	14.1.3.2	1999	X			
Chassis	Steering	Steering Geometry	Steering cramp angles increased. Turning radius reduced. Bump steer reduced.		1999				X
Chassis	Steering	Tilt and Telescopic Steering Column	Steering ergonomics improved.		1991	X	X		X

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Chassis	Suspension	Air Ride Suspension	Ride quality improved. Height adjusts to load. Body structure sees less shock.		1991	X		X	X
Chassis	Suspension	Independent Front Suspension	Ride quality improved. Cornering stability improved. Cab structure sees less shock.		2001	X		X	X
Chassis	Suspension	Taper Leaf Front Springs	Improved ride quality.		1999	X	X	X	X
Chassis	Tire Chains	Automatic Engaging Tire Chains	Tire traction in adverse weather conditions improved through automated activation without stopping the vehicle or leaving the operator's position.		1991	X		X	X
Chassis	Tires	Truck Tire Improvements	Rubber compounds improved for greater tread wear. Casing life improved. Load capacities increased.		1991	X		X	X
Chassis	Transmission	Electronic Transmission Controls	Shift performance improved. Service diagnostics provided. Engine communications capability.		1992	X	X	X	X
Chassis	Wheels	Hub Piloted Wheels	Wheel nut torque reduced. Centering of wheel improved. Wheel balance improvements reduce vibration.		1999	X	X		X

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Electrical	Audible Warning Devices	Siren Standards	Audible warning standards established.	13.9	1996	X			
Electrical	Batteries	Battery Conditioner	Battery life improved. Maintenance requirements reduced. Consistent battery condition maintained.	13.4.5	1991	X		X	X
Electrical	Circuits	Electromagnetic Interference Suppression	Systems less susceptible interference from communication equipment.	13.7	1991		X	X	X
Electrical	Circuits	Multiplex Control Systems	Wire harnesses simplified. Diagnostic capability. Flexible configuration of systems. Fewer connections. Serviceability and troubleshooting improvement. Reliance on relays reduced. Safety interlock capability improved.		1999		X	X	X
Electrical	Generators	Generator Design	Size reduced. Noise levels reduced. Power ratings based on temperature for more consistent performance.	23.4	1999 & 2003	X	X		X
Electrical	Generators	Generator Instrumentation	Generator and equipment life increased because user can monitor power output.	23.4.6	1996	X	X		
Electrical	Generators	PTO and Hydraulic Generator Interlocks and Indicators	Generator and equipment life increased because interlocks ensure generator output is correct Improved safety through consistent used of indicators and interlocks. Improved safety because interlocks prevent unexpected or improper operation. Hydraulic generators must operate at all engine speeds or have speed control systems.	23.5, 23.6.1, 23.6.2	1991	X			X
Electrical	Generators	Inverter Requirements	Power will be available for equipment because inverters can not be load managed and must operate for two hours minimum.	23.6.5	2003	X			X
Electrical	Line Voltage	Line Voltage Standards	Installation methods specified for generators and wiring. National Electrical Code (NEC) requirements specified for improved safety and quality. Frequency and voltage ranges specified for consistent power quality.	Chapter 23	1996	X	X	X	X

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Electrical	Line Voltage	Line Voltage Testing	Test criteria established for wiring, power supplies, and equipment. Equipment tested as installed to validate installation and improve reliability. Power supplies tested for two hours with the fire pump operating to validate operation as used.	23.16	1996	X		X	X
Electrical	Line Voltage	Cord Reel Distribution Box	Receptacles not mounted on a horizontal surface and at least 2" from ground. Power on indicator light visible for 360 degrees. Circuit protection sized for the box receptacles.	23.13.8	1996	X		X	X
Electrical	Line Voltage	Equipment Ratings by Location	Equipment must be rated for it's use and location (power ratings, wet/dry environments).	23.2.6	1996	X		X	X
Electrical	Lights, Scene	Scene Light Standards	Scene lighting increased for improved firefighter safety.	13.10	1996	X			X
Electrical	Lights, Warning	Optical Warning Light Standards	Warning light visibility improved to 360 degrees around vehicle.	13.8	1996	X			X
Electrical	Lights, Warning	LED Lighting	Visibility increased. Power requirements reduced. Replacement interval reduced.		1999	X		X	X
Electrical	Lights, Work	Control, Indicator, and Work Area Lighting	Night visibility improved. Work area lighting provided.	13.10	1996	X			X
Electrical	Low Voltage Power	Alternator Minimum Idle Capacity	Electrical system capacity at idle ensured.	13.3	1996	X	X	X	X
Electrical	Low Voltage Power	Electrical Load Management	Electrical system overload prevented. Battery condition preserved. Maintenance frequency reduced. Diagnostic capability and serviceability improved. Electrical system failure frequency reduced.	13.3.6	1996	X	X	X	X
Electrical	Wiring	Function Coding of Chassis Wiring	Diagnostics and serviceability improved.	13.2.6	1996		X		
Electrical	Wiring	Wiring Methods and Techniques Weather-Proof Connections	Failure rates reduced. Serviceability improved.	13.2	1996	X	X	X	X

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General	Composite Materials	Plastic, Polypropylene, and Composite Components	Lighter weight. Durability improvement. Maintenance improvement. Corrosion resistance.		1991	X	X	X	X
General	Conspicuity	Reflective Striping	Visibility of vehicle increased. Risk of crash reduced.	15.9.2	1991	X			
General	Equipment Mounting	Interior Equipment Mounting and Storage	Interior equipment mounting criteria. Interior storage compartment performance criteria. Crew safety improved during crash.	14.1.10 14.1.11	1996	X		X	X
General	Handrails	Handrail Grip Material	Grip material specified for handrails.	15.8	1996	X			X
General	Paint	Paint Process System Improvement	Harder finish. U.V. protection improvements. Adhesion qualities improved.	15.9	1991			X	
General	Stepping and Walking Surfaces	Slip Resistance Criteria	Interior slip resistance criteria established. Exterior slip resistance criteria established. Testing of surfaces mandated. Documentation of slip resistance mandated.	15.7.3	1999	X			X
General	Steps	Folding Step Standards	Performance standards established. Safety and ergonomics improved.	20.2.9.1	1999	X			
General	Steps	Step Performance Criteria	Step height criteria established. Step size criteria established. Minimum load capacity.	15.7	1991	X			
General	Warning Labels	Warning Labels Specified	Safety improvement through increased identification of hazard areas.	14.1.2 20.2.3 21.9 22.8 23.13.7 25.2.11	1996	X			

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Pump	Foam	Class A Foam Systems	Superior fire knockdown over plain water (2 to 3 times faster). Reduced water consumption and damage. Faster cleanup. Rekindle risk reduced. Environmental damage reduced. Faster recovery of visibility.	Chapter 21	1991	X	X	X	X
Pump	Foam	Compress Air Foam Systems (CAFS)	Superior fire knockdown over plain water (3 to 5 times faster). Reduced water consumption and damage. Faster cleanup. Rekindle risk reduced. Environmental damage reduced. Faster recovery of visibility. Firefighter fatigue reduced. Exposure protection enhanced.	Chapter 22	1991	X			X
Pump	Foam	Foam Agents & Additives	Improved chemical properties. More efficient heat absorption. Overall reduction in proportioning rates. Longer shelf life. No environmental damage. Reduced maintenance.		1991	X	X	X	X
Pump	Foam	Foam Proportioning System Enhancements	Accuracy and performance improved. Broader operating range. Easier to use. Reliability improved.	Chapter 21	1996	X	X	X	X
Pump	Foam	Foam System Testing	Improved safety and accuracy.	Chapter 21	1999	X			X
Pump	Foam	In-Tank Foam Cells	Reduced firefighter fatigue. Maximize space requirements in hose bed and compartments. Improved accessibility for plumbing to pump and proportioning equipment.	Chapter 21	1991	X			X
Pump	Plumbing	Remote Electrically Actuated Valves	Remote pump panel possible. Smaller more efficient pump panels. Controlled operation.		1991				X

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Pump	Plumbing	Flanged Pump Connections	Improved safety. Serviceability improved. Pipe thread connection eliminated. Extended system life.		1991	X	X	X	
Pump	Plumbing	Flexible Hose Used in Pump Compartment	Improved water flow efficiency by eliminating plumbing elbows. Plumbing flexibility improved.		1991		X	X	X
Pump	Plumbing	Inlets and Outlets Increased	Higher pump flow rates possible.	16.7.1	1991				X
Pump	Plumbing	Slow Close Valves	Pressure spikes avoided. Improved operator safety. Stress on plumbing components reduced.	16.7.5	1991	X			X
Pump	Plumbing	Stainless Steel Plumbing	Corrosion resistant. Increased life of plumbing system. Maintenance requirements reduced.		1996			X	
Pump	Plumbing	Thermal Relief Valve	Improved safety. Pump component protection. Enhanced engine cooling.		1991	X			X
Pump	Pressure & Flow Indicators	Digital Flow Indication Devices	Accuracy improved. Easier to read.		1991	X			X
Pump	Primer	Oil-Less or Biodegradable Pump Primer	Meets EPA requirements. Environmentally safe.	16.10.14	1996	X	X		X
Pump	Pump	Improved Transmission PTO Designs	Allows flexible body designs. Pump and roll options. Ability to PTO drive larger pumps.		1996				X
Pump	Pump	Pump Service Access	Minimum pump access established. Improved serviceability. Less downtime.	15.6	1996		X		
Pump	Pump	Pump Transmissions Improved	Accommodates torque from higher performance engines. Handles torque reversals from transmission mounted retarders.		1994			X	X

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Pump	Pump Controls	Enclosed Top-Mount Pump Panel	Safety of operator away from traffic. Safety of operator away from hose. Visibility for pump operator improved. Service access to pump and plumbing improved. Crew comfort improved. Crew communication improved.		1994	X			X
Pump	Pump Controls	User-Friendly Pump Panels	Simplified operation. Operator efficiency. Training time reduced. Crew safety improved.	16.12	1996	X	X		X
Pump	Pump Controls	Pressure Governor	Pressure control improved. Water stream protected from variation.		1991	X			X
Pump	Pump Controls	Pump Engage Inter-locks	Multiple indicators to verify pump engagement. Pump panel throttle lockout. Ability to preset pressure. Improved safety.	16.10	1996	X			X
Pump	Pump Controls	Rear Mount Pump Panel	Safety of operator away from traffic. Service access to pump and plumbing improved.		1999				
Pump	Pump Controls	Top-Mount Pump Panel	Safety of operator away from traffic. Safety of operator away from hose. Visibility for pump operator improved Service access to pump and plumbing improved.		1991	X	X		X
Pump	Safety Interlocks	Pump Interlock	Interlocks to ensure that pump is engaged. Safety Ensured	16.10	1996		X		
Pump	Testing	Hydrostatic Testing Requirements	Plumbing system integrity verified. Safety factors increased.	16.13.8	1991	X		X	
Pump	Water Tank	Dump Chutes	Chutes required on rear and both sides of apparatus. Safety improved by providing more flexibility to operator. Speed of operations improved during water shuttle operations.	19.5.2.1	1996	X			X
Pump	Water Tank	Polypropylene Water and Foam Tanks	Lighter weight. Longer lasting. Maintenance requirements reduced. Corrosion resistant.		1991	X	X	X	X