Second Revision No. 27-NFPA 1900-2021 [Global Comment]

Update sections in chapter 4 that contain multiple "shall" statements in the same requirement.

Supplemental Information

File Name	Description	Approved
1900_chapter_4_multiple_shall_statements_KH.docx	For staff use	
1900_chapter_4_multiple_shall_statements_KH_Global_SR-27_to_ballot.docx	For ballot	

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Tue Dec 07 10:43:24 EST 2021

Committee Statement

Committee Statement: The committee has identified several places in chapter 4 where there are multiple "Shall" statements and they have gone through and corrected them.

Response Message: SR-27-NFPA 1900-2021

4.3.1* Certification.

The aircraft rescue and firefighting vehicle manufacturer shall assume responsibility for the design, construction, and performance of all component parts of the complete vehicle, even if major portions are subcontracted, and certify that the completed vehicle meets the requirements of this standard.

4.3.2.2

These manuals shall cover the entire vehicle and be in accordance with 4.3.2.3 through 4.3.2.5.9.

4.3.2.4.4

Illustrations, wiring diagrams, and exploded views shall be used to clarify text and appear as close to the related text as possible.

4.3.2.5.2

Assemblies or components shall be shown in illustrations and shall be identified by reference numbers that correspond to the reference numbers in the parts list.

4.3.2.5.9

The purchasers shall specify provisions for training, including the location and duration, and agree on suitable training aids such as video tapes and training manuals.

4.3.3.4

Paint finish shall be selected for maximum visibility and be resistant to damage from firefighting agents.

4.3.3.6

Materials that deteriorate when exposed to sunlight, weather, or operational conditions normally encountered during service shall comply with one of the following:

(1) Not be used

(2) Have a means of protection against such deterioration that does not prevent compliance with performance requirements

4.4.1.2.2

The difference in weight between any two axles shall not exceed 10 percent of the weight of the heaviest axle if the heavy axle is a rear axle.

4.4.1.2.3

The requirement in 4.4.1.2.2 shall not apply to vehicles with a capacity of less than 1999 L (528 gal).

4.4.2.2.1

The vehicle shall be constructed so that a seated driver, having an eye reference point of 80.7 cm (31**3⁄4** in.) above the seat cushion and 30.5 cm (12 in.) forward from the seat back, shall be capable of the following:

(1) To see the ground 6.1 m (20 ft) ahead of the vehicle

(2) To have a field of vision of at least 5 degrees above the horizontal plane

(3) To have a field of vision in the horizontal plane of at least 90 degrees on each side from the straight ahead position

(4) Not to have his or her vision obstructed by more than 7 degrees per obstruction

4.6.1.1

Any low-voltage electrical systems or warning devices installed on the fire apparatus shall be appropriate for the mounting location and intended electrical load and meet the specific requirements of this section.

4.7.4.1

Positive drive either shall be permitted to be achieved by the use of automatic locking and torque proportioning differentials or selected manually by the seated driver by use of a single control while the vehicle is in motion.

4.11.1*

The braking system shall comply with FMVSS 121 as follows:

(1) No part of the brake chamber projects below the axle bowls.

(2) The air system has the capacity for quick buildup from 0 kPa (0 psi) to release of spring brakes within 15 seconds.

4.11.2*

Service brakes shall be of the all-wheel type with split circuits so that failure of one circuit does not cause total service brake failure.

4.13.4.3

Groupings of both the chassis and the firefighting system instruments, warning lights, and controls shall be removable as a unit or accessible for servicing.

4.13.5.2* SCBA Mounting.

Where SCBA holders are mounted within a driving or crew compartment, they shall comply with the following:

(1) The SCBA holder retains a pack and bottle combination for the published weight rating of the holder when subjected to the dynamic force pulse per

SAE J2418, *Occupant Restraint System Evaluation — Frontal Impact Component-Level Heavy Trucks*.

(2) If the SCBA unit is mounted in a seatback, the release mechanism is accessible to the user while seated.

(3) Brackets that lock automatically either in the event of impact or when the parking brake is released, but are not locked at other times, are permitted.

(4) *The SCBA holder retains the bottle when subjected to the deceleration pulse at 0, 30, 90, and 180 degrees with respect to the direction of bottle extraction and in the horizontal plane.

(5) The SCBA holder retains the bottle when subjected to a deceleration pulse that exceeds 2 g for at least 60 ms in the vertical direction.

(6) The deceleration pulse meets the SAE J2418 deceleration profile with an accuracy of ±10 percent within the 35 ms to 95 ms range.

(7) The deceleration pulse is measured on a rigid portion of the base of the test fixture.

(8) The test component is retained in the holder during and after the dynamic test.

(9) The force required to extract the bottle after each test is no more than 125 percent of the initial extraction force.

(10) The SCBA holder is attached to the fixture in the same manner that it will be fastened to the seat or vehicle.

(11) The test bottle does not move more than 7.6 m (3 in.) relative to the frame of the holder during each test.

(12) The test fixture does not allow the holder frame to move more than 7.6 m (3 in.) relative to the base of the test sled.

(13) Each holder bears a label affixed by the holder manufacturer certifying compliance to these specifications.

4.14.1

The body shall be constructed of materials that are of the lightest weight consistent with the strength necessary for off-pavement operation over rough terrain and exposure to excess heat, and body panels shall be removable where necessary to provide access to the interior of the vehicle.

4.14.4

A working deck that is reinforced and constructed of, or covered with, a slip-resistant material shall be provided and reinforced adequately to allow the crew to perform its

duties in the primary turret area, cab hatch area, water tank top fill area and foam-liquid top fill area, and in other areas where access to complementary or installed equipment is necessary.

4.16.5.3

All valves shall be of the quarter-turn type and selected for ease of operation and freedom from leakage.

4.17.3.5

The tank connections shall comply with the following:

(1) Have check valves

(2) Be constructed so that water is not lost from the tank when a connection or disconnection is made

4.18.1.4

The tank outlets shall be located above the bottom of the sump and provide continuous foam-liquid concentrate to the foam proportioning system, with that system operating as specified in 4.18.4 and with the vehicle discharging two tank loads of usable water as specified in 4.17.1.

4.19.2.1.2

The material of construction shall be resistant to corrosion by the AFFF agent to be stored, or a lining material shall be provided.

4.20.4.1

Where a manually operated turret is specified, the following shall apply:

(1) Controls are in the cab.

(2) Operation force is less than 133.4 N (30 lbf).

(3) An indicator of turret elevation and azimuth is provided.

4.20.4.2

Where a power-assisted turret is specified, the following shall apply:

(1) Controls are in the cab.

(2) An indicator of roof turret elevation and azimuth is be provided.

(3) Where specified, a manual override or secondary control powered by an alternative source of all turret movement functions is provided.

(4) Where specified, secondary controls are capable of operating the turret with a failed primary control system.

(5) Where specified, the manual override for turret operation force is less than 133.4 N (30 lbf).

4.20.6.5

Where remote color optics are specified the following shall apply:

(1) They are capable of permitting overall fire scene surveillance when fully extended and provide the driver/operator with the detail needed for placement of the piercing device on the aircraft hull for penetration.

(2) The camera and associated lighting are designed and installed for exterior environmental operating conditions encountered by ARFF vehicles.

(3) A monitor 178 mm (7 in.) or larger is cab-mounted and viewable from the driver/operator position.

4.21 Preconnected Handlines.

Preconnected handlines shall be those handlines for discharging water or foam, or both, that are specified by the purchaser as intended for use as primary ARFF equipment and all other handlines that are installed on the vehicle shall not be considered as being preconnected handlines.

4.23.1 Dry Chemical Container.

The dry chemical container shall be constructed in accordance with the ASME *Boiler and Pressure Vessel Code*, Section VIII, or equivalent, and so stamped.

4.25.1.1

The dry chemical turret performance shall be in accordance with Table 4.2.1.2(c) and Table 4.2.1.2(d).

4.25.1.2

Where entrained dry chemical discharge is specified for water tank capacity under 1999 L (528 gal), the dry chemical flow rate shown in parentheses in Table 4.2.1.2(c) and Table 4.2.1.2(d) shall be used.

4.26.1*

Lighting equipment shall be installed in conformity with local road regulations, where practicable, and shall include the following:

(1) Headlights with upper and lower driving beams where a control switch that is readily accessible to the driver is provided for beam selection

(2) In addition to dual taillights and dual stop lights, a minimum of one additional stop light located high up on the rear of the vehicle

(3) Self-canceling turn signals, front and rear, with a steering column–mounted control, a visual and audible indicator, and a four-way flasher switch

(4) Reflectors, marker, and clearance lights furnished to describe the overall length and width of the vehicle

(5) Engine compartment lights, nonglare type, arranged to illuminate both sides of the engine, with individual switches located in the engine compartment

(6) Service lighting for all areas described in 4.14.2(1), 4.14.2(2), and 4.14.2(3), as well as for the engine compartment

(7) Lighting for all top-deck working areas

(8) At least one backup light and an audible alarm with a minimum of 97 dBA that meet SAE J994, *Alarm — Backup — Electric, Laboratory Performance Testing,* installed in the rear of the body

4.26.2.1

The siren shall be mounted to allow maximum forward sound projection and protected from foam dripping from the turret or water splashed up by the tires.

4.26.4.2

Emergency warning light(s) shall be mounted on the top of the vehicle and visible for 360 degrees in a horizontal plane.

Second Revision No. 28-NFPA 1900-2021 [Global Comment]

Update sections in chapter 5 that contain multiple "shall" statements within the same requirement.

Supplemental Information

File Name	Description	Approved
1900_chapter_5_multiple_shall_statements_KH.docx	For staff use	
1900_chapter_5_multiple_shall_statements_KH_Global_SR-28_to_ballot.docx	For ballot	

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Tue Dec 07 10:51:30 EST 2021

Committee Statement

Committee Statement: The committee has identified several areas in chapter 5 that have multiple "shall" statements and they have gone through an corrected those areas.

Response Message: SR-28-NFPA 1900-2021

5.2.3 SCBA Mounting.

Where SCBA holders are mounted within a driving or crew compartment, they shall comply with the following:

(1) The SCBA holder retains a pack and bottle combination for the published weight rating of the holder when subjected to the dynamic force pulse per SAE J2418, *Occupant Restraint System Evaluation — Frontal Impact Component-Level Heavy Trucks*.

(2) If the SCBA unit is mounted in a seatback, the release mechanism is accessible to the user while seated.

(3) Brackets that lock automatically either in the event of impact or when the parking brake is released, but are not locked at other times, are permitted.

(4) *The SCBA holder retains the bottle when subjected to the deceleration pulse at 0, 30, 90, and 180 degrees with respect to the direction of bottle extraction and in the horizontal plane.

(5) The SCBA holder retains the bottle when subjected to a deceleration pulse that exceeds 2 g for at least 60 ms in the vertical direction.

(6) The deceleration pulse meets the SAE J2418 deceleration profile with an accuracy of ±10 percent within the 35 ms to 95 ms range.

(7) The deceleration pulse is measured on a rigid portion of the base of the test fixture.

(8) The test component is retained in the holder during and after the dynamic test.

(9) The force required to extract the bottle after each test is not more than 125 percent of the initial extraction force.

(10) The SCBA holder is attached to the fixture in the same manner that it will be fastened to the seat or vehicle.

(11) The test bottle does not move more than 7.6 m (3 in.) relative to the frame of the holder during each test.

(12) The test fixture does not allow the holder frame to move more than 7.6 m (3 in.) relative to the base of the test sled.

(13) Each holder bears a label affixed by the holder manufacturer certifying compliance to these specifications.

5.4.5

A handrail shall comply with the following:

(1) A handrail shall be provided on each side of the access extending from the docking platform to the bottom of the access

(2) The height of the handrail measured from the stepping surface shall be a minimum of 0.76 m (30 in.).

5.7.6.1.2

Lighting equipment installation shall also include the following:

(1) Headlights with upper and lower driving beams are provided, along with a control switch for beam selection that is accessible to the driver.

(2) Dual taillights and dual stop lights are provided.

(3) A minimum of one additional stop light is located high up on the rear of the vehicle.

(4) Self-canceling turn signals, front and rear, with a steering-column-mounted control and a visual and audible indicator is provided, along with a four-way flasher switch.

(5) Reflectors and marker and clearance lights are furnished to describe the overall length and width of the vehicle.

(6) Engine compartment lights, nonglare type, are provided and arranged to illuminate both sides of the engine, with individual switches located in the engine compartment.

(7) Service lighting are provided for all areas described in 4.14.2(1), 4.14.2(2), and 4.14.2(3), as well as for the engine compartment.

(8) Lighting for all top-deck working areas are provided.

(9) At least one backup light and an audible alarm with a minimum of 97 dBA that meet SAE J994, *Alarm — Backup — Electric, Laboratory Performance Testing*, is installed in the rear of the body.

5.7.6.2.1

The siren shall be mounted to allow maximum forward sound projection and protected from foam dripping from the turret or water splashed up by the tires.

5.7.7.2

Emergency warning light(s) shall be mounted on the top of the vehicle and visible for 360 degrees in a horizontal plane.

5.8.2.2.2

All vehicle-mounted electrical devices functioning at the crash site shall be turned on with the following stipulations:

(1) All vehicle lighting is on.

(2) All heating, defrosting, and air-conditioning systems, or as many systems as possible, are on with their respective fans adjusted to the maximum speed setting.

(3) Complementary power-generating devices (where applicable) are running.

(4) Intermittent warning devices, such as hazard flashers, warning buzzers, and horns, are turned off.

5.8.4.4
The capability of the vehicle's parking brake to hold the vehicle stationary on a 20 percent grade shall be demonstrated either on an actual grade or by means of an equivalent drawbar pull test.

5.8.4.5

If an actual 20 percent grade is available, the tests shall be conducted as follows:

(1) Drive the vehicle in a forward direction onto the 20 percent grade, stop, and set the parking brake.

(2) Shift the transmission to neutral, release the service brakes, and verify that there is no wheel rotation.

(3) Repeat 5.8.4.5(1) and 5.8.4.5(2) with the vehicle facing the opposite direction.

5.8.4.6
The capability of the vehicle's service brake to hold the vehicle stationary on a 50 percent grade shall be demonstrated either on an actual grade or by means of an equivalent drawbar pull test.

5.8.4.7

If an actual 50 percent grade is available, the tests shall be conducted as follows:

(1) Drive the vehicle in a forward direction onto the 50 percent grade, apply the service brakes, and shift the transmission to neutral.

(2) Verify there is no wheel rotation.

(3) Repeat 5.8.4.7(1) and 5.8.4.7(2) with the vehicle facing the opposite direction.

5.8.4.8

The capability of the vehicle's service brake to hold the vehicle stationary on a 20 percent grade shall be demonstrated either on an actual grade or by means of an equivalent drawbar pull test.

5.8.4.9

If an actual 20 percent grade is available, the tests shall be conducted as follows:

(1) Drive the vehicle in a forward direction onto the 20 percent grade, apply the service brakes, and shift the transmission to neutral.

(2) Verify that there is no wheel rotation.

(3) Repeat 5.8.4.9(1) and 5.8.4.9(2) with the vehicle facing the opposite direction.

5.8.4.10

The brakes shall lock the wheels and hold the vehicle stationary on both the 20 percent and 50 percent grade or the brakes shall generate an equivalent drawbar pull, with the vehicle pointed either uphill or downhill.

Second Revision No. 277-NFPA 1900-2022 [Section No. 4.1.3]

4.1.3* Equivalency.

Nothing in ~~this standard is~~ Chapters 4 through 6 is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

A.4.1.3

Local technical standards might be determined equivalent when their performance meets or exceeds the minimum requirements of this NFPA document, even if the language is not matching identically. The end user should work with the manufacturer to evaluate and determine equivalency between the local technical standard and this document.

4.1.3.1

Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

4.1.3.2

The system, method, or device employed shall be demonstrated to meet the acceptance criteria for the intended purpose to the authority having jurisdiction.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Feb 14 14:06:28 EST 2022

Committee Statement

Committee Statement: The committee is adding this new annex text in order to provide assistance to those who would need to use or apply the equivalency statement when purchasing an ARFF apparatus.

Response Message: SR-277-NFPA 1900-2022

Second Revision No. 5-NFPA 1900-2021 [Section No. 4.3.2.4.2]

4.3.2.4.2

The instructions shall cover such typical maintenance and repair operations as troubleshooting~~,~~ and adjustment procedures~~, minor and major repairs and overhaul, removal and replacement of units, assemblies and subassemblies, and complete instructions for disassembly and reassembly of components~~ .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 07:38:53 EST 2021

Committee Statement

Committee Statement: The committee agrees with the intent of the submitter s public comment, but believes the wording ‘minor repairs’ is not definable so the wording removed this text from the submittal.

Response Message: SR-5-NFPA 1900-2021

Public Comment No. 309-NFPA 1900-2021 [Section No. 4.3.2.4.2]

Second Revision No. 6-NFPA 1900-2021 [Section No. 4.3.2.5.6]

4.3.2.5.6

The vehicle manufacturer shall ensure that in-stock parts critical to the mission of the vehicle are shipped to the purchaser within 48 hours (business days) .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 07:41:08 EST 2021

Committee Statement

Committee Statement: The committee is making these changes as they wanted to add the clarification that business days are typically used for parts shipments.

Response Message: SR-6-NFPA 1900-2021

Public Comment No. 304-NFPA 1900-2021 [Section No. 4.3.2.5.6]

Second Revision No. 22-NFPA 1900-2021 [Section No. 4.3.2.5.10]

4.3.2.5.10*

Parts manuals shall not be required for commercial chassis vehicles supplied to a component manufacturer. ~~Parts manuals shall be required for upfit components added to the commercial chassis.~~

4.3.2.5.11

Parts manuals shall be required for upfit components added to the commercial chassis.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Dec 06 11:59:14 EST 2021

Committee Statement

Committee Statement: This change was made as there were two sentences/requirements in the original text.

Response Message: SR-22-NFPA 1900-2021

Second Revision No. 23-NFPA 1900-2021 [Section No. 4.3.3.1]

4.3.3.1

All exposed ferrous metal surfaces that are not plated or of stainless steel or that are not otherwise treated to resist corrosion shall be cleaned, ~~thoroughly and~~ prepared, and ~~shall be~~ painted in the color(s) specified by the purchaser.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Dec 06 12:02:00 EST 2021

Committee Statement

Committee Statement: These changes were to remove vague and unenforceable terms as well as to remove a second "shall" from the requirement.

Response Message: SR-23-NFPA 1900-2021

Second Revision No. 26-NFPA 1900-2021 [Section No. 4.3.3.8]

4.3.3.8

The use of proven, nonmetallic materials in lieu of metal shall be permitted, provided such use contributes to reduced weight~~, lower cost,~~ or less maintenance and there is no degradation in performance ~~or increase in long-term operations and maintenance costs~~ .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Dec 06 12:05:55 EST 2021

Committee Statement

Committee Statement: These changes were made to make the requirement more concise.

Response Message: SR-26-NFPA 1900-2021

Second Revision No. 16-NFPA 1900-2021 [Section No. 4.3.4]

4.3.4 Lettering, Numbering, and Striping.

4.3.4.1

All retroreflective materials used shall conform at minimum to the requirements of ASTM D4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Section 6.1.1, for Type I sheeting.

4.3.4.2

~~All retroreflective materials that are colors~~ Colors that are not listed in ASTM D4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Section 6.1.1, shall have a minimum coefficient of retroreflection of 10 with an observation angle of 0.2 degrees and an entrance angle of −4 degrees.

4.3.4.3

Lettering, numbering, and striping shall be in contrast to the vehicle color.

4.3.4.3.1

Reflective striping shall be placed horizontally on the sides of the vehicle below the body centerline.

4.3.4.3.2

The striping shall be at a minimum 20.3 cm (8 in.) in height and be at least 60 percent of the overall vehicle length.

4.3.4.3.3

Reflective striping shall be placed horizontally on the rear of the vehicle below the body centerline.

4.3.4.3.4

The striping shall be at a minimum 20.3 cm (8 in.) in height and be at least 60 percent of the overall vehicle width.

4.3.4.4

Vehicles shall display a unique reflective identification number on each side and on their roof.

4.3.4.4.1

Roof “primary” numbers shall be 61 cm (24 in.) in height and placed so that the base of the number is facing the front of the vehicle.

4.3.4.4.2

Side “secondary” numbers shall be 40.6 cm (16 in.) in height and placed above the vehicle centerline.

4.3.4.5

A graphical design shall be permitted, provided the design covers the minimum height and width requirements listed in 4.3.4.3.2 and 4.3.4.3.4 .

~~4.3.4.1~~

~~Vehicle numbering, lettering, and minimum 0.2 m (8 in.) wide reflective striping shall be provided in accordance with ASTM D4956.~~

~~**4.3.4.2**~~

~~Striping shall be placed horizontally on the sides of the vehicle below the body centerline.~~

~~**4.3.4.3**~~

~~Vehicles shall display an identification number on each side and roof.~~

~~**4.3.4.3.1**~~

~~Side numbers shall be a minimum of 0.4 m (16 in.) in height.~~

~~**4.3.4.3.2**~~

~~Primary numbers shall be a minimum of 0.6 m (24 in.) in height and affixed with their base toward the front of the vehicle.~~

~~**4.3.4.4**~~

~~Numbering, lettering, and striping shall be in sharp contrast to the vehicle color.~~

~~**4.3.4.5**~~

~~Vehicle numbering, lettering, and minimum 20.3 cm (8 in.) wide reflective striping shall be provided in accordance with ASTM D4956.~~

~~**4.3.4.5.1**~~

~~A graphic design meeting the reflectivity requirements of this subsection shall be permitted to replace all or part of the required striping, provided the design or combination thereof covers a minimum of the same perimeter length required in 4.3.4.5 .~~

~~**4.3.4.5.2**~~

~~Striping shall be placed on at least 60 percent of the perimeter length of each side, width, and rear.~~

~~**4.3.4.5.3**~~

~~At least 40 percent of the perimeter width of the front of the vehicle shall have reflective striping.~~

~~**4.3.4.6**~~

~~Where specified, at least 50 percent of the rear-facing vertical surfaces, visible when facing from the rear of the vehicle, shall be equipped with retroreflective material.~~

~~**4.3.4.6.1**~~

~~Where chevrons are used, each stripe in the chevron shall be a single color alternating between two high-contrast colors.~~

~~**4.3.4.6.2**~~

~~Each stripe shall be 152 mm (6 in.) in width.~~

~~**4.3.4.6.3**~~

~~Where Battenburg markings are used, each box in the Battenburg markings shall be 92,903 mm^2 (144 in.^{2}).~~

~~**4.3.4.6.6**~~

~~Any printed or processed retroreflective film construction shall conform to the standards required of an integral colored film as specified in ASTM D4956, *Standard Specification for Retroreflective Sheeting for Traffic Control* , Section 6.1.1.~~

Supplemental Information

File Name	Description	Approved
Updated_SR_16_4.3.4_Text.docx	This is the text that is meant to replace the current 4.3.4. For staff use	

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 09:07:01 EST 2021

Committee Statement

Committee Statement: These changes establish a quantifiable minimum standard for vehicle lettering, numbering, and striping.

Response Message: SR-16-NFPA 1900-2021

Public Comment No. 293-NFPA 1900-2021 [Section No. 4.3.4]

Public Comment No. 292-NFPA 1900-2021 [Section No. 4.3.4.1]

Second Revision No. 7-NFPA 1900-2021 [Sections 4.6.1.3.5, 4.6.1.3.6, 4.6.1.3.7, 4.6.1.3.8, 4.6.1....]

~~**4.6.1.3.5**~~

~~Where specified, hybrid or electric vehicles shall meet the requirements of FMVSS 305 including S5.4.1.1 Marking of RESS.~~

~~**4.6.1.3.6**~~

~~Where specified, hybrid or electric vehicles shall meet the requirements of FMVSS 305 S5.4.1.2.~~

4.6.1.3.5

High-voltage electrical energy storage devices shall be marked with a warning symbol.

4.6.1.3.5.1

The symbol shall be visible on electrical protection barriers that, when removed, expose live parts of high-voltage sources.

4.6.1.3.5.2

The symbol shall be yellow, and the bordering and the arrow shall be black.

4.6.1.3.6

Cables for high-voltage sources that are not located within electrical protection barriers shall be identified by having an outer covering with the color orange.

4.6.1.3.7

~~Where specified, hybrid~~ Hybrid electric or electric vehicles shall include a high-voltage isolation monitor that meets the requirements of ~~FMVSS 305,~~ SAE J2578, *Recommended Practice for General Fuel Cell Vehicle Safety*; UL 2231-1, ~~*Safety for*~~ *Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements*; and UL 2231-2, *Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems*.

4.6.1.3.8

~~Where specified, hybrid~~ Hybrid electric or electric vehicle rechargeable energy storage system shall have a high-voltage interlock in accordance with SAE J2578, *Recommended Practice for General Fuel Cell Vehicle Safety*, and SAE J2344, *Guidelines for Electric Vehicle Safety*.

4.6.1.3.9

~~Where specified, hybrid~~ Hybrid electric or electric vehicles shall meet the bonding requirements of IEC 62477-1, *Safety Requirements for Power Electronic Converter Systems and Equipment*.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 07:59:29 EST 2021

Committee Statement

Committee Statement: The committee has made these changes based on submitted public comments and to also address new technologies.

Response Message: SR-7-NFPA 1900-2021

Public Comment No. 296-NFPA 1900-2021 [Sections 4.6.1.3.5, 4.6.1.3.6, 4.6.1.3.7]

Public Comment No. 280-NFPA 1900-2021 [Section No. 4.6.1.3.7]

Second Revision No. 8-NFPA 1900-2021 [Section No. 4.6.4.1]

4.6.4.1

The battery charger shall be supplied from an external power source ~~of 115 volts or 220 volts ac~~ with a voltage as specified by the end user .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 08:38:01 EST 2021

Committee Statement

Committee Statement: The committee does agree with the direction that the submitter was going for but the committee wanted to make it open to any voltage specified by the end user.

Response Message: SR-8-NFPA 1900-2021

Public Comment No. 366-NFPA 1900-2021 [Section No. 4.6.4.1]

Second Revision No. 9-NFPA 1900-2021 [Section No. 4.7 [Excluding any Sub-Sections]]

Transmission of power from the ~~engine~~ power source(s) to the wheels of the vehicle shall be through an automatic or a semiautomatic gearbox.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 08:43:06 EST 2021

Committee Statement

Committee Statement: The committee believes that since we changed the wording from engine for 4.5, that it should also be changed in this area also.

Response Message: SR-9-NFPA 1900-2021

Public Comment No. 303-NFPA 1900-2021 [Section No. 4.7 [Excluding any Sub-Sections]]

Second Revision No. 276-NFPA 1900-2022 [Section No. 4.13.4.4]

4.13.4.4*

The following instruments and warning lights shall be provided as a minimum:

(1) Speedometer/odometer
(2) Engine tachometer(s)
(3) Fuel level
(4) Air pressure
(5) Engine(s) temperature
(6) Fire system pressure
(7) Water tank level
(8) Foam or tank level
(9) Low–air pressure warning
(10) Headlight beam indicator
(11) Engine(s) oil pressure
(12) Voltmeter(s)
(13) Transmission oil temperature
(14) Forward-looking infrared (FLIR) monitor

A.4.13.4.4

Depending on the type of vehicle driveline specified, the purchaser can consider adding or deleting instruments and warning lights. Based on the driveline specified, some of the base instruments and lights might not be applicable to that driveline configuration. Alternatively, some driveline systems might require new instruments and warning lights based on that particular technology that might be needed to alert the operator in the operation of the vehicle. The purchaser should consider that driveline is being specified and specify the appropriate instruments and lights for that technology.

4.13.4.4.1

The components in 4.13.4.4(4), 4.13.4.4(6), 4.13.4.4(7), 4.13.4.4(8), and 4.13.4.4(9) shall not be applicable to a small commercial chassis.

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Mon Feb 14 14:02:21 EST 2022

Committee Statement

Committee Statement: The committee is adding this annex text as it is believed that some guidance should be given to the fact that different controls, gauges, and warning lights may be needed for various driveline configurations. This was put in the Appendix for reference to end

users.

Response Message: SR-276-NFPA 1900-2022

Public Comment No. 301-NFPA 1900-2021 [New Section after A.4.13.4.2]

Second Revision No. 13-NFPA 1900-2021 [Section No. 4.16.2.2 [Excluding any Sub-Sections]]

While pumping at rated capacity, the drive shall allow controlled vehicle operations at ~~speeds from 0 kph to a maximum~~ a minimum speed of 16.1 kph (~~0 mph to a maximum of~~ 10 mph) in forward direction and ~~0 kph to a maximum~~ minimum speed of 8 kph (~~0 mph to a maximum of~~ 5 mph) in rearward direction.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 08:49:31 EST 2021

Committee Statement

Committee Statement: The committee has made this change as they believe by rewording the existing text they have established a minimum performance level and met what the submitter was attempting to accomplish by the submitted public comment.

Response Message: SR-13-NFPA 1900-2021

Public Comment No. 297-NFPA 1900-2021 [Section No. 4.16.2.2 [Excluding any Sub-Sections]]

Second Revision No. 10-NFPA 1900-2021 [Section No. 4.16.7]

4.16.7 Pressure Relief ~~Valves~~ System .

A pressure relief system shall be provided to protect ~~and ensure optimum performance of~~ the system from damage .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 08:44:14 EST 2021

Committee Statement

Committee Statement: The changes in title and text provide a more open description of all the possible solutions for a relief in the firefighting system.

Response Message: SR-10-NFPA 1900-2021

Public Comment No. 302-NFPA 1900-2021 [Section No. 4.16.7]

Second Revision No. 11-NFPA 1900-2021 [Sections 4.17.2.3.4, 4.17.2.3.5]

~~**4.17.2.3.4**~~

~~Water tank shall be full at start of tilt-table test.~~

~~**4.17.2.3.5**~~

~~Water loss shall be prevented during tilt-table testing.~~

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 08:46:52 EST 2021

Committee Statement

Committee Statement: The deleted sections are already covered in the performance test requirements and not related to the tank itself in construction or design. Deleting these cleans up the document.

Response Message: SR-11-NFPA 1900-2021

Public Comment No. 298-NFPA 1900-2021 [Sections 4.17.2.3.4, 4.17.2.3.5]

Second Revision No. 17-NFPA 1900-2021 [Section No. 4.20.6 [Excluding any Sub-Sections]]

If the boom-mounted turret is on a rotational base, it shall meet the following design and functional requirements:

(1) The boom-mounted turret ~~shall~~ meets the requirements of 6.3.22, 6.4.1, and 6.4.12 while in the stowed position.

(2) The vehicle ~~shall~~ achieves a 20 percent side slope, with the boom fully elevated and the nozzle rotated uphill at maximum horizontal rotation while discharging at maximum flow rate.

(3) The vehicle ~~shall be~~ is provided with an interlock or warning system and placards in full view of the driver/operator to provide the operational limitations during all phases of operation.

(4) Flow rates ~~shall~~ are ~~be~~ in accordance with Table 4.2.1.2(c) and Table 4.2.1.2(d) for major vehicles.

(5) If the boom-mounted turret is intended to be the primary turret, it ~~shall~~ meets the primary water-foam agent turret discharge requirements of Table 4.2.1.2(c) and Table 4.2.1.2(d) for the applicable vehicle class while in the ~~bedded~~ stowed position.

(6) The boom-mounted turret ~~shall~~ meets the foam-quality standard of Chapters 1~~,~~ through 3~~,~~ and 27 through 29 of NFPA 460 for the applicable foam applicator and foam type.

(7) The boom-mounted turret ~~shall~~ functions during ARFF operations without the need for outriggers or other ground contact stabilizers that would render the vehicle immobile or hinder its maneuverability.

(8) The boom-mounted turret ~~shall have~~ has a deployment time from the ~~bedded~~ stowed position to the maximum height and starts the application of agent within 30 seconds.

(9) The high rise, telescoping, or articulating movement of the boom~~/tower shall be~~ is accomplished with not more than two adjacent lever controls.

(10) The high rise, telescoping, or articulating movement of the boom~~/tower shall be~~ is permitted to be manual or automated for preselected positioning of the elevation and reach.

(11) If automated, these functions ~~shall be~~ are provided with a manual override positioning capability.

(12) The boom-mounted turret ~~shall be~~ is capable of applying agent to any interior area of the most current wide-body jet, so as not to impede evacuation and for safety considerations of the vehicle operator.

(13) The device ~~shall be~~ is capable of positioning the nozzle within 0.6 m (2 ft) of ground level in front of the vehicle.

(14) The device ~~shall be~~ is capable of applying agent to the interior of the aircraft through cargo bay door openings, passenger doorways, and emergency exits on the type of aircraft being protected while the aircraft is in either the gear-up or gear-down landing position.

(15) The boom-mounted turret ~~shall have~~ has a range of motion so as to permit positioning of the nozzle to direct a firefighting agent stream at least 90 degrees to the longitudinal axis of the fuselage for interior fire extinguishment.

(16) The turret/boom mechanism ~~shall be~~ is capable of providing for horizontal movement along the aircraft of at least 30 degrees left and right of the vehicle centerline so as not to require repositioning or movement of the ARFF vehicle.

(17) This horizontal rotation ~~shall be~~ is accomplished without the deployment of stabilizers or outriggers that might cause a delay in positioning or emergency movement of the rescue vehicle.

(18) The primary turret ~~shall have~~ has backup systems to allow for override of the single-lever boom control and hydraulic system (or other power source) if the primary system becomes disabled.

(19) The driver/operator ~~shall be~~ is able to see the boom, as it is rising to its maximum height, from a seated position by means of a camera or direct line of sight.

(20) A means of visually identifying the boom extension available ~~shall be~~ is provided either by an external marking on the boom or a display in the cab visible to the vehicle operator.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 09:23:04 EST 2021

Committee Statement

Committee Statement: These changes were made to comply with the NFPA MOS and are editorial in nature.

Response Message: SR-17-NFPA 1900-2021

Public Comment No. 295-NFPA 1900-2021 [Section No. 4.20.6 [Excluding any Sub-Sections]]

Second Revision No. 18-NFPA 1900-2021 [Section No. 4.20.7]

4.20.7

If the boom-mounted turret is on a nonrotational base, it shall meet the following design and functional requirements:

(1) The boom-mounted turret ~~shall~~ meets the requirements of 6.3.22, 6.4.1, and 6.4.12 while in the stowed position.

(2) The ~~turret shall achieve~~ vehicle achieves a 20 percent side slope with the boom fully elevated and the nozzle fully rotated uphill at maximum horizontal rotation while discharging at maximum flow rate.

(3) If the nonrotational boom-mounted turret is the primary turret, its flow rates ~~shall~~ are to be in accordance with Table 4.2.1.2(c) and Table 4.2.1.2(d) for major vehicles.

(4) If the nonrotational boom-mounted turret is the primary turret, it ~~shall~~ meets the primary water-foam agent turret discharge requirements of Table 4.2.1.2(c) and Table 4.2.1.2(d) for the applicable vehicle class while in the ~~bedded~~ stowed condition.

(5) The boom-mounted turret ~~shall~~ meets the foam quality standard of Chapter 28 of NFPA 460.

(6) The boom-mounted turret ~~shall~~ functions during ARFF operations without the need for outriggers or other ground contact stabilizers that could render the vehicle immobile or hinder its maneuverability.

(7) The ~~boom shall have~~ boom-mounted turret has a deployment time from the bedded position to maximum height and start the application of agent within 30 seconds.

(8) The boom-mounted turret ~~shall be~~ is capable of applying agent through passenger doorways~~,~~ to interior areas of the type of aircraft being protected.

(9) The device ~~shall~~ permits the operator to position the nozzle assembly so as to be able to discharge the agent in front of the vehicle at a level that permits the operator to see over the turret discharge.

(10) The boom-mounted turret ~~shall have~~ has a range of motion so as to permit positioning of the nozzle to direct a firefighting agent stream along the longitudinal axis of the fuselage or up to 90 degrees to the longitudinal axis for interior fire extinguishing.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Dec 06 10:59:25 EST 2021

Committee Statement

Committee Statement: These changes were made to eliminate the "shalls" in the list as well as to remain consistent with 4.20.6

Response Message: SR-18-NFPA 1900-2021

Second Revision No. 257-NFPA 1900-2022 [Section No. 4.26.4.3]

4.26.4.3

Two alternating flashing emergency warning lights shall be mounted at the rear of the vehicle as far apart as ~~practical~~ practicable .

4.26.4.3.1

These lights shall not be mounted any higher than 1828.8 mm (72 in.) above ground level.

4.26.4.3.2

The purchaser shall provide the vehicle manufacturer with the color of the light and desired flash pattern ~~based on the requirements of the AHJ~~ .

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Wed Feb 09 12:07:33 EST 2022

Committee Statement

Committee Statement: These changes are being made due to PC 350 regarding the work "practicable" and the deletion of text is due to the committee believing that this should not be under the responsibility of the AHJ.

Response Message: SR-257-NFPA 1900-2022

Public Comment No. 294-NFPA 1900-2021 [Section No. 4.26.4.3.2]

Second Revision No. 258-NFPA 1900-2022 [Section No. 4.26.4.4 [Excluding any Sub-Sections]]

Two alternating flashing emergency warning lights shall be mounted at the front of the vehicle as far apart as ~~practical~~ practicable .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:10:01 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-258-NFPA 1900-2022

Second Revision No. 259-NFPA 1900-2022 [Section No. 4.26.6]

4.26.6

Where furnished, air horns, an electric siren(s), and an electronic siren speaker(s) shall be mounted as low and as far forward on the apparatus as ~~practical~~ practicable .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:10:57 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-259-NFPA 1900-2022

Second Revision No. 1-NFPA 1900-2021 [Section No. 5.5.2]

5.5.2* Handrails.

5.5.2.1

Handrails shall be provided as required.

5.5.2.2

The height of the handrails measured from the platform surface shall be a minimum of 0.91 m (36 in.).

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 07:25:15 EST 2021

Committee Statement

Committee Statement: The committee agrees with the submitter for PC 332 in that for safety reasons the minimum height of the handrails should be specified in the document, however the committee made some minor changes to the submission.

Response Message: SR-1-NFPA 1900-2021

Public Comment No. 332-NFPA 1900-2021 [Section No. 5.5.2]

Second Revision No. 2-NFPA 1900-2021 [New Section after 5.5.3.3]

5.5.3.4

All safety-relevant functions of the staircase (e.g., movement of the staircase body) shall be carried out with a two-function control (deadman type).

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Fri Dec 03 07:28:42 EST 2021

Committee Statement

Committee Statement: The committee agrees with the the changes the submitter was making as part of PC 310, for safety reasons the use of a deadman control should be specified in the document, however the committee did make some minor changes to the text.

Response Message: SR-2-NFPA 1900-2021

Public Comment No. 310-NFPA 1900-2021 [Section No. 5.5.3.3]

Second Revision No. 260-NFPA 1900-2022 [Section No. 5.7.7.3 [Excluding any Sub-Sections]]

Two alternating flashing emergency warning lights shall be mounted at the rear of the vehicle as far apart as ~~practical~~ practicable .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:12:30 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-260-NFPA 1900-2022

Second Revision No. 261-NFPA 1900-2022 [Section No. 5.7.7.4 [Excluding any Sub-Sections]]

Two alternating flashing emergency warning lights shall be mounted at the front of the vehicle as far apart as ~~practical~~ practicable .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:13:01 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-261-NFPA 1900-2022

Second Revision No. 262-NFPA 1900-2022 [Section No. 5.7.9]

5.7.9

Where furnished, air horns, an electric siren(s), and an electronic siren speaker(s) shall be mounted as low and as far forward on the apparatus as ~~practical~~ practicable .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:13:33 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-262-NFPA 1900-2022

Second Revision No. 299-NFPA 1900-2022 [Chapter 6 [Title Only]]

ARFF Apparatus — Acceptance Criteria (NFPA 414)

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon May 02 09:35:26 EDT 2022

Committee Statement

Committee Statement: This change was made to make for the purposes of clarification as well as for document consistency.

Response Message: SR-299-NFPA 1900-2022

Second Revision No. 4-NFPA 1900-2021 [Section No. A.5.8.1]

A.5.8.1

Refer to SAE ARP ~~1328B~~ 1328C, *Aircraft Ground Support Equipment — Wind Stability Determination* .

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Fri Dec 03 07:37:40 EST 2021

Committee Statement

Committee Statement: Update document number.
Response Message: SR-4-NFPA 1900-2021

Public Comment No. 290-NFPA 1900-2021 [Section No. A.5.8.1]

Second Revision No. 270-NFPA 1900-2022 [Section No. C.2.1]

C.2.1 Navigation Device.

The DEVS global positioning system (GPS) receiver should accept differential correction messages from an always available and reliable source with accuracy within 2 m (6.6 ft) and use these messages to compute a differentially corrected GPS position solution once per second. It also should achieve time to first fix (TTFF) of 30 seconds and should interface with the navigation computer. The antenna should be weatherproof and mounted high and as close to the center of the vehicle as ~~practical~~ practicable with a clear view of the sky.

Submitter Information Verification

Committee: AIR-AAA
Submittal Date: Wed Feb 09 12:28:24 EST 2022

Committee Statement

Committee Statement: This change is begin made as a result of PC 350 and using the proper word.
Response Message: SR-270-NFPA 1900-2022

Second Revision No. 234-NFPA 1900-2022 [Section No. G.4]

G.4 History of NFPA 414.

In 1960, a tentative edition of this standard was adopted by the Association. The original document was further revised in 1962, 1963, 1964, 1965, 1967, 1968, 1969, 1970, 1975, and 1978.

In 1984, the standard was revised completely to identify three types of vehicles and to make the document easier to use. The text also was rewritten to conform with the *NFPA Manual of Style*.

The standard was revised again in 1990, and a chapter was added to provide a test method to verify the design requirements.

Notable revisions to the 1995 edition included the removal of requirements for a separate category of rapid intervention vehicle.

The major change for the 2001 edition was the combination of major firefighting vehicles and combined agent vehicles. Additionally, a table concisely provided many requirements that previously were covered by numerous paragraphs.

The 2007 revision included minor changes to the document, plus the addition of a new chapter on interior access vehicles.

The 2012 introduced many changes or enhancements due to the development and use of larger aircraft, such as the A-380 and the Boeing Dreamliner, as well as the composite materials from which they are manufactured.

The increased size of aircraft and some limitations to traditional aircraft rescue and firefighting (ARFF) vehicles prompted a new emphasis on Chapter 5, which deals with aircraft interior access vehicles. These vehicles assist in the evacuation of passengers from aircraft in addition to the use of evacuation slides or if the slides are not appropriate for use and deployment. The 2012 edition was that many ARFF vehicles are operated by a single person and that many of the devices and warnings/alarms are now designed with a single user/operator in mind. The capacities for ARFF vehicles were increased to address this change in aircraft as well as to ensure that the vehicles are still able to meet prescribed response time standards.

Changes included the addition of an equivalency statement, to provide the AHJ or purchaser some flexibility when it comes to meeting the requirements.

The committee also addressed the environmental impact some extinguishing agents pose and have either limited them or removed them from the document and replaced them with acceptable alternatives. The committee also reviewed the entire document to ensure that it is consistent with the source documents, with commonly accepted practices as they relate to the ARFF industry, and with the *Manual of Style for NFPA Technical Committee Documents*.

The 2017 edition revisions included updates to referenced publications and definitions and a rewrite of Chapter 5, Aircraft Interior Access Vehicles. This rewrite includes the addition of language to address cab visibility, cab construction, equipment, AIAV body, docking platform, acceptance criteria, and testing. Revisions also included extracted language from NFPA 1901 on SCBA mounting and a full extract of NFPA 1901 language for Chapter 6, Electrical System Performance Tests.

The 2020 edition added new requirements for forward-looking infrared cameras mounted on ARFF vehicles. Clarifications were made to the definitions and requirements for boom-mounted turrets to align more accurately with industry practices. Extensive changes were made to prototype vehicle testing procedures, with lists specifying the various testing procedures that need to be conducted based on changes made to existing vehicles. References were updated throughout the document, and minor editorial changes have been made.

For the 2024 edition of NFPA 1900, NFPA 414 was combined with three other documents to create NFPA 1900. A new requirement was added for the purchaser to tell the manufacturer what they needed in terms of onboard data management and communications equipment or accommodations for such equipment. Requirements and definitions for MADAS and VDR were moved to the annex. Requirements for electric and hybrid propulsion vehicles were added. Pump and nozzle testing was clarified. A J turn maneuverability test was added. Reflective striping requirements were simplified and clarified. A minimum handrail height was

specified for AIAVs.

Submitter Information Verification

Committee: AIR-AAA

Submittal Date: Mon Feb 07 11:51:03 EST 2022

Committee Statement

Committee Statement: These changes are being made in order to capture the history and updates to the 414 portion of 1900.

Response Message: SR-234-NFPA 1900-2022