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AUGUST 2023



Photo by Ron Jeffers.

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A Major Overhaul to the NFPA Apparatus Standards

BY WILLIAM C. PETERS

SOME THINGS AGE GRACEFULLY, LIKE fine wine, vintage apparatus (photo 1), and beautiful buildings. Others become overweight, bloated, and out of style (like me!). National Fire Protection Association (NFPA) 1901, *Automotive Fire Apparatus*, and 1906, *Wildland Fire Apparatus*, fell into the second category.

When I was promoted to the position of apparatus chief in the Jersey City (NJ) Fire Department in 1987, I encountered and used the 1985 edition of NFPA 1901. The “required” portion of the standard was all of 27 pages long with 11 additional pages of annex material. The complete standard had some very basic requirements for all apparatus. I still have that document and laugh when I look at it! Just think for a moment, the warning light section (or I should say sentences) provided the following requirement: “A red flashing light, or lights visible through 360 degrees in a horizontal plane, shall be installed. Lights shall comply with federal standards as a minimum.” Compare that with today’s standard!

The 2016 edition of NFPA 1901 had 102 pages of “required” material and 86 additional pages of annex material. NFPA 1906 had 127 pages of combined requirements and annex material. Don’t get me wrong; this was all good material, but bloated we have become!

After I got promoted, I decided that I wanted to find out how this standard was developed and wanted to get involved. I started attending the apparatus committee meetings as an observer and found that the committee was open to my opinions. Having a background both as a truck mechanic and in the career fire service, I started submitting public comments on things that I thought were important and needed to be added, improved, or adjusted. Eventually, I was included first as an alternate and then as a voting member of the committee; earlier this year, I received a gold lapel pin for 25 years of service on



(1) Photos 1, 4, 10, 11, 12, 13, 15, 16, 18, 19, and 20 by Ron Jeffers; photos 2, 3, 5, 6, 7, 8, 9, 14, and 17 by author.

the committee! What a surprise!

It should be noted that the NFPA committee on fire apparatus is responsible for NFPA 1901, *Automotive Fire Apparatus*; NFPA 1906, *Standard for Wildland Fire Apparatus*; NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Emergency Vehicles*; and NFPA 1912, *Standard for Fire Apparatus Refurbishing*.

History and Background

Looking way back, the first national specification on municipal fire apparatus was NFPA 19, which was adopted in 1914. Prior to that, the International Association of Fire Engineers and the National Board of Fire Underwriters developed a standard test procedure. A few years later, the NFPA included specifications for chemical hose wagons and automobile service ladder trucks. NFPA 19 went through many revisions over the years up until 1975, when it was renamed NFPA 1901. As a matter of fact, when I was a volunteer in 1970, we used “Pamphlet 19,” as it was known then, when specifying and receiving a new Mack pumper.

In 1991, a major revision was made to the apparatus standard. It was divided into four individual standards:

- NFPA 1901 for pumpers.
- NFPA 1902 for initial attack apparatus.
- NFPA 1903 for mobile water supply apparatus.

- NFPA 1904 for aerial apparatus.

This was a major revision requiring fully enclosed driving and crew areas, defining maximum stepping heights, handrails, upgrading of warning light systems, and requiring a 250-pound minimum tip load on aerials.

The committee realized that there was too much repetition in the four separate standards, and the 1996 revision put all apparatus back into a single standard called NFPA 1901. This edition also defined basic requirements for a fifth apparatus known as Special Service apparatus. This took in units not defined by the first four classifications including rescue trucks, hazmat units, breathing air units, and command units.

Once again in the 1999 edition, adjustments were made to define quint apparatus, and it took in the requirements of NFPA 11c for industrial foam apparatus. These seven classifications of apparatus remained in NFPA 1901 through all revisions up to and including the 2016 edition.

The first edition of NFPA 1906, *Wildland Fire Apparatus*, was published in 1995 to establish the basic requirements for apparatus used in the wildland setting. It too went through several revisions, and in 2006 it was aligned with 1901 where appropriate. In 2012, it was reorganized to follow the same format and style as 1901. The 2016 edition added a new chapter with the requirements for carrying wildland firefighting crews safely.

Development of NFPA 1900

In the past, the apparatus standards were updated approximately every five years. A brief overview of the process is as follows:

- As soon as a standard is published, it is then open to public comments as well as inputs from the apparatus committee or other NFPA standards committees.
- The committee then holds a First Draft meeting to review all the new material.

Every comment is addressed and a determination made. A ballot is then held of the voting members of the committee and a First Draft report is then posted. This provides the opportunity for the public to additionally comment on the committee's actions.

- The committee then holds a Second Draft meeting to discuss the public inputs and a second ballot is then held of the voting members. A Second Draft report is then posted.
- It is then sent on to the NFPA Technical Meeting for adoption if there are no objections.

The Apparatus Committee held our regular update meeting in October 2018 in Orlando, Florida. The committee broke down into task groups and worked through hundreds of public comments. The task group chairs then presented their group's findings to the committee for further discussion and vote. There were several days of intense meetings with the resolution of the first round of comments complete.

In April 2019, the Standards Council approved a document consolidation plan that affected all documents in the Emergency Response and Responder Safety (ERRS) project. That plan called for the consolidation of the following vehicle standards into NFPA 1900:

- NFPA 414, Aircraft Rescue and Firefighting.
- NFPA 1901, Automotive Fire Apparatus.
- NFPA 1906, Wildland Fire Apparatus.
- NFPA 1917, Automotive Ambulances.

The decision was made that NFPA 1900 needed to be made up of the technical committees with distinct expertise in their field, so the Aircraft group worked on their chapters, the Apparatus group did structural and wildland apparatus, and the Ambulance group did their chapters.

All the work that the committee did in Orlando had to be readdressed for the new 1900 standard. To make matters worse, the country was in the middle of a public health pandemic where schools were closed and public gatherings were discouraged. It was decided that the all-important decisions were going to be discussed and handled by telecon-

ferencing, commonly called Zoom calls! For many of us in the "senior group," this was really different!

Task groups had individual calls to discuss their subject matter; then, in January 2022, the committee met several times a week for four weeks to address the findings of each of the task groups. Apparatus committee members, manufacturers who had an interest in the subject being discussed, and the fire service public in general were on the call. It was a daunting task, but our chairman kept good order and controlled the large group.

The committee was balloted, the proposals passed, and the apparatus and wildland portions of the document were accepted. The combined standard was issued by the Standards Council on October 7, 2022.

NFPA 1900 Is Issued

When I received my copy of NFPA 1900, it was like getting the Sears "Wish-book" in the mail at Christmastime when I was a kid! (You younger folks wouldn't understand that joy!) The standard contains 34 chapters with a total of 375 pages! Twenty of those chapters are the input from the apparatus and wildland standards.

Disclaimer: While I have been a member of the Apparatus Committee for a million years, the following is MY interpretation of the changes and the reasoning behind them. Only official NFPA sources can answer specific questions you may have.

The standard contains the following chapters.

- Chapter 1-Administration.
- Chapter 2-Reference Publications.
- Chapter 3-Definitions.
- Chapter 4, 5, and 6-Aircraft Rescue and Firefighting Vehicles.
- Chapter 7-Fire Apparatus, General Requirements.
- Chapter 8-Fire Apparatus, Requirements by Type.
- Chapter 9-Fire Apparatus, Chassis and Vehicle Components.
- Chapter 10-Fire Apparatus, Low Voltage Electrical Systems and Warning Devices.
- Chapter 11-Fire Apparatus, Driving and Crew Areas.

- Chapter 12-Fire Apparatus, Body, Compartments, and Equipment Mounting.
- Chapter 13-Fire Apparatus, Fire Pumps and Associated Equipment.
- Chapter 14-Fire Apparatus, Auxiliary Pumps and Associated Equipment.
- Chapter 15-Fire Apparatus, Pumps for Wildland Firefighting and Associated Equipment.
- Chapter 16-Fire Apparatus, Ultra High-Pressure Fire Pumps and Associated Equipment.
- Chapter 17-Fire Apparatus, Water Tanks.
- Chapter 18-Fire Apparatus, Foam Proportioning Systems.
- Chapter 19-Fire Apparatus, Compressed Air Foam Systems (CAFS).
- Chapter 20-Fire Apparatus, Aerial Devices.
- Chapter 21-Fire Apparatus, Line Voltage Electrical Systems.
- Chapter 22-Fire Apparatus, Command and Communications.
- Chapter 23-Fire Apparatus, Air Systems.
- Chapter 24-Fire Apparatus, Winches.
- Chapter 25-Fire Apparatus, Trailers.
- Chapter 26-Fire Apparatus, Vehicle Protection Systems.
- Chapter 27-Fire Apparatus, Wildland Fire Crew Carrier Apparatus.
- Chapters 28, 29, 30, 31, 32, 33, and 34-Ambulances.
- Annex A-H, depending on the type of vehicle specified.

Chapter 3-Definitions

The definitions chapter greatly expanded with the combination of definitions pertaining to fire and wildland apparatus, airport apparatus, and ambulances.

Chapter 7-General Requirements

In my FDIC Apparatus Purchasing workshop, several participants expressed confusion about when the new standard was going into effect. The first page of the standard says that it was issued by the Standards Council on October 7, 2022, with an effective date of October 27, 2022.

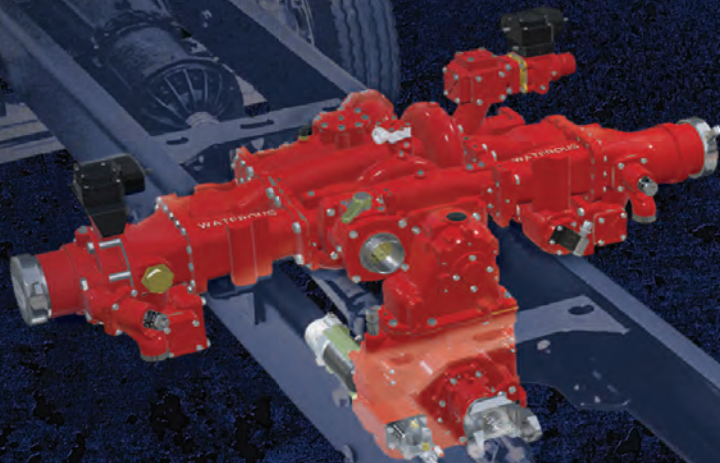
Chapter 7 says that chapters 7 through 27 shall apply to new fire apparatus



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that are 10,001 pounds or greater gross vehicle weight rating (GVWR), trailers towed by fire apparatus under emergency conditions, and that are contracted for **on or after January 1, 2024**. It goes on to say that the standard can be used for vehicles under 10,001 GVWR or those contracted prior to January 1, 2024, if the purchaser and contractor agree.

Similar to the previous 1901, the following chapters apply to all automotive and wildland apparatus:

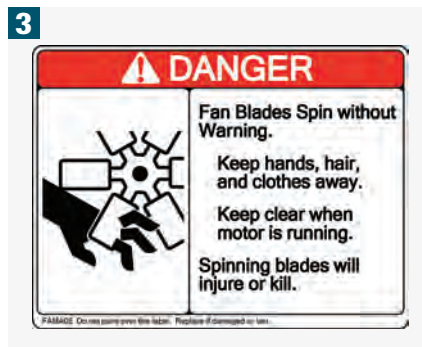
- Chapter 1-Administration.
- Chapter 2-Reference Publications.
- Chapter 3-Definitions.
- Chapter 7-Fire Apparatus, General Requirements.
- Chapter 8-Fire Apparatus, Requirements by Type.
- Chapter 9-Fire Apparatus, Chassis and Vehicle Components.
- Chapter 10-Fire Apparatus, Low Voltage Electrical Systems and Warning Devices.
- Chapter 11-Fire Apparatus, Driving and Crew Areas.
- Chapter 12-Fire Apparatus, Body, Compartments, and Equipment Mounting.

It goes on to define additional chapters that are either “required” or “if specified” on a table. Across the top of the table are types of apparatus and the left column are chapters 13 through 27, which might apply depending on the selection of apparatus type. The types listed are a combination of 1901 and 1906 apparatus:

- Pumper.
- Initial Attack.
- Mobile Water Supply.
- Aerial.
- Quint.
- Special Service.
- Mobile Foam.
- Wildland Fire Suppression.
- Wildland Water Supply.
- Wildland Crew Carrier.

Another new requirement in the Responsibility of the Purchaser section is to identify any crew seats that are either designated as “primary” or “secondary” seating positions. (I will explain Primary and Secondary seating positions in Chapter 11.)

Safety signs that warn of rotating shaft hazards shall be located on the frame rail on each side of the apparatus



and a fan hazard sign is to be located near spinning fans. These warning labels are all over the apparatus (photos 2 and 3).

Illumination shall be provided for controls, switches, instruction plates, labels, gauges, and instruments. The following was added: except drain controls and associated plumbing were located below the truck body.

The whole section requiring a vehicle data recorder has been removed and replaced with a section about onboard data management and communications equipment. The purchaser must now tell the manufacturer if it needs to make provisions for the following (photo 4):

- Radio communications equipment.
- Mobile data terminals or other computer equipment.
- Traffic preemption equipment.
- Vehicle data recorder.
- V2X communications.
- Digital Alert Warning System (DAWS).

The apparatus is now required to have a vehicle stability control system in any configuration that is commercially available. The standard still describes tilt-table testing for structural and wildland apparatus.

The maximum top speed of apparatus remained; however, originally 1901 re-



quired apparatus with a GVWR of more than 26,000 pounds to be limited to 68 miles per hour (mph). The new standard increased the weight to “over 33,000 lbs.” Top speed of apparatus over 50,000 lbs. or carrying 1,250 gallons of water or foam remained at 60 mph.

A new requirement is that the apparatus operator manuals must be publicly accessible on the manufacturer’s Web site. No more hiding the manuals in a cardboard box in the chief’s office!

Another new requirement having to do with documentation is that the apparatus must include one of the following:

- Applicable apparatus operator manuals stored on the apparatus and protected in a permanent, dedicated accessible location.
- The applicable apparatus operator manuals available to be viewed on the apparatus on an accessible electronic display.
- A means of accessing an Internet link to the applicable operator manuals for viewing on a computer, tablet, or smartphone.

The manuals must include all of the fluids used in the vehicle as well as all of the information needed to perform NFPA 1910 certification testing. The vehicle’s water fording capabilities must also be described.

New requirements that address electric vehicles (EV) are described in Chapter 7. The high voltage battery system must be equipped with first responder “cut loops” in the battery management system. They are to be provided on each side of the apparatus in compartments near the rear of the cab and, when cut, will disconnect the power from the high voltage battery cells (photo 5). The cut loops need to be protected behind an access door large enough to cut the loop



with standard bolt cutters. The cut loop is to have a connector that allows the loop to be removed to temporarily disable the high voltage system. Identification signs are to be displayed on each side of the cab and at the rear of the apparatus.

Chapter 8-Requirements by Type

In NFPA 1901, each of the seven types of apparatus had a chapter outlining general requirements for the type, pump, tank, equipment storage, hose storage,

types of ladders, and an equipment list. NFPA 1900 combines all of the requirements into one chapter, once again, using a table depending on the type of apparatus specified. The apparatus types listed across the top are as follows:

- Pumper.
- Initial Attack.
- Mobile Water Supply.
- Mobile Water Supply with Pump.
- Aerial.
- Quint.
- Special Service.
- Mobile Foam.
- Wildland Fire Suppression
 - ◊ 10,001 to 14,000 GVWR
 - ◊ 14,101 to 26,000 GVWR
 - ◊ Over 26,000 GVWR.
- Wildland Water Supply.
- Wildland Crew Carrier.

The left column lists Pump, Tank, Equipment Storage, Hose Storage, Roadside Safety, and Aerial Safety. Each of these shows the requirement depending on the type of apparatus. For example, a pumper is required to have a 750-gallon-per-minute (gpm) fire pump,

a 300-gallon tank, 40 cubic feet (cu. ft.) of compartment space of equipment storage, 37 cu. ft. of hose storage space, two wheel chocks, one traffic vest per seating position, five traffic cones, and five illuminated traffic warning devices.

This is all the same as the original 1901 requirements except there is no mention of preconnected hoselines (except a 100-foot protection line on Mobile Water Supply apparatus). The previously required two areas of 3.5 cu. ft. of hose storage for preconnects have been added to the total hose load capacity. Also, the removal of requirements for hose, equipment, and ladders is explained below.

Some other big changes involve equipment carried on the apparatus. The minimum ladders required on the apparatus have been removed. The standard just requires that ground ladders carried on the apparatus meet the requirements of NFPA 1931 and be **new or have successfully completed annual testing within the last year**. This allows you to transfer your ladders from the rig you are replacing if you wish (photo 6).





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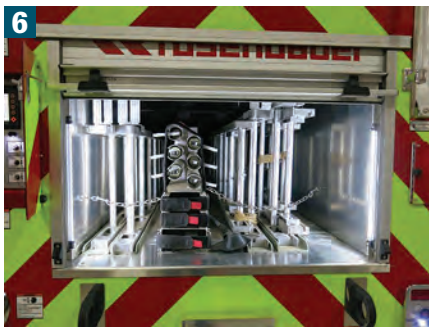
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A similar change includes suction and supply hose. It says, “where suction hose is provided” and “where supply hose is provided,” and gives requirements for the hose. The paragraph in 1901 entitled “Equipment Supplied by the Contractor,” which includes ground ladders and suction or supply hose, has been deleted.

Another surprising deletion is the Minor Equipment list for each type of apparatus. Previously, the standard stated that the equipment listed shall be available on the apparatus before it is placed in service. It has been replaced with a sentence that states: “A detailed list of who is to furnish the equipment to be carried on the apparatus and the method for organizing and mounting these items shall be supplied by the purchasing authority.”

All of the equipment, hose, nozzles, forcible entry tools, SCBA and spare tanks, fire extinguishers, adapters, and so on are all now in tables in Annex A as “Equipment that **Should be Carried** on Fire Apparatus.” Once again, the table has the type of apparatus at the top and a listing of what is **recommended** to be carried. The only items of equipment that are still in the body of the standard as required are as follows (photo 7):

- Wheel chocks.
- Traffic vests.
- Traffic cones.
- Illuminated traffic warning devices.
- Traffic warning triangle kit (or three traffic cones).
- Tire tool kit (if specified).

The rationale for this revision was two-fold. First, this is an apparatus standard and not an equipment standard; second, the minimum equipment listed might not meet the service needs of the community. It is recommended that the purchaser conduct a needs assessment to determine the appropriate level of equipment



that is needed to best serve its community. Purchasers should check for Insurance Services Office equipment requirements for their state or jurisdiction to maximize the community’s grading.

Chapter 9-Chassis and Vehicle Components

What some might be surprised to see is the amount of redundant and superfluous material that was removed from the standard. The following chassis requirements were adjusted to reflect current conditions. Engine manufacturers have their own requirements for filters and so on, so it is unnecessary to require them in the standard.

Chassis weight carrying capacities remained the same in 1900 as they were in 1901. It still shows that ground ladders, suction hose, and designed hose loads in beds or reels are to be considered in addition to the allowance for miscellaneous equipment from the chart or the purchaser’s provided list of equipment it intends to carry, whichever is greater.

The “Engine” definition in Chapter 3 identifies IC for Internal Combustion and EV for Electrical Vehicle. For the first time, this chapter references “IC” engines, which includes both diesel and gasoline engines. The separate section on gasoline engines has been removed.

Some manual controls and indicators have been removed from the chassis chapter. Audible and visual warning devices to alert the driver for high engine temperature or low oil pressure have been removed from the requirements. Most vehicles with IC engines have this feature anyway.

Another requirement that was removed was the prohibition of automatic engine shutdown systems. This had been in the standard to prevent a pumper or aerial that is working at the scene from shutting down unexpectedly. However, an engine derate programming system to protect the engine is permitted.

NFPA1901 required a “high idle” switch to increase engine speed when parked. In 1900, the high idle switch has been renamed “auxiliary control device” with the same requirements for an interlock to prevent operation unless the parking brake is engaged and the transmission is in neutral or disconnected from driving the rear wheels. Also, the specific verbiage requiring an “engine hour meter” has been changed to a means of displaying total engine run time in hours.

In the engine cooling system section, the requirement for drain valves in the lowest parts of the cooling system was removed. In addition, the requirement that the radiator be mounted to prevent leaks caused by twisting was deleted. All manufacturers know that this is required to build a reliable apparatus.

Another obvious area where engine and apparatus manufacturers comply without being required by the standard is providing an oil filter and engine oil fill pipe. These requirements have been removed.

Another requirement that had obviously gotten out of control was the label in the driver’s compartment that listed fluids for the apparatus. Removed were pump priming fluid, drive axle lubrication fluid, air-conditioning refrigerant, air-conditioning lubricating oil, power steering fluid, cab tilt fluid, transfer case fluid, equipment rack fluid, GAFS air compressor system lubricant, and generator system lubricant. Most, if not all, of these would not be serviced by the apparatus operator. The label now will display only the following:

- Engine oil.
- Engine coolant.
- Chassis transmission fluid.
- Pump transmission lubrication fluid.
- Front tire cold pressure.
- Rear tire cold pressure.
- Maximum tire speed rating.

All other fluids will be listed in the maintenance and operator’s manuals.

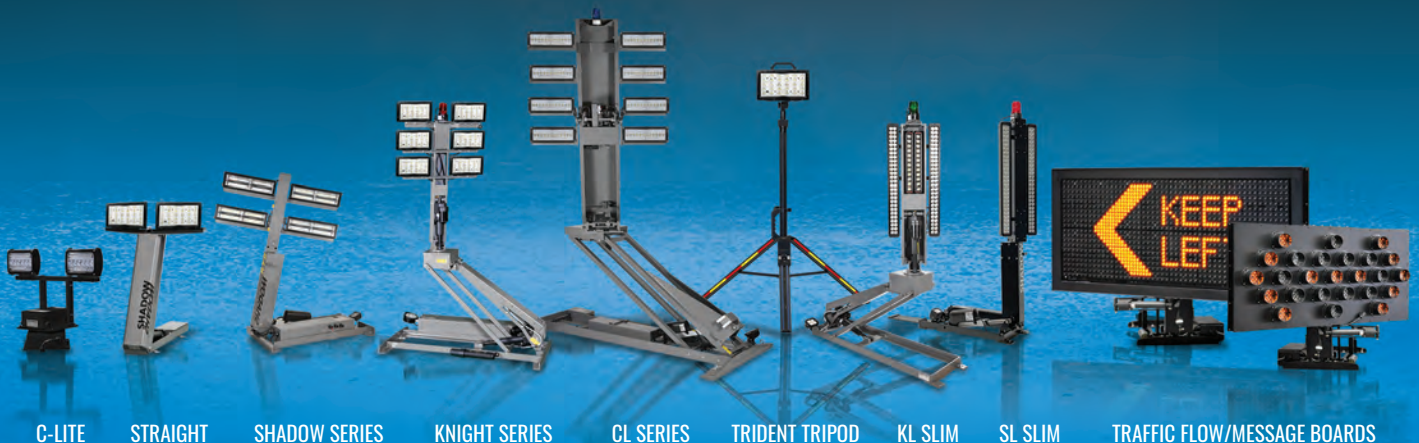
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The air intake system only requires a means to separate burning embers from reaching the air filter. The engine air filter and requirements for air inlet restrictions are not in the standard any longer, as it is assumed that the manufacturer will provide it. Also removed was the previously required air-restriction indicator mounted in the driving compartment and visible to the driver.

In the fuel system section, separate diesel and gasoline engine requirements were removed. The only things that remain are that fuel supply lines and filters are to meet the manufacturer's recommendations and that filters or strainers be the serviceable type located in an accessible location.

Deleted were dual fuel lines, fuel line protection from excessive heating from exhaust, protection from mechanical damage, and all requirements for electric fuel priming systems. All requirements for gasoline engines were removed.

The diesel particulate filter (DPF) section was combined with the exhaust section and was considerably reduced (photo 8). A noticeable change in the DPF system is that apparatus having GVWR of 19,501 lbs. or greater shall have a switch to initiate the regeneration process manually and the same requirement for a switch to prohibit regeneration. In NFPA 1901, these requirements applied to 20,000 lbs. or greater. The requirement for automatic regeneration was removed in NFPA 1900. An exhaust silencing device (muffler) was removed, as the exhaust must pass through a diesel particulate filter, which acts as a muffler.

The requirements and description of a parking brake system for both air and hydraulic brakes were removed. These requirements are provided in the Federal Regulations controlling truck braking systems.



The performance requirement for the capacity of the fuel tank to pump for 2½ hours at rated capacity at 150 psi net pump pressure remained the same. Removed was “or 60% of gross HP for 2½ hours, whichever is greater.” A paragraph describing two fuel tanks automatically feeding the engine was removed.

Since all vehicles require a transmission to transfer power from the engine to the wheels, the requirements for a heavy-duty transmission that provides the driver with individual gears or ranges of gears to meet the performance requirements of the standard were removed. The only thing left was if the apparatus has a front drive axle, an indicator is to be provided to show when the axle is engaged.

Chapter 10-Low Voltage Electrical Systems and Warning Devices

Starting in Chapter 10, all of the references are to “low voltage,” and this is to differentiate from EVs that have high voltage battery packs. NFPA 1900 states that an alternator or other means to charge a low voltage electrical system is to be provided. The “other means” is the addition to this requirement.

The rated output of battery charger/conditioner shall exceed the draw of any loads when the major load disconnect switch is off (photo 9). The purpose of this requirement is to be sure that the apparatus batteries will continue to charge even when there are multiple 12-volt lights, radios, thermal imaging cameras, and rechargeable battery packs attached to the apparatus system (photo 10).

A major load disconnect switch shall be provided to minimize the drain on the low voltage batteries when it is off. This is the typical battery power switch. The previous requirement that said the starter solenoid and alternator are to be connected directly to the batteries was removed, as was the green “master disconnect on” light visible to the driver.

An unnecessary requirement that has been in the standard for ages was that an electrical starting device to start the engine was to be provided. I doubt that anyone attempts to crank a



500-horsepower diesel engine over with a hand crank! Fortunately, that requirement was removed.

Another change that was necessary in the warning light category was the placement of the lines identifying the four warning light zones. Initially it was an “X” drawn through the center of the truck and the zones were A in the front, and, going clockwise, B on the right side, C to the rear, and D on the left. This technically placed the parts of the sides of the truck (like the ends of the front bumper) in the front zone. This has been adjusted and now the four zones are identified by drawing a line at a 45-degree angle out from the corners of the apparatus. This makes much more sense. Front lights face forward and side lights face to the side.

There has been a serious increase in the number of apparatus being struck while operating on highways, many times resulting in serious firefighter injuries and death. One theory is that modern LED warning lights are considerably brighter than past lighting and many have flash patterns that are blinding. The committee listened to manufacturers and users alike who described systems that automatically

reduce lighting output or change flash patterns while on scene at night. Since all manufacturers could not provide such a system at this time and some purchasers didn't want to be restricted by such a requirement, the committee decided to allow the purchaser to specify changes to the two signal modes (calling for right-of-way and blocking right-of-way) so long as any optical changes within any modes still meet the minimum requirements of the chapter.

Warning lights shall not be mounted to impair the effectiveness of lighting devices required under federal regulations including headlights, turn signals, clearance lights, and brake lights. Previously, the standard just said "front optical devices to be spaced from the headlights."

One of the points made was that optical warning lights with a high flash rate were distracting to motorists approaching the apparatus as well as to firefighters around the rig retrieving hose or tools. The minimum flash rate has changed from 75 to 60 flashes per minute, which is in alignment with SAE guidelines.

Authorized warning light colors identified in the standard are red, blue, yellow, and white. Red and blue are authorized in any zone at any time, yellow in any zone except A (front) while responding, and white in any zone except C (rear) while responding and must turn off while on scene. Some departments use a green light as an identifier and others use green to signify the location of a command post. The committee decided to allow green in any zone, but it is not calculated in the zone totals as an optical source.

In addition to the four optical zones on the apparatus, there are also upper and lower warning light zones. Large apparatus are identified as being 25 feet or more in length and small apparatus less than 25 feet.

Previously, the maximum height for warning lights on small apparatus was 8 feet. This has now been raised to 8' 6" — same as large apparatus. The upper-level optical devices on small apparatus shall consist of a single optical warning device providing 360 degrees of conspicuity

or a combination of optical devices creating 360 degrees of conspicuity.

Two other changes dealing with small apparatus are now there are different requirements for upper and lower warning light zones. Previously, they were just measured as a zone total. Also removed was permitting zone C (rear) warning lights to go steady when the brake lights are activated.

Compliance to the standard was previously done one of three ways: (1)

certification from lighting manufacturers if the lights were mounted as directed, (2) by mathematical calculation, or (3) by actual measurement of the lighting system after it is installed on the apparatus. Since no one did the actual testing after installation on the apparatus, that option was removed.

The lighting requirements in the rear work area behind the vehicle were better defined and a figure showing the measurement points was provided. Lateral

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hosebeds (crosslays) no longer require illumination. Previously, only crosslays with a permanent cover were exempt.

Work and scene lights received some additional attention in NFPA 1900. A problem was discovered that some lights lose output when they are on for a while and heat up. Added to the standard was that the thermal degradation of scene lights be not more than 25% when they reach operating temperature.

Some other requirements added to scene lights are that they must have a lens designed to protect from spray and that they be designed for wet locations. If the light is adjustable and the housing temperature can exceed 131°F, a handle must be provided. If manually adjustable floodlights are not operable from the ground, access steps and handrails will allow users to reach the light. Scene lights are not to be mounted where they block Department of Transportation lights or clearance lights on the cab or body (photo 11).

Added to the compartments that are exempt from activating the hazard light in the cab are front bumper compartments and compartments on an aerial device or turntable that don't affect structure or operation if left open (photo 12).

A rear-view visibility system (backup camera) is required to allow the vehicle operator to see an area not less than 10 by 20 feet behind the apparatus when placed in reverse (photo 13).

An acceptance test of the low voltage



battery charger/conditioner was added to the low voltage electrical system performance tests.

Chapter 11-Driving and Crew Area

The provision to provide red or orange seat belts has been further defined. On trucks that are SAE Class 4, 5, or 6 with seating for more than 5 or SAE Class 7 or 8 with seating for more than 3, red or orange seat belts are to be provided.

SAE classes based on GVWR are as follows:

- 4 14,001 to 16,000 GVWR.
- 5 16,001 to 19,500.
- 6 19,501 to 26,000.
- 7 26,001 to 33,000.
- 8 33,001 and up.

In the last upgrade of NFPA 1901, information was brought to the committee's attention on a current size study of firefighters in personal protective equipment (PPE). However, it was too late in the process to be added to the standard.

After much discussion, it was decided that "primary" and "secondary" seating would be identified and added to NFPA 1900. Primary seats are the driver and officer and additional seats designated to be used by firefighters wearing PPE as the apparatus is used in regular service. Secondary seating positions are those that are not intended to be used by firefighters wearing PPE (photo 14).

Primary seating positions are required to provide 20.8 inches of space at the hip

and 27.6 inches at the shoulder. Secondary seats require 20 inches at the hip and 22 inches at the shoulder. Previously, all seats only required 22 inches of space at the shoulder. Primary seat width is permitted to overlap a secondary seat but not another primary seat.

A climate-controlled fresh air intake for the body of a wildland crew transporter was outlined. Previously, a green light indicating that the master disconnect switch was "on" was required. This was removed.

The tiller seating position is considered the same as a primary seat. A tiller training seat is permitted in the tiller cab. Together, they require 40 inches at hip and 44 inches at shoulder level, and both seats require seat belts.

One of following methods must be provided to indicate that the tiller operator is present:

- Tiller seat cushion occupant sensor.
- Seat belt engaged.
- Manual operator presence switch.
- Other means to sense that an operator is seated at the tiller position.

An audible warning alarm is to sound in the tractor cab if the parking brake is released and the tiller operator's presence is not indicated. In addition, if a means of locking the tiller steering is provided, a means of suppressing the audible warning alarm is to be provided.

Chapter 12-Body Compartments and Equipment Mounting

The previous requirement for a protected space or compartment for radio equipment was removed. Chapter 7 requires the purchaser to specify any specific requirements for radio equipment and other electronics so it can be specified at that time.

There were several changes to the requirements involving power equipment racks. This section now includes manually-operated as well as power-operated racks.

Flashing lights front and rear on equipment racks have been eliminated. Retro reflective material is now required to make the rack visible from any direction when deployed. Previously, the outward ends that protrude past the body required reflective material.



The operating controls are to be located where the operator will be clear from a falling load from the rack.

A means needs to be provided to prevent manually-operated racks that prevent rapid deployment of the load. Stowing and deploying a manual rack shall require no more than 70 lbs. of force per required personnel.

Any steps installed on the apparatus that decrease the angle of approach or departure angle shall be designed to



be movable so as not to be damaged when the vehicle travels over terrain that requires the full angle of approach or departure (photo 15).

Reflective striping on the cab and body are to be a minimum of 4 inches wide. Added was the statement "or as wide as possible if 4 inches of flat surface is not available." Another big change was the colors of the rear chevron stripes. Rear chevron stripes can either be red/yellow as previously described or alternating contrasting colors (photo 16). I guess



the definition of contrasting colors is up to the purchaser.

The addition of requirements for hose reels was that they need to be equipped with a brake and hold at least 100 feet of 3/4-inch booster hose. If the capacity of the reel is more than 100 feet of booster hose, the reel is to have a power rewind feature.

Chapter 13-Fire Pumps

Most of the pump section remained the same; however, it was recognized that much larger pump capacities were being specified. The previous suction hose chart was from 250-4,000 gpm. The chart now goes up to 7,500 gpm. Another addition for larger pumps was that pumps rated more than 3,000 gpm are to prime in not more than 90 seconds (photo 17).

Added was at least one valved intake is to be provided and controlled from the pump operator's position.

Previously, suction drain valves were required to be a minimum of 3/4 inches. The size of the valves was removed.

Added to the "Throttle Ready" requirements was the following: "When multiple pumps, generator, aerial hydraulic pumps are powered off the chassis engine, the 'Throttle ready' shall only indicate when all devices are in a mode where the advancement of the engine throttle is safe" (photo 18).

Engine coolant temperature and engine oil pressure warnings are not required at the pump operator's panel if an EV is driving the pump.

Added to the pump certification test was the allowance for the test to be stopped to charge EV batteries.

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Chapter 14-Auxiliary Pumps and Associated Equipment

There were no changes in this chapter.

Chapter 15-Pumps for Wildland Firefighting and Associated Equipment

The wildland pump exhaust requirement was previously to meet the requirements of the USDA Forest Service standard unless 100% of the exhaust gases pass through a turbocharger. Added was 100% of exhaust pass through a diesel particulate filter (DPF) with a warning when the filter requires regeneration, manual cleaning, or replacement.

The electrical starting device just states that it meets the requirements of the engine manufacturer. Previously, it required compliance with the voltage drop of conductors.

The pump cooling line is now required to have a strainer with a cleanout and check valve. A means to verify that the recirculating line is functioning is also required.

Chapter 16-Ultra High Pressure Fire Pumps and Associated Equipment

Most of this chapter remained the same as in NFPA 1901. One addition was the requirement that the lubricant temperature not exceed the manufacturer's recommended temperature when

the pump is operating at rated capacity and discharge pressure.

Chapter 17-Water Tanks

Other than specifically calling out certain requirements for structural or wildland apparatus, there were only two minor changes to the water tank chapter. The maximum distance between tank baffles was increased from 48 to 51 inches, and cleanout sumps are required for tanks of 500 gallons or more used for structural firefighting. Previously, it was all tanks.

Chapter 18-Foam Proportioning Systems

With concerns about the environment, foam systems are required to have a test connection that allows the use of substitute fluids when conducting testing. If that requirement cannot be met, a means shall be provided for testing the system that does not require flowing foam solution into the environment.

A minimum 0.75-inch full-flow valve and piping are to be provided as a tank inlet to any foam concentrate tank.

Chapter 19-Compressed Air Foam System

There were no changes in this chapter.

Chapter 20-Aerial Devices

The minimum rated capacity of aerial ladders was inadvertently deleted in editing. An errata correcting this will be issued before the effective date.

Personnel anchor points provided in the apparatus platform are to withstand 1,800 lbs. perpendicular to the mounting surface.

A number of years ago, to avoid confusion with aerial control levers, specific directions were required. The center lever was to be pushed forward to rotate the turntable clockwise and pulled back for counterclockwise. A provision was included in NFPA 1900 to allow the center control lever (rotation control) to move in the direction of travel.

The aerial stabilizers previously had a maximum ground pressure of 75 psi. This has been increased to 100 psi and the maximum force at any stabilizer is not to exceed 65,000 lbs. with the aerial in every position permitted (photo 19).



Chapter 21-Line Voltage Electrical Systems

There were a few changes in this chapter. Previously, the stability of a generator was to be + or -3 Hz when operating at 60 Hz. The current standard says the generator is to produce electric power at its rated frequency + or -5%. This allows for other than 60 Hz power output.

Line voltage receptacles located in the cab of the apparatus can now be mounted at least 3 inches above the interior cab floor height. Previously, 1901 required receptacles to be mounted 12 inches high, which was difficult to meet.

Line voltage scene lights are required to comply with all the scene light provisions cited in Chapter 10 (.25% thermal degradation, lens designed to protect from spray, designed for wet locations, if it exceeds 131°F a handle must be provided, and so on). In addition, the manufacturer of a line voltage scene light must have it tested by a nationally recognized testing laboratory.

Chapter 22-Command and Communications

There were no changes in this chapter.

Chapter 23-Air Systems

Previously, breathing air compressors and booster systems mounted on apparatus were specified to be able to operate in temperatures from 32°F to 110°F. This has been adjusted to from 40°F to 110°F.

One other minor change was the maximum SCBA pressure that is to be used when type-testing fill station containment systems. The test includes pressurizing a 5,500-psi composite cylinder to 6,050 psi and causing a failure by either mechanical impact or explosive device. The test shall prove that the fill station is capable of containing

all fragments of the failed cylinder, a cylinder in an adjacent chamber did not rupture, and the venting provisions directed the air-concussive release away from the operator.

Chapter 24-Winches

There were no changes in this chapter.

Chapter 25-Trailers

There were no changes in this chapter.

Chapter 26-Vehicle Protection Systems (Wildland)

Chassis component protection for fluid tanks, lines, and electrical components that are not protected by the vehicle or skid plates is required to be protected by a manufactured guard. The specifications for the guard are provided.

Chapter 27-Wildland Crew Transport

In NFPA 1906, there was an extensive description of the crew body crash testing including structural integrity for roof loading and side loading including test methods. This has been replaced with the single requirement that the crew body meet the requirements for ambulance modular body evaluation (photo 20).



Get It and Use It!

The changes to the apparatus standard were a long time coming. Over the years, more and more requirements were added and refined, but not much was eliminated. These changes should make many purchasers happy, especially those who want to use “Highly Contrasting Colors” on their chevron stripes!

Remember, Annex A has lots of great explanatory material. If a paragraph

is marked with an asterisk (*), there is additional material in Annex A.

If you have ideas that you think should be in the standard, submit a public comment. It is easy to do online. I assure you, it will be addressed by the committee during the next upgrade.

Finally, get the standard and use it! The print version is a bit pricey (and heavy to carry), but a downloadable version is available. As the credit card commercial says: “Don’t leave home

without it!” especially when inspecting apparatus.

Best of luck with your purchasing project. ■

WILLIAM C. PETERS retired after 28 years with the Jersey City (NJ) Fire Department, having served the last 17 years as battalion chief/apparatus supervisor. He is a voting member of the NFPA 1901 apparatus committee and the author of *Fire Apparatus Purchasing Handbook* (Fire Engineering) and numerous apparatus-related articles.

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FDIC 2023, Here We Go Again!

BY WILLIAM C. PETERS

THE YEAR 2023 WAS ANOTHER SPECTACULAR one for FDIC International. The exhibit halls were packed with more than 34,000 firefighters from all over the world. Some days, it felt like most of them were in the same aisle as me, trying to get a glimpse of the newest and best fire and emergency medical services equipment available.

In addition to the typical pumpers, rescue trucks, aerials, platforms, and brush trucks, there were lots of ambulances, boats, and even an armored rescue unit! I saw several tillered aerials that seem to be making a comeback with smaller departments as well as major manufacturers displaying their “green” battery-powered units.

The weather worked in our favor this year, and the outside exhibits were well-attended. Where else can you get a ride on a Neoteric Rescue hovercraft (photo 1) or watch a Super-Vac TAF-35 remote-controlled misting vent fan blow the heck out of the trees (photo 2)? This unit is driven on tracks and uses a turbine fan to blow a misting stream of water 300 feet!

There was a steady stream of strong, young (and I do mean strong and young!) firefighters taking part in the Scott

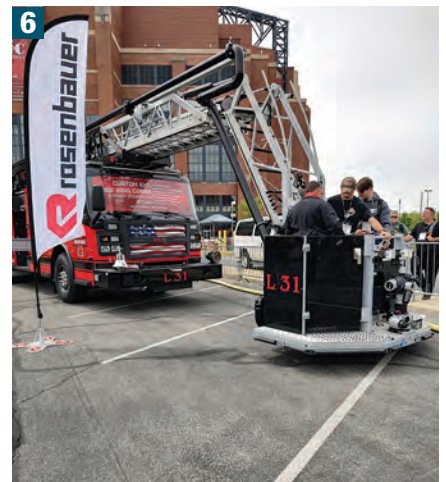
Firefighter Combat Challenge (photo 3). For those of you who are unfamiliar with the challenge, a firefighter in full compliant gear and wearing a self-contained breathing apparatus on air must complete the following events: shoulder load a length of 2½-inch hose and climb up the drill tower to the top, hoist a 42-pound donut roll of hose up to the top, go down the steps, simulate chopping by striking a beam with a 9-pound hammer until it moves 5 feet, do a zigzag run through obstacles, pull a charged attack line 75 feet and flow water, and drag a 175-lb. weighted dummy 100 feet! I got tired just watching it!

What looked like a barbecue out of control was Fire Base’s “Froggy’s Fog” training smoke (photo 4). In addition, if you felt a little warm, it was probably from the Lion Products propane training simulators for a car fire, helicopter, and propane tank that firefighters were igniting and extinguishing (photo 5).

Rosenbauer was demonstrating a 100-foot King Cobra platform that has an articulating end section that makes it convenient for reaching over fixed objects like parapets. Another nice feature of this rig was that only the base section of the aerial was painted black. The

fly sections were all silver galvanized steel, which will be easier to see at night (photo 6). Rosenbauer also had its RTX electric pumper available for pumping and driving (photo 7).

Parked between Lucas Oil Stadium and the convention center was a black-over-red Rosenbauer rig that was lettered for the Fire Dept. Coffee company. This unit is being outfitted to respond to disaster scenes to provide



(1) Photos by author.

comfort and help. In addition to coffee urns (of course), there was a refrigerator, a generator, a washer and dryer, forcible entry tools, saws, and a canopy tent. I'm sure that the compartments will fill up as time goes on (photos 8 and 9).

A section of the lot was marked off for the Will-Burt light towers and drone demonstrations. Many fire departments are now using drones to give the incident commander views that were never possible before (photo 10).

In Lucas Oil Stadium, there were dozens and dozens of vendors displaying their wares. One that I was attracted to was the Turtle Fire System EV (electric vehicle) nozzle. [In full disclosure, this unit was designed by a captain in the Jersey City (NJ) Fire Department, where I worked for many years.] A circular disc unit is attached to a removable 5-foot steel pipe and is capable of spraying from 150 to 500 gallons per minute (gpm) under a burning vehicle. Especially

effective on EV fires, it can be used on standard internal combustion car/truck fires, for cooling fuel tanks, and for exposure protection (photo 11).

The Illinois Firefighters Association had a bright lime-green pumper displayed to promote its firefighter cancer awareness and prevention program. Information about the dangers of soiled fire gear and ways to prevent cancer was on display, known as its "Stop Cancer at the Door" campaign (photo 12).

Across the rear of the stadium floor was the "Firehouse of the Future," complete with apparatus bays, recreation, sleeping, and kitchen areas. It was nothing like the firehouses I worked in during my career (photo 13).

The REV Group's entry into the EV fire truck market was the Vector (photo 14), which was unveiled last year, but this year's model was totally complete. The information provided stated that it performs 100% of its fireground duties on battery power, although there is a diesel engine as backup if needed. The unit has a 1,250-gpm pump, a Hypro foam system, seating for six in a raised aluminum cab, and a 400-kW tandem drive motor





that can deliver 536 horsepower (hp) to the drive wheels or pump.

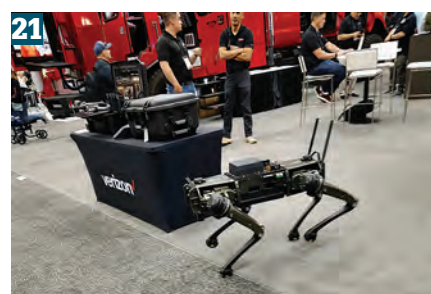
Ferrara, another REV Group company, had a tractor-drawn aerial on display that had National Fire Radio logos and a play on words from a beer manufacturer stating "It's Tiller Time" on the aerial sign plates (photo 15).

Another Ferrara rig on display was Washington, D.C., Rescue Squad 2 (photo 16). This heavy-duty tandem walk-in rescue had several nice features, especially concerning operator maintenance. The driver's step well had an air outlet, electrical connection for the battery charger, charge indicator, and separate shore-power connection for rechargeables (photo 17). The officer's step well allowed the operator to monitor the engine coolant and windshield washer fluid through sight windows cut in the step (photo 18). Torque monitors under the lug nuts will change position if a lug

is loose, indicating a problem before the wheel becomes damaged (photo 19).

Verizon displayed an emergency response vehicle with a whole array of antennas up (photo 20). It also had a robotic "dog" going through all the motions for a captive audience (photo 21). The Fire Department of New York (FDNY) used one of these robotic dogs to search a collapsed parking garage recently instead of risking firefighters in an unstable building.

Pierce displayed 13 units, including an electric Volterra pumper for the Gilbert (AZ) Fire Department and a huge Oshkosh Volterra 6x6 airport crash truck, six aerial apparatus, and several pumpers and rescue units including one for the Indianapolis (IN) Fire Department (photo 22). The Gilbert unit, built on a Velocity chassis, has seating for six, a 500-gallon water tank, a 1,500-gpm pump, and an Oshkosh parallel-electric driveline. An



internal combustion diesel engine backs up the battery power when necessary for uninterrupted service for pumping and driving. The side was plainly marked “Electric Vehicle” (photo 23).

The Oshkosh Striker Volterra electric crash truck was quite eye-catching (photo 24). When operating on batteries, it has zero emissions, can go from 0 to 50 miles per hour in 25 seconds while fully loaded, and has one hour of zero emissions standby time. An internal combustion engine can be provided as backup to the battery power.

Indianapolis Fire Department Engine 14 was on display. The unit is a typical “city-type” pumper with front suction, a low hosebed, a 500-gallon tank, and top-mounted pump controls (photo 25).

The South Hill (VA) Fire Department had a nice tandem nonwalk-in rescue truck on display. The front bumper had a 15,000-pound winch and three anchor points under the bumper (photo

26). Rear pull-down stairs provided safe, easy access to the top body compartments (photo 27). Spacious extinguisher compartments in the wheel wells make good use of excess space (photo 28).

Seagrave displayed an FDNY aerial. This tandem axle, split tilt cab unit is powered by a 500-hp Cummins X12 engine. The cab and body are both constructed of stainless steel. The aerial ladder is rated at 100 feet with a 250-pound tip load (photo 29).

Another Seagrave unit was a stainless-steel pumper for the Rockville (MD) Fire Department. This unit has a 2,000-gpm fire pump, a Hale Smart-foam system, a 750-gallon L-shaped water tank with a low hosebed, and





dual large-diameter hose (LDH) discharges on the right pump panel (photo 30).

Sutphen held down its corner position with several configurations of its apparatus.

Rosenbauer displayed the unique electric engine that it manufactured for the Los Angeles (CA) Fire Department (photo 31) and more than a dozen rigs of different sizes and configurations inside the convention center.

A Rosenbauer T-REX aerial platform for the Mountain Brook (AL) Fire Department had its 115-foot aerial platform booming over the display (photo 32). The unit had a four-section aerial with an 18-foot articulating jib on the end. Other features are a 600-hp Cummins X-15 engine, a Hale 2,000-gpm pump, a 300-gallon water tank, and a 20-gallon foam tank.



Spencer Manufacturing had a pumper with a solid Poly custom body (photo 33). The unit had a Hale Qmax 1,500-gpm pump, a 1,000-gallon water tank, spacious compartments, and a low hosebed.

One of the more unusual units on display was the Lenco Medcat armored



vehicle for the Miami-Dade (FL) Fire Department. Not only is it bulletproof for the rescue of civilians in a shooting incident, but it is able to ford deep water for water rescue situations (photos 34 and 35).

A very rugged-looking wildland, first response, quick-attack unit by Blanchat Manufacturing for the Gilman (IL) Fire Protection District was on display (photo 36). The unit featured rollover protection for the occupants, a heavy-duty front bumper with a winch and a bumper monitor, a 600-gallon poly tank, a Rowe RPM2 200-gpm pump, and a FoamPro CAFS 2.0 system.

US Fire Apparatus displayed a water monitor unit on a Dodge Ram chassis (photos 37 and 38). The unit carried some 12-inch LDH and had a mounted deck gun capable of discharging between 6,000 and 9,000 gpm.



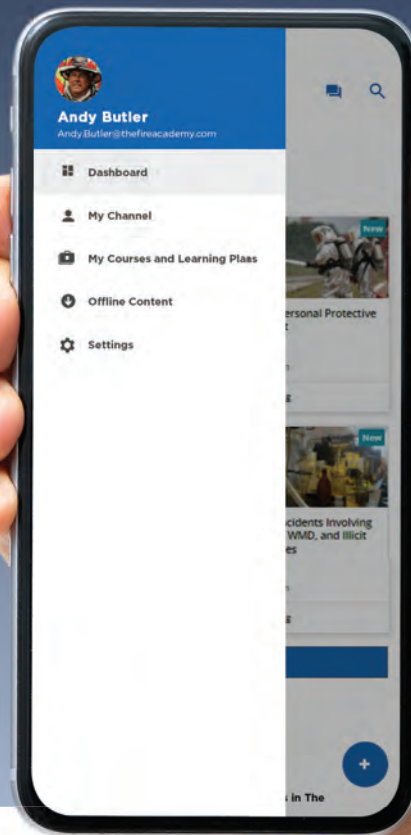
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Darley had its usual large display of fire pumps and equipment. Single-stage fire pumps like the one shown (photo 39) are pretty much becoming standard in the fire service because of their cost and ease of operation.

The engine manufacturers are gearing up for the next round of Environmental Protection Agency (EPA) diesel regulations. A Cummins X-10 was on display that should satisfy most of the fire service (photo 40). It is EPA 2027-compliant and can provide between 320 and 450 hp @ 1,000 to 1,650 ft. lb. of torque. This engine will be suitable for apparatus from 52,000 to 88,000 Gross Weight Rating category. It is currently in use in Europe and will be available in the North American market in 2026.

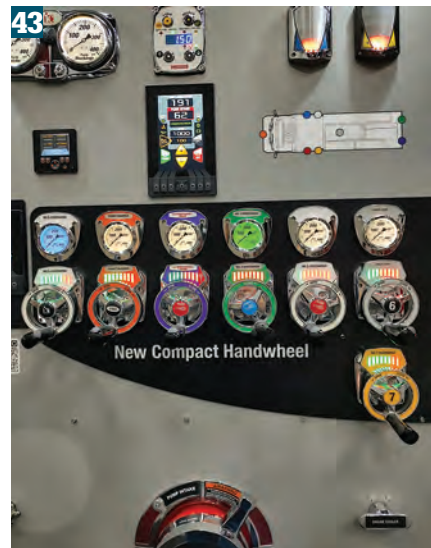
Federal Signal had a demo model of its new Pathfinder PF-400 system with a 400-watt programable siren and light controller. The unit can synchronize warning lights and has the Q-Tone siren and Rumbler built in.

Cell Block had a vehicle hiding under its car fire containment cover. Two firefighters can deploy the fire-resistant cover to contain car fires (photo 41).

A company representative was demonstrating the Lowrance Self-Contained Portable Sonar unit (photo 42). He related a story of how emergency services personnel were trying to make a water recovery for a long period of time using conventional methods and when they deployed this unit, the victim was recovered quickly.

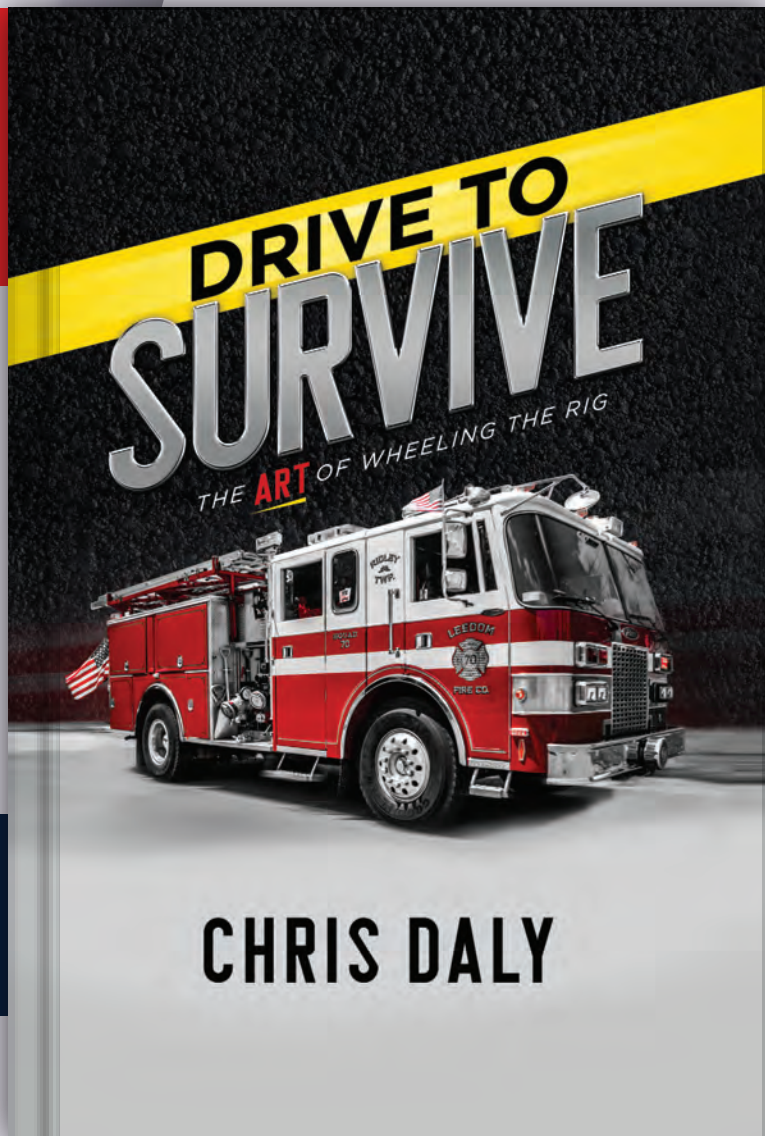
Innovative Controls had a pump panel display of its new compact hand-wheel controllers with LED indicators. These units will fit nicely on narrower pump panels and looked very neat and clean (photo 43).

All in all, FDIC International 2023 had booming attendance, world-class instruction, exciting exhibits, bagpipes, laughter, comradery, and fellowship. Bobby Halton would have been proud! ■



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