1901-1 Log #CP125 Final Action: Accept
(Entire Document)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Completely revise NFPA 1901, Standard for Automotive Fire Apparatus, 2003 edition, as shown in the draft at the end of this report. All text from proposals with affirmative actions have been incorporated in the draft.
Substantiation: In addition to the specific changes documented with committee proposals, the committee reviewed the entire document and has editorially clarified the language where appropriate and corrected cross references based on changes in the numbering of chapters and sections.
Committee Meeting Action: Accept

1901-2 Log #CP115 Final Action: Accept
(1.1, 1.2 and 1.3.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 1.1, 1.2 and 1.3.1 to read as follows:
1.1* Scope. This standard defines the requirements for new automotive fire apparatus and trailers designed to be used under emergency conditions to transport personnel or equipment and to support the suppression of fires and mitigation of other hazardous situations.
1.2 Purpose. This standard specifies the minimum requirements for new automotive fire apparatus and trailers.
1.3 Application.
1.3.1* This standard shall apply to new vehicles that meet the following criteria:
(1) Fire Apparatus of 10,000 lb (4500 kg) or greater gross vehicle weight rating (GVWR), or trailers intended to be towed by fire apparatus under emergency response conditions
(2) Designed for use under emergency conditions to transport personnel or equipment and to support the suppression of fires and mitigation of other hazardous situations
(3) Contracted for on or after January 1, 2009
Substantiation: The committee is adding a chapter on trailers used in connection with emergency incident operations and is changing the scope, purpose and application statements in Chapter 1 to accommodate that addition into the document.
Committee Meeting Action: Accept

1901-3 Log #51 Final Action: Accept in Principle
(1.3.1(3))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Change date the document becomes effective.
Substantiation: New version requires a new date it becomes effective.
Committee Meeting Action: Accept in Principle
Change the date in 1.3.1(3) and in 1.3.2 to read: “January 1, 2009.”
Committee Statement: The committee is defining the date to be used based on the issue date for the new document.

1901-4 Log #52 Final Action: Accept
(2.2)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
~~NFPA 1914, *Standard for Testing Fire Department Aerial Devices,* 2002 edition.~~
NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus,* 2007 edition.
Revise other NFPA document dates as appropriate.
Substantiation: NFPA 1914-2002 is being replaced by NFPA 1911-2007
Committee Meeting Action: Accept

1901-5 Log #49 Final Action: Accept
(2.3.10)

Submitter: Bob Eugene, Underwriters Laboratories Inc.
Recommendation: Revise as follows:
2.3.10 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.
UL 498, Standard for Safety Attachment Plugs and Receptacles, 2001, with revisions through May 14, 2004.
UL 969, Standard for Marking and Labeling Systems, 1995 with revisions through November 30, 2001.
Substantiation: Update to current editions and titles of standards.
Committee Meeting Action: Accept

1901-6 Log #CP6 Final Action: Accept
(3.3 Definitions)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Revise the definition of “Aerial Fire Apparatus” to read: “A vehicle equipped with an aerial ladder, elevating platform, ~~aerial ladder platform,~~ or water tower that is designed and equipped to support fire fighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground.

Revise the definition of “Class A Foam” to read: Foam for use on fires in Class A fuels.[1150, 2004]

Delete the definition of “Class A fire.”

Add a definition for “Class A Fuel” to read: “Materials such as vegetation, wood, cloth, paper, rubber, and some plastics in which combustion can occur at or below the surface of the material. [1150, 2004]”

Revise the definition of “Continuous Duty” to read: “Operation at a substantially constant load for an indefinitely long time. [70, 2005]”

Revise the definition of “FMVSS” to read: “Abbreviation for Federal Motor Vehicle Safety Standard. Regulations promulgated by National Highway Transportation Safety Administration (NHTSA) of the United States under Public Law 89-563, which are mandatory and must be complied with when motor vehicles or items of motor vehicle equipment are manufactured and certified thereto.”

Revise the definition of “GAWR (Gross Axle Weight Rating)” to read: “The final stage manufacturer's specified maximum load-carrying capacity of an axle system, as measured at the tire-ground interfaces.”

Revise the definition of GCWR (Gross Combination Weight Rating to read: "The final stage manufacturer’s specified maximum loaded weight for a combination (articulated) vehicle consisting of a tow vehicle and one or more towed units."

Revise the annex to the definition of GCWR (Gross Combination Weight Rating) to read: "A combination vehicle is the combination of a towing vehicle and one or more towed units (trailers). When a trailer is detachable, the GCWR limits the maximum loaded weight for any replacement trailer. The in-service weight or gross combination weight, including any connected trailer, should always be equal to or less than the GCWR."

Revise the definition of ground clearance to read: "Clearance under a vehicle at all locations except the axles and driveshaft connections to the axle or items designed to swing clear."

Revise the definition of “GVWR (Gross Vehicle Weight Rating)” to read: “The ~~chassis~~ final-stage manufacturer's specified maximum load-carrying capacity of a vehicle having two axle systems (a multiaxle axle installation is one system).”

Revise the definition of “ramp breakover angle” to read: “The angle measured between two ~~(2)~~ lines tangent to the front and rear tire static loaded radius, and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll ~~drive without the ramp touching the underside of the vehicle.~~”

Revise the annex to the definition of “Standard Cubic Feet per Minute (SCFM)” to read: “Standard temperature is 60°F (15°C) and standard pressure is 14.696 psi (101.33 kPa) or 29.92 in. Hg (760 mm Hg).”

Revise the definition of “water tower” to read: “An aerial device consisting of permanently mounted power-operated booms that articulate, telescope, or both, and a waterway designed to supply a large-capacity, mobile, elevated water stream. ~~The booms can be of articulating design or telescoping design.”~~

Substantiation: The committee is trying to establish uniformity in definitions between the documents it is responsible for as well as with the Glossary of terms. These changes are for that purpose.

The definition of "Aerial Fire Apparatus" is being revised to delete the term “aerial ladder platform” as that term is no longer used in the document to describe a type of aerial device.

The definition of “Class A Foam” is being revised to use the preferred definition.

The definition of “Class A Fire” is being deleted as it is no longer used in the document.

The definition of “Class A Fuel” is being added to support the new definition of Class A foam.

The committee is adopting the preferred definition of “continuous duty.”

The definition of “FMVSS” is being revised to be consistent with a change made to the definition in NFPA 1906.

The definition of “GAWR” is being revised to be consistent with a change made to the definition in NFPA 1906.

The definition and annex for GCWR (Gross Combination Weight Rating) is being revised to be consistent with a change made to the definition in NFPA 1906.

The definition of “Ground Clearance" is being revised to be consistent with a change made to the definition in NFPA 1906.

The definition of “GVWR” is being revised to be consistent with a change made to the definition in NFPA 1906 and NFPA 1912.

The definition of “ramp breakover angle” is being revised to be consistent with changes made in NFPA 1906.

The changes to the annex for “Standard Cubic Feet per Minute (SCFM)” are editorial for clarification and consistency with changes made in NFPA 1906.

The definition of “water tower” was revised for the last revision of NFPA 1912 and those changes are being incorporated into NFPA 1901.

Committee Meeting Action: Accept

1901-7 Log #CP10 Final Action: Accept

(3.3 Bulk Air System (New))

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add a new definition for bulk air system to read as follows:

Bulk Air System. A method of piping air tanks together to allow air to be supplied to an air system or SCBA fill station, using one or more tanks where all tanks are used simultaneously and are at the same pressure.

Substantiation: Not all air storage systems are piped in a cascade progressive valve system. New text will use the term bulk air system.

Committee Meeting Action: Accept

1901-8 Log #CP11 Final Action: Accept

(3.3 Estimated In-Service Weight (New))

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add definition of Estimated In-Service Weight to read:

Estimated In-Service Weight. The amount that the fire apparatus manufacturer estimates the apparatus will weigh when it is placed in service with all fixed and portable equipment installed, all tanks full, and all personnel seating positions occupied.

Substantiation: A term called Estimated In-Service Weight is being introduced in this edition of the standard and needs to be defined.

Committee Meeting Action: Accept

1901-9 Log #CP12 Final Action: Accept

(3.3 Personal Gear (New))

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add a definition for personal gear to read as follows:

The weight of personal clothing and items for personal hygiene carried on the fire apparatus by each crew member when they expect the response to be of long duration.

Substantiation: The term personal gear is being used in the standard and needs to be defined.

Committee Meeting Action: Accept

1901-10 Log #CP116 Final Action: Accept
(3.3 Trailer, Tow Vehicle)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: In Chapter 3, add new definitions as follows:
Trailer. A vehicle designed to be pulled by a tow vehicle and used to transport equipment or other vehicles under emergency response conditions.
Tow Vehicle. A motor vehicle used to tow a trailer under emergency response conditions whether the tow vehicle-trailer combination is designed to remain together as a single unit or to be separated at the incident to allow the trailer to be used independently of the tow vehicle
Substantiation: The committee is adding a chapter on trailers used in connection with emergency incident operations and is adding 2 definitions to support that addition into the document.
Committee Meeting Action: Accept

1901-11 Log #CP7 Final Action: Accept
(3.3.8 Air Quality Monitors)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise the definition of air quality monitors to read as follows:
3.3.8 Air Quality Monitors. Electronic instruments that monitor the air for such elements as carbon monoxide levels, and moisture levels, ~~percent of oxygen,~~ and are capable of sending a signal to automatically shut-down the air system.
Substantiation: All air quality measurement devices must be electronic in design and should be capable of signaling the shut down of the air system.
Committee Meeting Action: Accept

1901-12 Log #CP8 Final Action: Accept
(3.3.9 Air Tanks)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add an annex to the definition of air tank to read as follows:
A.3.3.9 Air tanks might be designated as cylinders, receivers, or vessels.
Substantiation: Air tanks are sometimes referred to by other names and the addition of this wording will clarify this for the user.
Committee Meeting Action: Accept

1901-13 Log #CP9 Final Action: Accept
(3.3.10 Air Truck)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete the definition of "Air Truck".
Substantiation: Air trucks are a type of special service vehicle and the term “air truck” is not used in the document.
Committee Meeting Action: Accept

1901-14 Log #53 Final Action: Accept
(3.3.39 Combination Vehicle)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

3.3.39 Combination Vehicle. A vehicle consisting of a ~~pulling tractor and trailer~~ towing vehicle and one or more towed units.

Substantiation: Combination vehicles include both tractor-trailer units and any vehicle towing a trailer such as a rescue truck towing a boat or haz-mat equipment trailer.
Committee Meeting Action: Accept

1901-15 Log #54 Final Action: Accept
(3.3.76 Gauge)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

3.3.76 Gauge. ~~A round, analog pressure-indicating device that uses mechanical means to measure pressure.~~ A visual device that indicates a measurement.

Change the term "pressure-indicating device" to "pressure gauge" in the following paragraphs:

16.12.1.1(1)
16.12.1.1(2)
16.12.2
16.12.2.1
16.12.2.1.1
16.12.2.1.2
16.12.2.1.3
16.12.2.1.4
16.12.2.1.6
16.12.2.1.6.2
16.12.2.1.6.3
16.12.3.1
16.12.3.2
16.12.3.3
16.12.3.4
16.12.3.5
16.12.3.8
16.12.3.8.2
16.12.3.8.3
16.12.4
17.11.1
17.11.1.3
17.11.1.3.1
17.11.1.3.2
17.11.2
17.11.2.1
17.11.2.2
17.11.2.5
17.11.2.5.1
17.11.2.5.2
17.11.3
18.12.1.1(1)
18.12.1,1(2)
18.12.2
18.12.2.1
18.12.2.1.1
18.12.2.1.2
18.12.2.1.3
18.12.2.1.4
18.12.2.1.6
18.12.2.1.6.2
18.12.2.1.6.3
18.12.3.1
18.12.3.2
18.12.3.3
18.12.3.4
18.12.3.5

18.12.3.8
18.12.3.8.2
18.12.3.8.3
18.12.4
21.5
21.5.1
21.5.3
21.5.3.2
21.5.3.3
21.5.4
22.7
22.7.1
22.7.3
22.7.3.2
22.7.3.3
22.7.4
22.7.6
and any other locations where the term is used

Substantiation: Gauge is also commonly used to describe digital gauges. Digital pressure-indicating device is awkward and not the commonly used term

Committee Meeting Action: Accept

1901-16 Log #CP13 Final Action: Accept
(3.3.88 Initial Attack Apparatus)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise the definition of initial attack apparatus to read as follows:
Fire apparatus with a ~~permanently mounted~~ fire pump of at least 250 gpm (1000 L/min) capacity, water tank, and hose body whose primary purpose is to initiate a fire suppression attack on structural, vehicular, or vegetation fires, and to support associated fire department operations.
Substantiation: The pump on initial attack apparatus does not need to be permanently mounted.
Committee Meeting Action: Accept

1901-17 Log #55 Final Action: Accept
(3.3.98 Line Voltage Circuit, Equipment or System 3.3.102 Low Voltage Circuit, Equipment or System)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
3.3.98 Line Voltage Circuit, Equipment, or System. An ac or dc electrical circuit, equipment, or system where the voltage to ground or from line to line is 30 volts (V) rms (ac), ~~or~~ 42.4 V peak ~~(dc)~~, (ac) or 60 V dc; or greater.
3.3.102 Low Voltage Circuit, Equipment, or System. An electrical circuit, equipment, or system where the voltage does not exceed 30 volts (V) rms (ac), ~~or~~ 42.4 V peak ~~(dc),~~ (ac), or 60 V dc; usually 12 V dc in fire apparatus.
Substantiation: These numbers are used in the National Electrical Code and various UL and IEC documents. These are generally considered the safe levels without causing physiological damage. The 42.4 volt number comes from the peak voltage of a 30 V rms sinusoidal AC voltage. Without this change, a 42 volt nominal truck electrical system which charges at more than 42.4 volts would be defined as a line voltage system.
Committee Meeting Action: Accept

1901-18 Log #CP14 Final Action: Accept
(3.3.125 Plate)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Change the term being defined in 3.3.125 to “Instruction Plate”.
Change the term “plate” to “instruction plate” in paragraphs 12.1.4, 12.1.4.1, 12.1.4.2, 20.3.4, and 20.14.3.
Substantiation: The committee is changing the term “plate” to “instruction plate” as a more descriptive term.
Committee Meeting Action: Accept

1901-19 Log #CP117 Final Action: Accept
(4.1 and 4.2.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Renumber 4.1 to make all the text other than the title as 4.1.1
Add a new 4.1.2 to read:
4.1.2 If a tow vehicle is to respond while calling for right-of way under emergency conditions, it shall meet the requirements of 4.1.1.
Add a new 4.2.3 to read:
4.2.3 If a trailer is towed as a component of an emergency vehicle, the trailer shall comply with Chapter 27.
Renumber existing 4.2.3 as 4.2.4
Substantiation: The committee is adding a chapter on trailers used in connection with emergency incident operations. These changes in Chapter 4 provide the umbrella requirements that trailers and tow vehicles meet this standard.
Committee Meeting Action: Accept

1901-20 Log #116 Final Action: Accept
(4.7.1)

Submitter: Tom Hillenbrand, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
4.7.1 All certification shall be performed by a certification organization that is accredited for inspection and testing systems on fire apparatus in accordance with ~~ANSI Z34.1, Standard for Third Party Certification Programs for Products, Processes, and Services~~ ISO/IEC 17020, General Criteria for the operation of various types of bodies performing inspection (1998).
Substantiation: ANSI Z34.1 is withdrawn and is not applicable. ISO/IEC 17020 provides criteria for bodies that perform inspections. The document also covers requirements for bodies conducting tests (qualification of personnel, equipment calibration, etc.). Requiring accreditation to ISO/IEC 17020 is appropriate for the type of inspection/testing performed by third-party certification organization on fire apparatus. Referencing ISO/IEC 17020 will provide consistency with the reference to ISO/IEC 17020 in the proposed 2007 Edition of NFPA 1911.
Committee Meeting Action: Accept

1901-21 Log #121 Final Action: Reject
(4.10.1.1)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
If external illumination is provided, it shall be a minimum of 5 fc (~~50~~54 lx) on the face of the device.
Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. This should be consistent throughout the Standard.
Committee Meeting Action: Reject
Committee Statement: These, and many other, conversion values were corrected with the 2003 edition of 1901 to be in accordance with the NFPA Manual of Style (MOS). Chapter 4 and Annex B.8.3 of the MOS provide extensive information on this subject. The MOS required that "The precision used to express a measurement shall not exaggerate the accuracy intended for the measurement." (4.2.1.2) and "The converted value shall be rounded such that the last place digit of the converted value is equal to or less than the converted value of the intended precision. (See conversion steps outlined in B.8.3.)" Unless the inch-pound measurement of 5 fc should be 5.0 fc, the correct statement of the conversion is 50 fc not 54 fc.

1901-22 Log #CP15 Final Action: Accept
(4.10.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 4.10.3 to read as follows:
~~No~~ Gauges or visual displays required by this standard shall be no more than 84 in. (2.1 m) above the level where the operator stands to read the instrument.
Add an annex to 4.10.3 to read:
Secondary gauges could be located in other positions.
Substantiation: Questions have been raised as to whether a secondary gauge can be higher than 84 inches if a primary gage is at or below 84 inches. The revision clarifies the committee's intent.
Committee Meeting Action: Accept

1901-23 Log #CP22 Final Action: Accept
(4.11 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new section after section 4.10 to read as follows:
4.11 Vehicle Data Recorder.
4.11.1 All apparatus shall be equipped with an on-board vehicle data recorder (VDR).
4.11.2 The VDR shall be capable of recording the data shown in Table 4.11.2 in that order at least once per second.

*** Insert 1901 Log CP22 Rec Table 4.11.2 ***

4.11.3 Data shall be stored at the sampling rate in a 48 hour loop.
4.11.4 Memory shall be sufficient to record 100 engine hours worth of minute by minute summary data showing the data in table 4.11.4.

*** Insert 1901 Log CP22 Rec Table 4.11.4 ***

4.11.5 When the memory capacity is reached, the system shall erase the oldest data first.
4.11.6 All data stored in the VDR shall be uploadable by the user to a computer and importable into a data-management software package.
4.11.7 Data shall be password protected with access controlled by the purchaser.
4.11.8 Software shall be provided with the apparatus that will to run on both Windows and Apple operating systems and produce the following formatted reports from the uploaded data:
(1) Daily log for the time the engine is running for a given date (minute by minute output of all values)
(2) Weekly summary (maximum values each hour for each day of the week)
(3) Monthly summary (maximum values each day for each day of the month)
Add an annex to 4.11.6 to read:
A.4.11.6 The purchaser should specify the format and connection for uploading data. The standard allows multiple types of formats and means of uploading data to allow for future technology. For users that have multiple vehicles, it may be beneficial to require all systems to be compatible with the users data systems.
Substantiation: This requirement is providing an additional tool to the Safety Officer or Fire Chief to use in promoting safe driving and riding procedures to and from the fire scene. By recording the optical warning switch status, the person analyzing the data can distinguish emergency driving conditions from routine driving conditions.
The fire department will set the passwords and will “own” the data. Accident reconstruction is not the primary purpose of the device, but the 48 hour loop feature will allow the data to be retrieved for crash investigation purposes.
The reports are structured to allow a daily, weekly, or monthly view of vehicle use. The measurements do not involve the need for advanced instruments such as accelerometers or solid state gyroscopes, so the cost of the device is less than if full vehicle dynamics were to be required.
Committee Meeting Action: Accept

1901-24 Log #56 Final Action: Accept
(4.11.3)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
4.11.3 A through-the-frame connector shall be permitted to be used in place of ~~metal~~ protective looms or grommets.
Substantiation: The protective looms or grommets, as described in 4.11.2, are not made of metal.
Committee Meeting Action: Accept

Insert tables for proposal 1901-23 Log #CP22

Table 4.11.2 VDR Data

Data	Unit of measure
Vehicle speed	MPH
Acceleration (from speedometer)	MPH/Sec.
Deceleration (from speedometer)	MPH/Sec.
Engine speed	RPM
Engine throttle position	% of full throttle
ABS Event	On/Off
Seat occupied status	Occupied Yes/No by position
Seat belt status	Buckled Yes/No by position
Master Optical Warning Device Switch	On/Off
Time	24 hour time
Date	Year/Month/Day

Table 4.11.4 VDR Summary Data

Data	Unit of measure
Maximum vehicle speed	MPH
Maximum acceleration (from speedometer)	MPH/Sec.
Maximum deceleration (from speedometer)	MPH/Sec.
Maximum engine speed	RPM
Maximum engine throttle position	% of full throttle
ABS Event	On/Off
Seat occupied with seat belt unbuckled	Yes/No by position at 30 sec. into minute
Master Optical Warning Device Switch	On/Off at 30 sec. into minute
Time	24 hour time
Date	Year/Month/Day

1901-25 Log #10 Final Action: Accept in Principle
(4.12.1)

Submitter: Gary Handwerk, Hale Products, Inc.
Recommendation: Add new text:
Mobile water supply fire apparatus should have a maximum center of gravity height. This height should not exceed the rear axle/wheel assembly tread width.
Substantiation: This will help to reduce tanker/tender accidents.
Committee Meeting Action: Accept in Principle
See committee action on proposal 1901-26 (Log #CP17).
Committee Statement: The committee believes the action taken on proposal 1901-26 (Log #CP17) addresses the submitter's concerns.

1901-26 Log #CP17 Final Action: Accept
(4.12.1 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Replace 4.12.1 with the following text.

4.12.1* Rollover Stability. The apparatus shall meet either the criteria defined in 4.12.1.1 or the criteria defined in 4.12.1.2.

4.12.1.1 The apparatus shall remain stable to 26.5 degrees in both directions when tested on a tilt table in accordance with SAE J2180, A Tilt Table Procedure for Measuring the Static Rollover Threshold for Heavy Trucks, when loaded with fuel, firefighting agents, and weight equivalent to the minimum NFPA equipment allowances, including hose, ladders and personnel.

4.12.1.1.1 Tilt table compliance shall be certified by a test of the apparatus, or a test of a substantially similar apparatus.

4.12.1.1.2 The test apparatus shall be considered substantially similar if it includes the same chassis make and model; the same or greater water tank size, shape and CG height; and the same make and model of front and rear suspension.

4.12.1.2 The apparatus shall be equipped with a stability control system having at minimum a steering wheel position sensor, vehicle yaw sensor, lateral accelerometer, and individual wheel brake controls.

Add an annex to the new 4.12.1 to read as follows:

A14.12.1 Vehicle Crash Safety Topics.

Custom Fire Apparatus Cab. The nature of the custom fire apparatus cab makes it much stronger in rollover than typical conventional commercial chassis cabs. There is much anecdotal evidence to indicate that the crash worthiness of a typical custom fire apparatus cab is significantly greater than a typical commercial cab, and most custom chassis manufacturers can provide test data on cab integrity.

Lateral Acceleration Alert Device. There are both mechanical and electronic devices available that will measure the lateral acceleration of a vehicle. Although these devices will not prevent rollover, they can be used effectively as a driver training tool to indicate when the vehicle is approaching the roll threshold, and as a reminder to the driver that excessive lateral acceleration can lead to a rollover event.

Side Roll Protection. Many custom fire apparatus manufacturers offer side air bags or curtains that inflate during a roll event. These are usually combined with seat belt pretensioning devices, and suspension seat pull-down devices. This option can reduce injury during a rollover as long as the occupants are seated and belted.

Roll Stability Control. This technology electronically senses the lateral acceleration of the vehicle and takes action by de-powering the engine and applying the brakes if the vehicle approaches a roll threshold. The effectiveness of this product is limited to events on relatively flat pavement, since it cannot do much to help the situation once a vehicle is off the road and leaning into a ditch.

Electronic Stability Control. ESC uses a steering wheel position sensor, vehicle yaw sensor, lateral accelerometer, and individual wheel brake controls in conjunction with the ABS system. The system tracks the direction that the driver intends to steer, and uses brake application at individual wheels to help straighten out the vehicle.

Driver Skill and Experience. While the design and features of the vehicle are important to safe driving, the most important aspect of crash prevention is the skill and experience of the operator. The operator's attitude, training, experience, qualifications, and the application of these are the most important elements in crash prevention. The operator must ensure that the physical limits of the vehicle are not exceeded. Driver skill is only developed through training and practice.

Substantiation: Emergency response vehicles are involved in accidents on almost a daily basis. Statistics show that approximately 25% of injuries and fatalities occur during vehicle accidents. Drivers tend to drive the emergency response vehicles more aggressively during a response when optical warning devices are engaged. Vehicles with a higher rollover threshold, or a stability control system, will be safer to drive.
Committee Meeting Action: Accept

1901-27 Log #CP2 Final Action: Accept in Principle
(4.12.2.3.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Clarify the text that was the subject of the following Formal Interpretation.
Question: Does the committee agree that the phrase "as supplied by the manufacturer" is intended to assume the vehicle is in the loaded condition in accordance with the requirements in Section 12.1?
Answer: Yes
Substantiation: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued.
Committee Meeting Action: Accept in Principle
Revise 4.12.2.3.3 to read as follows:
The fire apparatus, ~~as supplied by the manufacturer~~ when loaded to its estimated in-service weight, shall have a side-to-side tire load variation of no more than 7 percent of the total tire load for that axle. ~~or the limits allowed by the axle or component manufacturer.~~
Committee Statement: Apparatus as shipped might not meet 4.12.2.3.3 but later loading will bring it within requirement. Specifying the estimated in-service weight allows the manufacturer to account for apparatus that have heavy built-in equipment on one side that will only be balanced once compartments on the opposite side are loaded with equipment.

1901-28 Log #CP16 Final Action: Accept
(4.12.4 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 4.12.4 to read as follows:
4.12.4 Each tire shall be equipped with a visual indicator or monitoring system that will indicate tire pressure.
Add an annex to 4.12.4 to read as follows:
A.4.12.4 A frequent killer of firefighters is apparatus rollover. Proper tire inflation will improve the handling characteristics to minimize rollover.
Substantiation: One of the National Fallen Firefighter Foundation Life Safety Initiatives is: “Safety must be a primary consideration in the design of apparatus and equipment.” Providing a means to quickly check of tire inflation will improve the handling of the fire apparatus.
Committee Meeting Action: Accept

1901-29 Log #57 Final Action: Reject
(4.14.2)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
4.14.2* The maximum top speed of the apparatus shall not exceed the tire manufacturer's maximum continuous speed rating for the tires installed on the apparatus.
Substantiation: Same change made in 1906.
Although many fire trucks are typically used in situations that do not require long response times, in situations such as initial delivery from factory to customer, sale of apparatus, and emergency response to major disasters; long drives are likely to be made at governed speed. Running a tire for long distances at a speed above its continuous duty rating can have disastrous consequences.
Committee Meeting Action: Reject
Committee Statement: See changes to this paragraph in committee action on proposal 1901-30 (Log #110).

1901-30 Log #110 Final Action: Accept in Principle
(4.14.2)

Submitter: Roger Lackore, Pierce Manufacturing Inc.
Recommendation: Revise text to read as follows:
4.14.2* The maximum top speed of the apparatus shall not exceed either 68 mph (105 km/h), or the manufacturer's maximum speed rating for the tires installed on the apparatus.
Substantiation: Both the American Trucking Association (ATA) and the Canadian Trucking Association (CTA) have noted the significant role of speed in accidents involving heavy trucks, and they have recommended that all heavy trucks be governed to limit top speed to 68 mph.
Committee Meeting Action: Accept in Principle
Revise 4.14.2 to read as follows:
The maximum top speed of fire apparatus with a GVWR over 26,000 lbs (11,800 kg) shall not exceed either 68 mph (105 km/h), or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower.
Add a new requirement as 4.14.3 to read as follows;
If the combined water/foam agent tank capacity of the fire apparatus exceeds 1,250 gallons (4732 L), or the GVWR of the vehicle is over 50,000 lbs (22,680 kg), the maximum top speed of the apparatus shall not exceed either 60 mph (85 km/h), or the manufacturer's maximum fire service speed rating for the tires installed on the apparatus, whichever is lower.
Committee Statement: The committee thinks that “fire service” speed rating is more appropriate for speed and also thinks there should be a lower maximum speed limit for apparatus with over 1250 gallons of water/foam or with a GVWR over 50,000 lb (22,680 kg).

1901-31 Log #58 Final Action: Reject
(4.16.8, 4.16.9)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: The stopping distances in 4.16.8 and 4.16.9 are specifically based on US Federal FMVSS requirements. These standards are changing. If these specifications need to match the federal FMVSS standards, then they need to change also, or the specification needs to change to a generic statement the test should match the FMVSS standards.
Substantiation: The chassis manufacturer must design to meet the FMVSS standard. The apparatus manufacturer can not practically modify the brake system, so out requirements must match.
Committee Meeting Action: Reject
Committee Statement: Stopping distance requirements are not changing for straight trucks. Also, the log is simply a statement and does not include any specific proposal to consider.

1901-32 Log #CP18 Final Action: Accept
(4.19.1(1)(d))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 4.19.1(1)(d) to read as follows:
4.19.1 Fire Apparatus Documentation. The contractor shall supply, at the time of delivery, at least one copy of the following documents:
(1) The manufacturer's record of apparatus construction details, including the following information:
(a) Owner's name and address
(b) Apparatus manufacturer, model, and serial number
(c) Chassis make, model, and serial number
(d) GAWR of front and rear axles and the vehicle GVWR.
Substantiation: The GVWR of the vehicle is as important to documents as the GAWR.
Committee Meeting Action: Accept

1901-33 Log #59 Final Action: Accept in Principle
(4.19.1(7))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
(7) If the apparatus has a fire pump or an industrial supply pump, the certification of inspection and test for the fire pump *(see 16.13.1.1.3 or 16.13.1.2.3 as applicable)* or the industrial supply pump *(see 18.13.1.1.3)*
Substantiation: For fire pumps rated less than 750 gpm, the manufacturer instead of a third party provides the certification, as specified in 16.13.1.2.3.

Committee Meeting Action: Accept in Principle
Revise 4.19.1(7) to read as follows:
(7) If the apparatus has a fire pump ~~or an industrial supply pump~~, the certification of inspection and test for the fire pump (see 16.13.1.1.3 or 16.13.1.2.3 as applicable) ~~or the industrial supply pump (see 18.13.1.1.3)~~
Committee Statement: The committee is accepting the submitter's change but is also deleting the reference to 18.13.1.1.3 as it is recommending the deletion of Chapter 18 on industrial pumps and is integrating the relevant material into Chapter 16. (see proposal 1901-99 (Log # 9).

1901-34 Log #CP123 Final Action: Accept
(4.4.1.2 and 4.20)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add a new paragraph as 4.4.1.2 to read as follows:

4.4.1.2 The contractor's detailed description shall include a statement specifically describing each aspect of the delivered apparatus which is not fully compliant with the requirements of this standard, as further set forth in section 4.20 of this standard.

Renumber existing 4.4.1.2 as 4.4.1.3.

Add a new section as 4.20 to read as follows:

4.20 Statement of Exceptions. The entity responsible for final assembly of the apparatus shall provide to the purchaser, at or before the time the apparatus is delivered, either a certification that the apparatus fully complies with all requirements of this standard, or alternatively, a Statement Of Exceptions specifically describing each aspect of the completed apparatus which is not fully compliant with the requirements of this standard at the time of delivery.

4.20.1 The Statement Of Exceptions shall contain, for each identified non-compliant aspect of the apparatus, the following information:

(1) a separate specification of the section of the applicable standard for which compliance is lacking

(2) a description of the particular aspect of the apparatus which is not in compliance therewith

(3) a description of the further changes or modifications to the delivered apparatus which must be completed to achieve full compliance

(4) an identification of the entity who will be responsible for making the necessary post-delivery changes or modifications to the apparatus to achieve full compliance with the applicable standard.

4.20.2 Prior to, or at the time of, delivery of the apparatus, the Statement Of Exceptions shall be signed by an authorized agent of the entity responsible for final assembly of the apparatus, and by an authorized agent of the purchasing entity, indicating mutual understanding and agreement between the parties regarding the substance thereof.

4.20.3 An apparatus which is delivered subject to a Statement Of Exceptions, whether signed or unsigned per 4.20.2, shall not be placed in emergency service until the apparatus has been modified as necessary to accomplish full compliance with this standard.

Substantiation: Apparatus manufacturers who wish to deliver an apparatus that fully complies with the standard are frequently asked by purchasers to omit certain required design features of the apparatus (e.g. reflective striping) because the purchaser prefers to have that aspect of the apparatus completed locally, or provided by another vendor, or provided internally by the purchaser itself. This section allows a manufacturer/seller to deliver an apparatus that is, in part, incomplete, and thus non-compliant, although certain documentation and disclosure requirements must be met by the manufacturer, and the apparatus may not be placed into emergency service by the purchaser until the required work is completed in a manner that results in a fully compliant apparatus.

Committee Meeting Action: Accept

1901-35 Log #115 Final Action: Reject
(Chapters 5, 6, 7, 8, 9, 10, and 11)

Submitter: Jeff Weber, Emergency Water Solutions (EWS)
Recommendation: Add text to read as follows:

3.0 Proposal. VaporRelief System (VRS) is an integrated cooling system that is built directly into emergency vehicles to combat and prevent heat stress related injuries. It is a rapid deployable system that creates an instantaneous cooling fog from the sides of the emergency vehicle. The system can instantaneously provide a cool environment to revitalize heat stressed victims. The VRS is considered a vital safety apparatus to improve the Health and Safety of Firemen and Emergency workers.

3.1 New Truck Construction. The VRS is a standard safety feature to be incorporated in all new emergency vehicles that interface with high temperature environments or where emergency personnel are subjected to conditions which cause internal body temperatures to elevate above normal. Emergency vehicle manufactures are to provide VRS as a standard feature in all new fire and rescue vehicles beginning Jan. 1, 2007.

3.2 Retro-Fit of Fire and Rescue Vehicles. All fire districts are to retro-fit at least one truck per fire station with a VRS system beginning Jan. 1, 2007. Districts with multiple trucks are required to equip at minimum 25 percent of emergency vehicles fleet in service.

Substantiation: One of the most serious inherent dangers in the firefighting industry today is heat related illnesses. Heat stress, exhaustion and stroke are life threatening to firemen if they are not recognized and treated immediately. By the nature of the tasks firemen perform, they are often subjected to elevated body temperatures. Elevated body temperatures are experienced during both normal routine training exercises and during live fire and rescue operations. Increased body temperatures result from the body's own metabolic hat being generated while performing strenuous activities and/or in combination with radiant heat exposure while wearing protective garments. The body will also gain heat by convection if the ambient air temperature is above the normal body temperature of 98.6 degrees.

Protective firefighting garments serve well to protect the human body from external flash heat sources, and slow the transference of heat thru the garments to the human body. The downside is they also block or slow the human body's ability to cool itself by trapping in heat and inhibiting the body's natural ability to cool thru perspiration. Without a means to quickly cool the human body down, serious injury and potentially death can occur.

Heat illness can and does occur at relatively low outside ambient air temperatures if the human body is under physical stress while covered with protective clothing and carrying bulky equipment. Internal body temperatures can quickly elevate and lead to heat stress in a very short period of time. That time frame is even shorter when ambient temperatures increase in fire situations. If the natural cooling process is impaired, external cooling means must be provided to avoid injury.

The body attempts to control its temperature by raising and lowering heart rate (raising and lowering blood pressure), sending blood to the surface of the skin, and thru perspiration. As the perspiration evaporates (adiabatic cooling), heat is drawn from the body. Heat illness occurs as the body loses its ability to regulate temperature and affects not only the person's welfare, but also cognitive abilities. This creates a danger to himself and others.

Currently there are limited means for fire and rescue teams to aid in combating heat fatigue in both emergency and non-emergency situations. The most prevalent practices include piling firefighters into an air conditioned truck cab, spraying down firefighters with hoses, and water spray fans. These methods have serious limitations, are not effective, can be dangerous and are impractical. In the case of misting fans, they are slow to setup (requires both power and water lines), take a lot of storage space in the trucks, do not work in high humid environments, create tripping hazards, and impose a safety risk from blowing objects at firefighters.

In summary, heat related illness is a serious risk and life threatening to fire and rescue crews. The industry is in serious need of an effective, safe and rapid deployable system and that has an immediate impact to improve the health and safety of emergency personnel.

4.2 Solution

Emergency Water Solutions (EWS) has developed and patented system that solves the shortfalls of the current cooling practices being employed today. EWS offers a complete system that is incorporated directly into the chassis of emergency vehicle. The VaporRelief System (VRS), is turned on by a flip of a switch has no hoses or water and power connections to make in the field, creates a chilled water fog that is effective even in humid environments, and can service multiple fire fighters simultaneously. There are no tripping hazards created around the working area of the truck and the system has been proven to be very safe and effective for combating and treating heat related illnesses.

The system is driven from low volume compressed air generated from on-board brake systems and employs 6 - 12 atomizing spray heads configured around the perimeter of the emergency vehicle. The water is delivered from a

self-contained tank (with chillier in humid environments), and is a sanitized system that self purges after each cycle to reduce maintenance and avoid clogging spray heads from water sitting in lines. The system requires minimal space on the vehicle and is encapsulated within the body of the truck.

The VRS is a very maintenance system utilizing just one moving part (one small pump). Operational costs only include filling with water. All other power and air requirements are gained from existing vehicle systems. It is a simple, but well engineered system that is safe to operate.

The system is very cost effective and can be installed on new vehicles and easily retrofitted on existing emergency vehicles in the field. System cost is under $6,000 d is installed in 5-8 hours. The VRS was developed to be a safe, effective, and affordable product that will be no doubt improve the safety of the fire and emergency personnel.

Emergency Water Solutions recommends the VRS be incorporated into NFPA as a "Standard" and installed on all new emergency vehicles.

Note: Supporting material is available for review at NFPA Headquarters.

Committee Meeting Action: Reject

Committee Statement: There are many methods that can be used to cool fire fighters and the committee does not believe this is one that should be required as a minimum standard.

1901-36 Log #120 Final Action: Accept in Principle

(Chapter 5)

Submitter: John Sinclair, Kittitas County Fire District 2 / Rep. IAFC EMS Section

Recommendation: Add new text as follows:

5.9 AED. The pumper shall be equipped with an automatic external defibrillator (AED). An AED shall not be required on new apparatus if the purchaser certifies to the manufacturer that the pumper shall be equipped with medical equipment capable of delivering external defibrillation.

Substantiation: Firefighters die at an alarming rate each year. A major cause of firefighter deaths is sudden cardiac arrest from heart attack. Rapid defibrillation has been clearly proven to increase survival in sudden cardiac arrest. For those fire departments that provide emergency medical services (EMS), the capability for providing rapid external defibrillation may already exist. Those agencies may "opt out" upon certification that the vehicle will be equipped with an AED or equivalent capability. However, for other agencies, the inclusion of an AED provides vital lifesaving equipment for a population known to be at high risk of death from heart attacks. Fifty-six percent of volunteer firefighter fatalities were caused by sudden cardiac death (NFPA, 2005)[1]. This population is least likely to have defibrillation equipment on-scene during emergency operations and may not be required under other EMS specific language contained elsewhere in NFPA Standards. Therefore, AED equipment is appropriate for inclusion in the NFPA 1901 standard so that lifesaving equipment travels with firefighters during emergency operations and is immediately available when needed.

[1] National Fire Protection Association. (2005) Firefighter Fatalities in the United States - 2004. Author, Quincy, MA.

Committee Meeting Action: Accept in Principle

Add new text as A.5.8.3(19) and A.8.8.2(42) to read:

One automatic external defibrillator (AED).

Committee Statement: The committee believes that an AED would be a good piece of equipment to carry on a fire apparatus, but believes the first step is to put the recommendation in the annex. It is adding it to the list of suggested equipment for a pumper and ladder truck and by reference in A.9.8.3 to A.5.8.3 and A.8.8.2, it is on the suggested list for a quint.

1901-37 Log #39 Final Action: Reject
(5.7)

Submitter: Jeff Wegner, Smeal Fire Apparatus Co.
Recommendation: Revise text to read as follows:
Equipment required. ~~supplied by the Contractor.~~ The contractor may ~~shall~~ supply the equipment listed in 5.7.1 and 5.7.2 and shall provide and install such brackets or compartment as are necessary to mount the equipment.
Substantiation: The fire department should be allowed to supply their own ground ladders and supply hose if it meets the current NFPA 1931 standard for ground ladders and the hose passes pressure testing. The brackets or compartments must be supplied by contractor. How can you tell a department they can not supply ground ladders on an apparatus when they meet another standard, NFPA 1931?
If a department has ground ladders that pass testing, then all this requirement does is unnecessarily raising the cost of the apparatus. The way the standard reads I could go out and purchase New Ground Ladders for example on a truck a month earlier, get funded for a new truck and not be able to use the ladders.
The only person this standard benefits is the ground ladder company so they can increase their sales and simplifies the build procedure for the apparatus manufacturer, as he does not have to get the dimensions of the customers ground ladders for installation.
Committee Meeting Action: Reject
Committee Statement: Committee believes that ladders and hard suction hose often do not get replaced over the life of the truck. As such replacing the old ladders with new ladders provides the fire department added safety while replacing the suction hose provides increased reliability.

1901-38 Log #129 Final Action: Reject
(5.7)

Submitter: Madhu Manikkam, E-One
Recommendation: Revise text to read:
Equipment ~~(supplied by the contractor)~~ required: The purchaser shall specify the source of equipment listed in 5.7.1 and 5.7.2 and shall specify to the contractor such brackets and compartments as are necessary to mount the equipment intended to be installed on the apparatus.
Substantiation: In large number of purchases, fire departments procure ground ladders and suction hoses from local sources. The standard does not allow the local FD to have the flexibility to purchase loose equipment from their own local/regional sources. The same logic applies to Sections 6.6, 8.7, 9.7, 10.4, and 11.8.
Committee Meeting Action: Reject
Committee Statement: Committee believes that ladders and hard suction hose often do not get replaced over the life of the truck. As such replacing the old ladders with new ladders provides the fire department added safety while replacing the suction hose provides increased reliability.

1901-39 Log #60 Final Action: Accept
(5.8.2, 6.7.2, 7.7.2.2, 9.8.2, 11.9)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
5.8.2(3) One ~~combination spray~~ handline nozzle, 200 gpm (750 L/min) minimum
5.8.2(4) Two ~~combination spray~~ handline nozzles, 95 gpm (360 L/min) minimum
6.7.2(3) Two ~~combination spray~~ handline nozzles, 95 gpm (360 L/min) minimum
7.7.2.2(2) Two ~~combination spray~~ handline nozzles, 95 gpm (360 L/min) minimum
9.8.2(3) One ~~combination spray~~ handline nozzle, 200 gpm (750 L/min) minimum
9.8.2(4) Two ~~combination spray~~ handline nozzles, 95 gpm (360 L/min) minimum
11.9(3) Four foam or ~~spray~~ water handline nozzles, 200 gpm (750 L/min) minimum
11.9(4) Two foam or ~~spray~~ water handline nozzles, 95 gpm (360 L/min) minimum
Substantiation: Many departments have found that they get better results with straight tip nozzles. Apparatus with CAFS must use straight tip nozzles instead of spray nozzles for CAFS application. This choice should be left to the department.
Committee Meeting Action: Accept

1901-40 Log #CP19 Final Action: Accept
(5.8.3, 6.7.3, 7.7.3.1, 8.8.2, 9.8.3, 10.5.2 and 11.9.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 5.8.3, 6.7.3, 7.7.3.1, 8.8.2, 9.8.3, 10.5.2, and 11.9.3 to add the following to the equipment lists:
One traffic vest for each seating position, each vest to comply with ANSI/ISEA 207, *Standard for High-Visibility Public Safety Vests*, and have a five-point break away feature that includes two at the shoulders, two at the sides and one at the front.
Five fluorescent orange traffic cones not less than 28 in.(711 mm) in height, each equipped with a 6 in. (152 mm) retro-reflective white band no more than 4 in. (152 mm) from the top of the cone, and an additional 4 in. (102 mm) retro-reflective white band 2 in. (51 mm) below the 6 in. (152 mm) band.
Five illuminated warning devices such as highway flares.
Substantiation: Firefighters routinely work in roadways. The dangers of working in the roadway environment are well documented and incidents of roadway workers being struck are increasing. The inclusion of traffic vests and cones provided an added margin of safety for firefighters. The above requirements are consistent with the requirements and recommendations of the Manual on Uniform Traffic Control Devices and the Emergency Responder Safety Institute.
Committee Meeting Action: Accept

1901-41 Log #62 Final Action: Accept
(5.8.3.1, 8.8.3.2, 9.8.3.1, 11.9.3.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
If the supply hose carried does not use sexless couplings, an additional double female adapter and double male adapter, sized to fit ~~2½ in. (65 mm) or larger fire hose~~ the supply hose carried, shall be carried mounted in brackets fastened to the apparatus.
Substantiation: If the apparatus is carrying 3” or 3½” supply hose, these adapters should specifically be 3” or 3½” to match, not 2½”.
Committee Meeting Action: Accept

1901-42 Log #63 Final Action: Accept in Principle
(5.8.3.4, 5.8.3.5, 6.7.3.2, 6.7.3.3, 7.7.3.4, 7.7.3.5, 8.8.3.4, 8.8.3.5, 9.8.3.3, 9.8.3.4, 11.9.3.4, 11.9.3.5)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise to read:

5.8.3.4 [6.7.3.2, 7.7.3.4, 8.8.3.4, 9.8.3.3, 11.9.3.4] If the apparatus does not have a 2½" National Hose (NH) intake, an adapter from 2½" NH female to a pump intake shall be carried, mounted in a bracket fastened to the apparatus.

5.8.3.5 [6.7.3.3, 7.7.3.5, 8.8.3.5, 9.8.3.4, 11.9.3.5] If the supply hose carried has other than 2½" National Hose (NH) threads, adapters shall be carried to allow feeding the supply hose from a 2½" NH thread male discharge and to allow the hose to connect to a 2½" NH female intake, mounted in brackets fastened to the apparatus.

Substantiation: With this change, any apparatus that meets this standard could supply water to, or receive water from, any other apparatus in the country. This guarantees interoperability with any other department and apparatus. The standard already requires one or more 2½" NH discharges, and most apparatus have a 2½" auxiliary intake. Most already carry adapters to and from 2½" NH. For most apparatus, this change would not add any equipment not already carried.
Committee Meeting Action: Accept in Principle

Add text as 5.8.3.4, 6.7.3.2, 7.7.3.4, 8.8.3.4, 9.8.3.3, 11.9.3.4 to read as follows:

If the apparatus does not have a 2½" National Hose (NH) intake, an adapter from 2½" NH female to a pump intake shall be carried, mounted in a bracket fastened to the apparatus if not already mounted directly to the intake.

Add text in 5.8.3.5, 6.7.3.3, 7.7.3.5, 8.8.3.5, 9.8.3.4, 11.9.3.5 to read as follows:

If the supply hose carried has other than 2½" National Hose (NH) threads, adapters shall be carried to allow feeding the supply hose from a 2½" NH thread male discharge and to allow the hose to connect to a 2½" NH female intake, mounted in brackets fastened to the apparatus it not already mounted directly to the intake.
Committee Statement: The committee is accepting the submitters wording with a change that would allow the adapter to to be carried on a pump intake rather than in a bracket.

1901-43 Log #61 Final Action: Accept in Principle
(5.8.3(17), 6.7.3(14), 7.7.3.1(13), 8.8.2(23))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

Two wheel chocks, mounted in readily accessible locations, each designed to hold the apparatus, when loaded to its ~~maximum in-service weight~~ GVWR or GCWR, on a 10 percent grade with the transmission in neutral and the parking brake released.

Substantiation: Consistency with 1906.
Committee Meeting Action: Accept in Principle

Accept the submitter's change and also revise 9.8.3(21), 10.5.2(7), and 11.9.3(13) to read as changed.
Committee Statement: The committee feels that the requirement in 9.8.3(21), 10.5.2(7) and 11.9.3(13) should be consistent with the changes made in 5.8.3(17), 6.7.3(14), 7.7.3.1(13), and 8.8.2(23).

1901-44 Log #103 Final Action: Reject
(8.7.1)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Revise text to read as follows:
~~A minimum of 115 ft (35 m) of~~ Ground ladders as specified by the fire department shall be supplied and installed by the contractor.
Substantiation: Many departments do not have the need for 115 ft of ground ladders on their aerial. They may want to free up some space for additional equipment or reduce the size of their apparatus. It should be up to the fire department how many ground ladders they carry on their aerial apparatus.
Committee Meeting Action: Reject
Committee Statement: The committee believes that the 115 feet for ladder fire apparatus and 85 feet for Quint apparatus is the minimum amount of ladders that should be carried.

1901-45 Log #104 Final Action: Reject
(8.7.2)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Delete paragraph 8.7.2.
Substantiation: Many departments do not have the need for 115 ft of ground ladders on their aerial. They may want to free up some space for additional equipment or reduce the size of their apparatus. It should be up to the fire department how many ground ladders they carry on their aerial apparatus.
Committee Meeting Action: Reject
Committee Statement: The committee believes that the 115 feet for ladder fire apparatus and 85 feet for Quint apparatus is the minimum amount of ladders that should be carried.

1901-46 Log #105 Final Action: Reject
(9.7.1.1)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Replace text in 9.7.1.1 with the following:
Ground ladders as specified by the fire department shall be supplied and installed by the contractor.
Substantiation: Many departments do not have the need for 85 ft of ground ladders on their quint. They may want to free up some space for additional equipment or reduce the size of their apparatus. It should be up to the fire department how many ground ladders they carry on their quint.
Committee Meeting Action: Reject
Committee Statement: The committee believes that the 115 feet for ladder fire apparatus and 85 feet for Quint apparatus is the minimum amount of ladders that should be carried.

1901-47 Log #106 Final Action: Reject
(9.7.1.2)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Add new text as follows:
The contractor shall provide such brackets or compartments as are necessary to mount the equipment.
9.7.1.2 (old) 9.7.1.3
Substantiation: Same wording as in 8.7 (ground ladders on aerial apparatus).
Committee Meeting Action: Reject
Committee Statement: Brackets for ladders are required on both ladders and quints. Section 9.7 already states the contractor shall provide and install such brackets or compartments. Adding it again in 9.7.1.2 would be redundant.

1901-48 Log #100 Final Action: Accept in Principle
(10.4)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Delete the following text:
~~Equipment Supplied by the Contractor. The contractor shall supply the equipment listed in 10.4.1 and 10.4.2 and shall provide and install such brackets or compartments as are necessary to mount the equipment.~~
Substantiation: Section 10.4.1 states, "If ground ladders are carried on the apparatus, they shall meet the requirements of NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders*." Section 10.4.2 states, "If the special service fire apparatus is equipped with a pump, the requirements in 10.4.2.1 through 10.4.2.3 shall apply." Suggest eliminating the statement in section 10.4. It is difficult to state that the contractor must supply equipment if subsequent paragraphs indicate that the same equipment is not necessarily on the apparatus. Therefore, eliminate section 10.4 and let sections 10.4.1 and 10.4.2 stand on their own.
Committee Meeting Action: Accept in Principle
Revise 10.4 to read as follows:
Equipment Supplied by the Contractor. If the apparatus is designed to carry ground ladders, or has a pump, the contractor shall supply the equipment listed in 10.4.1 and 10.4.2 and shall provide and install such brackets or compartments as are necessary to mount the equipment.
Committee Statement: The equipment is not required unless the vehicle has a pump or is designed to carry ground ladders.

1901-49 Log #CP21 Final Action: Accept
(12.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 12.1 to read as follows:

12.1* Carrying Capacity. The GAWR and the GCWR or GVWR of the chassis shall be adequate to carry the weight of the ~~unequipped~~ fire apparatus when loaded to its estimated in-service weight as defined in 12.1.2. ~~with the water tank and other tanks full, the specified hose load, unequipped personnel weight, ground ladders, and the miscellaneous equipment allowance as defined in Table 12.1.~~

12.1.1 The manufacturer shall establish the estimated in-service weight during the design of the fire apparatus.

12.1.2 The estimated in-service weight shall include the following:

(1) The chassis, body, and tank(s)
(2) Full fuel, lubricant, and other chassis or component fluid tanks or reservoirs
(3) Full water and other agent tanks
(4)* 250 lb (114 kg) in each seating position
(5) Fixed equipment such as pumps, aerial devices, generators, reels, and air systems as installed
(6) Ground ladders, suction hose, designed hose load in their hose beds and on their reels
(7) An allowance for miscellaneous equipment that is the greatest of the values shown in Table 12.1.2, a purchaser-provided list of equipment to be carried with weights, or a purchaser-specified miscellaneous equipment allowance

Revise A.12.1.2(4) to read as follows:

A.12.1.2(4) ~~A weight of 250 lb (114 kg) for a fully equipped fire fighter is used elsewhere in NFPA standards.~~ The ~~200~~ 250 lb (~~90~~ 114 kg) per person used here does not include the weight of SCBA and tools carried by a fire fighter, because the weight of this equipment is accounted for elsewhere.

Agencies may want to also consider the weight of personal gear when the apparatus could be used for responses of anticipated long duration such as wildland fire responses where the crew must take their personal gear with them.

~~12.1.1 If the purchaser provides a list of equipment to be carried with weights, or a specified miscellaneous equipment allowance, and that value exceeds the minimum specified in Table 12.1, then this value shall be used for the miscellaneous equipment allowance.~~

~~12.1.2* The unequipped personnel weight shall be calculated at 200 lb (90 kg) per person multiplied by the number of seating positions on the apparatus.~~

Add a new paragraph as 12.1.3 to read:

12.1.3 The manufacturer shall engineer and design the fire apparatus such that the completed apparatus, when loaded to its estimated in-service weight, with all movable weights distributed as close as is practical to their intended in-service configuration, does not exceed the gross vehicle weight rating (GVWR).

12.1.4 ~~3~~ A final manufacturer's certification of the GVWR or GCWR, along with a certification of the GAWR, shall be supplied on a label affixed to the vehicle.

12.1.5 ~~4~~ The fire apparatus manufacturer shall permanently affix a high-visibility instruction plate in a location visible to the driver while seated.

12.1.5.1 ~~4.1~~* The instruction plate shall show the height of the completed fire apparatus in feet and inches or meters, the length of the completed fire apparatus in feet and inches or meters, and the gross vehicle weight rating (GVWR) in pounds or kilograms.

12.1.5.2 ~~4.2~~ Wording on the instruction plate shall indicate that the information shown was current when the apparatus was manufactured and that, if the overall height changes while the vehicle is in service, the fire department must revise that dimension on the plate.

Renumber Table 12.1 as Table 12.1.2

Revise the first paragraph of A.12.1 to read:

A.12.1 The carrying capacity of a vehicle is one of the least understood features of design and one of the most important. All vehicles are designed for a ~~maximum~~ GVWR ~~or maximum total weight~~, which should not be exceeded by the apparatus manufacturer or by the purchaser after the vehicle has been placed in service. For tractor-drawn vehicles, the in-service weight of the apparatus should not exceed the GCWR. There are many factors that make up the ~~rated~~ GVWR, including the design of the springs or suspension system, the rated axle capacity, the rated tire and wheel loading, and the distribution of the weight between the front and rear wheels.

Revise the second paragraph of A.12.1 to read:

Water Tank. One of the most critical factors is the size of the water tank. Water weighs approximately 8.3 lb/gal (1

kg/L). A value of 10 lb/gal (1.2 kg/L) can be used when estimating the weight of the tank and its water, making a 500 gal (2000 L) tank and its water about 5000 lb ~~2.5 tons~~ (2400 kg).

Revise the sixth paragraph of A.12.1 to read as follows:

Underloading. Brake equipment on heavy vehicles can be sensitive to the weight distribution of the vehicle. Specifying a GVWR significantly greater than the estimated ~~intended~~ in-service weight can lead to poor brake performance, chatter, and squeal. Purchasers who specify configurations with limited compartment volume on a high capacity chassis should consult the manufacturer to ensure that a vehicle with an underloaded condition will not result.

Revise the personnel allowance weight in B.5.1 and Figure B.5.1(b) from 200 lb (90 kg) to 250 lb (113 kg).

Substantiation: This text and associated annex material was rewritten to reflect the use of defined terms of "estimated in-service weight" and "GVWR" as appropriate to describe the weight situations. 12.1.2 is defining what the estimated in-service weight includes.

The committee recognizes that fire fighters, following the trend of the general population, are getting larger and heavier. The 95th percentile male is now 6 foot 2 inches tall and weighs 230 lb. The committee also felt that specifying an "unequipped" occupant was not realistic since every fire fighter will have bunker gear, a helmet, and boots to add to their weight. The weight of other items such as SCBA, although stored in the cab, are accounted for in the general equipment weight allowance elsewhere in this specification although annex test is being added to alert purchasers to consider the weight of personal gear if the apparatus is going to respond to incidents of anticipated long duration. Other changes are editorial for consistency with changes made when processing the last edition of NFPA 1906.

Committee Meeting Action: Accept

1901-50 Log #CP23 Final Action: Accept

(12.2.1.3)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Revise 12.2.1.3 to read as follows:

Automatic engine shutdown systems shall not be permitted unless they are an integral part of the standard engine management system. ~~that cannot be disabled.~~

Add new text as 12.2.1.4 to read as follows:

Engine derate programming shall be permitted to be used to protect the engine.

Renumber going forward.

Substantiation: The current wording was created to keep apparatus OEMs from relying on engine shutdown systems to mask a poorly designed cooling system, and to ensure that the engine is kept running even if it is destroying itself rather than quit pumping water. The committee feels that it is better to allow the engine to derate the power if there is a mechanical failure of the cooling system, than to force the engine to overheat and risk catastrophic failure. If the apparatus is pumping, it is better to reduce the water flow, than stop it all together. As the derate begins, there are warning lights on the engine to warn that derating is eminent. The cooling system specifications already require the apparatus manufacturer to design an adequate cooling system for the engine.

Committee Meeting Action: Accept

1901-51 Log #CP24 Final Action: Accept
(12.2.1.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise text to read as follows:
12.2.1.4 Engine Speed Auxiliary Control.
12.2.1.4.1* An engine speed auxiliary control device (high idle switch or hand throttle) shall be installed to allow an increase in the engine speed when the apparatus is parked.
12.2.1.4.2* An interlock shall prevent the operation of this engine speed auxiliary control device unless the parking brake is ~~fully~~ engaged and the transmission is in neutral or park, ~~or unless the engine speed control device is used with chassis engine-driven components, in which case it shall be interlocked with the engagement of those components.~~ or the parking brake is engaged and the engine is disengaged from the drive wheels.
Substantiation: The current wording allows an engine control device to be used while the vehicle is in motion. This is unsafe and should not be allowed. The intent of the deleted wording was to allow engine speed to be controlled by a hand throttle during pumping when the transmission is in drive but the pump PTO has disengaged the drive axle. The new wording provides for this intent without allowing the auxiliary speed control to be active during vehicle motion.
Committee Meeting Action: Accept

1901-52 Log #CP25 Final Action: Accept
(12.2.1.4.3 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add new text as 12.2.1.4.3 to read as follows:
12.2.1.4.3 The engine shall be prevented from regulating it's own engine speed during times when engine rpm control is critical for consistent apparatus functions such generator, water pump, or aerial operation.
Renumber going forward
Substantiation: Engine OEMs may desire to control engine speed during DPF regeneration. The committee does not want the engine to automatically change speed during pumping or other critical operations.
Committee Meeting Action: Accept

1901-53 Log #CP26 Final Action: Accept
(12.2.3.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 12.2.3.3 to read as follows:
12.2.3.3 A permanent plate in the driving compartment shall specify the quantity and type of the following fluids used in the vehicle and tire information:
(1) Engine oil …".
(17) Maximum Tire Speed Ratings
Substantiation: The apparatus operator should have information readily available on the maximum speed that the apparatus tires are rated for.
Committee Meeting Action: Accept

1901-54 Log #64 Final Action: Accept in Principle
(12.2.4)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

12.2.4* ~~Fuel and~~ Air Intake System.

~~12.2.4.1* Diesel Engines.~~

A.12.2.4~~.1~~ A manual emergency engine shutdown might be provided in addition to the normal engine shutoff switch. It could be of the type that will close off either the air supply or the exhaust gas flow of the engine. The activation mechanism should be provided with a guard and marked with a sign that reads “Emergency Shutdown.” Provisions to prevent restarting of the engine without a special reset procedure should be included.

~~12.2.4.1.1 Air Intake System.~~

12.2.4~~.1.1~~.1* An air filter shall be provided in the engine's intake air system.

A.12.2.4~~.1.1~~.1 Caution needs to be used because air intake filters might affect the engine manufacturer's air restriction requirements.

12.2.4~~.1.1~~.2 Air inlet restrictions shall not exceed the engine manufacturer's recommendations.

12.2.4~~.1.1~~.3* The air inlet shall be equipped with a means of separating water and burning embers from the air intake system such that particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter element.

A.12.2.4~~.1.1~~.3 The extent to which air inlet protection is required could depend on specific fire department operations. Departments operating in ember-rich environments such as wildland fires should consider specifying a multiscreen ember separator capable of meeting the performance criteria in accordance with LF 1093-90, *Ember Separation Test Procedure*, published by Parker Hannifin, Racor Division, or an equivalent test. Purchasers of apparatus utilizing commercial chassis should be aware that to meet this specification, the manufacturer may need to add a screen and housing externally mounted on or around the commercial chassis hood or the bumper extension.

12.2.4~~.1.1~~.4 An air restriction indicator shall be mounted in the driving compartment and visible to the driver.

12.2.5 Fuel System

12.2.5.1 Diesel Engines.

12.2~~.4.1.2~~.5.1.1* The fuel supply lines and fuel filters shall meet the engine manufacturer's recommendations.

A.12.2~~.4.1.2~~.5.1.1 To prevent engine shutdown due to fuel contamination, dual filters in parallel, with proper valving so that each filter can be used separately, might be preferable. The purchaser should specify if dual filters are desired. Installation of two or more pumps should be designed so that failure of one pump will not nullify the performance of the other pump(s). It should be remembered that commercial vehicles are designed for over-the-road operation, and the fuel system and battery are at least partially cooled by the flow of air resulting from the motion.

12.2~~.4.1.3~~.5.1.2 Electric Fuel Priming System.

12.2~~.4.1.3.1~~.5.1.2.1* Where an electric fuel priming system is furnished, the valving and piping shall be arranged so that the priming system can be operated only to reprime the fuel system.

A.12.2~~.4.1.3.1~~.5.1.2.1 With the use of diesel engines, the concern for vapor lock common with gasoline engines does not exist, and electric fuel pumps usually are not compatible for connection in series with a diesel engine fuel system. As a result, when an electric fuel pump is specified with a diesel engine, it is arranged as a fuel priming pump only. When not properly marked with a label or when the control valves are not properly set, the auxiliary priming system can cause the diesel engine to lose its prime. In addition, operation of a priming pump during diesel engine operation can boost fuel inlet pressure to the engine's fuel system. This could cause erratic engine behavior and loss of engine speed control. Control systems for priming pumps should allow only momentary operation and prevent the operation of the pump while the engine is operating.

12.2~~.4.1.3.2~~.5.1.2.2 When the priming system is not being intentionally operated, it shall be isolated from the fuel system and inoperable.

12.2~~.4.1.3.3~~.5.1.2.3 The priming system shall be marked with a label to indicate proper operation.

12.2~~.4.2~~.5.2 Gasoline Engines.

~~12.2.4.2.1 Air Intake System.~~

~~12.2.4.2.1.1 An air filter shall be provided in the engine's intake air system.~~

~~12.2.4.2.1.2 Air inlet restrictions shall not exceed the engine manufacturer's recommendations.~~

~~12.2.4.2.1.3* The air inlet shall be equipped with a means of separating water and burning embers from the air intake system such that particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter element.~~

~~A.12.2.4.2.1.3 See A.12.2.4.1.1.3.~~

~~12.2.4.2.1.4 An air restriction indicator shall be mounted in the driving compartment and visible to the driver.~~

~~12.2.4.2.2 Fuel System.~~

12.2~~.4.2.2.1~~.5.2.1 Fuel lines and filters or strainers that meet the engine manufacturer's recommendations shall be provided.

12.2~~.4.2.2.2~~.5.2.2 The filters or strainers shall be of a serviceable type and mounted in an accessible location.

12.2~~.4.2.2.3~~.5.2.3 Where two or more fuel lines are installed, separate fuel pumps operating in parallel with check valves and filtering devices shall be provided.

12.2~~.4.2.2.4~~.5.2.4 The fuel line(s) shall be located or protected so as not to be subjected to excessive heating from any portion of an exhaust system.

12.2~~.4.2.2.5~~.5.2.5 The line(s) shall be protected from mechanical damage.

12.2~~.4.2.2.6~~.5.2.6 A gasoline feed system shall include an electric-powered fuel pump located within or adjacent to the fuel tank.

Renumber following sections

Substantiation: Air intake system descriptions are identical, so they can be combined for simplicity.

Committee Meeting Action: Accept in Principle

Revise 12.2.4 to read as follows:

12.2.4* Air Intake System.

12.2.4.1* An air filter shall be provided in the engine's intake air system.

12.2.4.2 Air inlet restrictions shall not exceed the engine manufacturer's recommendations.

12.2.4.3* The air inlet shall be equipped with a means of separating water and burning embers from the air intake system such that particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter element.

12.2.4.4 An air restriction indicator shall be mounted in the driving compartment and visible to the driver.

Renumber annex material as follows to align with renumbered 12.2.4.

A.12.2.4 A manual emergency engine shutdown might be provided in addition to the normal engine shutoff switch. It could be of the type that will close off either the air supply or the exhaust gas flow of the engine. The activation mechanism should be provided with a guard and marked with a sign that reads “Emergency Shutdown.” Provisions to prevent restarting of the engine without a special reset procedure should be included.

A.12.2.4.1 Caution needs to be used because air intake filters might affect the engine manufacturer's air restriction requirements.

A.12.2.4.3 The extent to which air inlet protection is required could depend on specific fire department operations. Departments operating in ember-rich environments such as wildland fires should consider specifying a multiscreen ember separator capable of meeting the performance criteria in accordance with LF 1093-90, Ember Separation Test Procedure, published by Parker Hannifin, Racor Division, or an equivalent test. Purchasers of apparatus utilizing commercial chassis should be aware that to meet this specification, the manufacturer may need to add a screen and housing externally mounted on or around the commercial chassis hood or the bumper extension.

Renumber and rearrange the text that dealt with fuel systems as 12.2.5 to read as follows:

12.2.5 Fuel System

12.2.5.1 Diesel Engines.

12.2.5.1.1* The fuel supply lines and fuel filters shall meet the engine manufacturer's recommendations.

12.2.5.1.2 The filters or strainers shall be of a serviceable type and mounted in an accessible location.

12.2.5.1.3 Where two or more fuel lines are installed, separate fuel pumps operating in parallel with check valves and filtering devices shall be provided.

12.2.5.1.4 The fuel line(s) shall be located or protected so as not to be subjected to excessive heating from any portion of an exhaust system.

12.2.5.1.5 The line(s) shall be protected from mechanical damage.

12.2.5.1.6 Electric Fuel Priming System.

12.2.5.1.6.1* Where an electric fuel priming system is furnished, the valving and piping shall be arranged so that the priming system can be operated only to reprime the fuel system.

12.2.5.1.6.2 When the priming system is not being intentionally operated, it shall be isolated from the fuel system and inoperable.

12.2.5.1.6.3 The priming system shall be marked with a label to indicate proper operation.

12.2.5.2 Gasoline Engines.

12.2.5.2.1 Fuel lines and filters or strainers that meet the engine manufacturer's recommendations shall be provided.

12.2.5.2.2 The filters or strainers shall be of a serviceable type and mounted in an accessible location.

12.2.5.2.3 Where two or more fuel lines are installed, separate fuel pumps operating in parallel with check valves and filtering devices shall be provided.

12.2.5.2.4 The fuel line(s) shall be located or protected so as not to be subjected to excessive heating from any portion of an exhaust system.

12.2.5.2.5 The line(s) shall be protected from mechanical damage.

12.2.5.2.6 A gasoline feed system shall include an electric-powered fuel pump located within or adjacent to the fuel tank.

Renumber annex material as follows to align with renumbered 12.2.5.

A.12.2.5.1.1 To prevent engine shutdown due to fuel contamination, dual filters in parallel, with proper valving so that each filter can be used separately, might be preferable. The purchaser should specify if dual filters are desired. Installation of two or more pumps should be designed so that failure of one pump will not nullify the performance of the other pump(s). It should be remembered that commercial vehicles are designed for over-the-road operation, and the fuel system and battery are at least partially cooled by the flow of air resulting from the motion.

A.12.2.5.1.6.1 With the use of diesel engines, the concern for vapor lock common with gasoline engines does not exist, and electric fuel pumps usually are not compatible for connection in series with a diesel engine fuel system. As a result, when an electric fuel pump is specified with a diesel engine, it is arranged as a fuel priming pump only. When not properly marked with a label or when the control valves are not properly set, the auxiliary priming system can cause the diesel engine to lose its prime. In addition, operation of a priming pump during diesel engine operation can boost fuel inlet pressure to the engine's fuel system. This could cause erratic engine behavior and loss of engine speed control. Control systems for priming pumps should allow only momentary operation and prevent the operation of the pump while the engine is operating.

Renumber 12.2.5 as 12.2.6.

Committee Statement: The committee is accepting the submitters suggested changes and is also adding the requirements under current 12.2.4.2.2.2 through 12.2.4.2.2.5 to the requirements for diesel fuel systems (see 12.2.5.1.2 trough 12.2.5.1.5) as these requirements apply to diesel engines as well as gasoline engines.

1901-55 Log #111 Final Action: Accept in Principle
(12.2.4.1.1.3)

Submitter: Dan W. McKenzie, US Department of Agriculture

Recommendation: Revise text to read as follows:

12.2.4.1.1.3* The air inlet shall be equipped with a means to separating water and burning embers from the air intake system. This can be achieved by meeting one of the following methods. (1) Provide a screen or barrier such that particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter. (2) Provide a multiscreen ember separator capable of meeting the performance criteria in accordance with LF 1093-90, Ember Separation Test Procedure, published by Parker Hannifin, Racor Division, or equivalent test. (3) Centrifugal separator such that particulate matter larger than 0.039 in (1.0 mm) in diameter cannot reach the filter. (4) Any other method such that particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter.

Substantiation: Any method that meets the requirement of separating water and burning embers from reaching the air filter should be acceptable.

Committee Meeting Action: Accept in Principle

See committee action on proposal 1901-56 (Log #CP1).

Committee Statement: The committee action on proposal 1901-56 (Log #CP1) allows alternate methods and the committee believes meets the intent of the submitter.

1901-56 Log #CP1 Final Action: Accept in Principle
(12.2.4.1.1.3, and 12.2.4.2.1.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Clarify the text that was the subject of the following Formal Interpretation.
Question: Does the committee agree that it is acceptable for particulate matter larger than 0.039 in. (1.0 mm) to reach the air filter element as long as it is not burning when it reaches the air filter element?
Answer: Yes
Substantiation: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued.
Committee Meeting Action: Accept in Principle
Revise 12.2.4.1.1.3 to read as follows:
12.2.4.1.1.3* The air inlet shall be equipped with a means of separating water and burning embers from the air intake system.
Add a new paragraph as 12.2.4.1.1.4 to read:
The requirement in 12.2.4.1.1.3 shall be permitted to be achieved by either of the following methods:
(1) Provide a device such that burning particulate matter larger than 0.039 in. (1.0 mm) in diameter cannot reach the air filter element
(2) Provide a multiscreen ember separator capable of meeting the test requirements defined in LF 1093-90, Ember Separation Test Procedure, published by Parker Hannifin, Racor Division, or an equivalent test.
Renumber existing 12.2.4.1.1.4 as 12.2.4.1.1.5.
Revise A.12.2.4.1.1.3 to read as follows:
A.12.2.4.1.1.3 The extent to which air inlet protection is required could depend on specific fire department operations. Departments operating in ember-rich environments such as wildland fires should consider specifying a multiscreen ember separator capable of meeting the ~~performance~~ test requirements defined in ~~criteria in accordance with~~ LF 1093-90, Ember Separation Test Procedure, published by Parker Hannifin, Racor Division, or an equivalent test. Purchasers of apparatus utilizing commercial chassis should be aware that ember separators capable of meeting these test requirements ~~to meet this specification, the manufacturer~~ may ~~need to~~ have ~~add~~ a screen and housing externally mounted on or around the commercial chassis hood or ~~the~~ bumper extension.
Committee Statement: The committee recognizes that either of the two methods of ember separation are acceptable. The multiscreen ember separator is proven under controlled lab conditions, and the simple window screen approach has been validated by California Dept. of Forestry in field trials. Most custom chassis manufacturers utilize the more elaborate multi-screen system.

1901-57 Log #CP28 Final Action: Accept
(12.2.5.6 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add new text after current 12.2.5.5 to read as follows:
12.2.5.6* Diesel Particulate Filter. If the apparatus is driven by a diesel engine equipped with a diesel particulate filter, the requirements of 12.2.5.6.1 through 12.2.5.6.6 shall apply.
12.2.5.6.1 The regeneration process shall be activated by two methods:
(1)* Automatically by the engine system, but only when the transmission is in gear, and the speedometer is indicating a speed above 5 mph (8 km/hr), whether the apparatus is in motion or is operating in stationary pump mode with an engine rpm sufficient to indicate 5 mph (8 km/hr) on the speedometer.
(2) Manually when initiated by activation of a switch located in the driver's area of the driving compartment.
12.2.5.6.2 Instructions for initiating the manual regeneration process shall be explained in the apparatus operator's manual.
12.2.5.6.3* A switch shall be provided at the driver's area that will inhibit DPF regeneration until the switch is reset or the engine is shut down and restarted.
12.2.5.6.4 A diesel particulate filter (DPF) icon visible to the driver when seated in the driver's seat shall illuminate to indicate that the DPF requires active regeneration.
12.2.5.6.5 A high exhaust system temperature (HEST) icon visible to the driver when seated in the driver's seat shall illuminate to indicate that an active regeneration process has been initiated
12.2.5.6.6* Exhaust tail pipes that exit at ground level shall be equipped with an exhaust temperature mitigation device.
Add annex material as follows to support the new requirements.
A.12.2.5.6 Exhaust temperature while the diesel particulate filter (DPF) is actively regenerating can reach 900°F to 1300°F (480°C to 704°C). The purchaser should be aware that these temperatures are much higher than normal engine idle exhaust temperatures.
Apparatus that make short runs with extended idle time may tend to build up soot in the DPF without giving the engine sufficient opportunity to passively regenerate. If the DPF light illuminates, the vehicle should be driven above 5 mph for a period of time to allow the DPF to regenerate either actively or passively, or parked in a controlled area and a manual regeneration initiated.
Those fire departments that employ in-station exhaust venting equipment while performing pump tests should consult their vent supplier to ensure that the vent system will handle any potential DPF active regeneration event.
A.12.2.5.6.1(1) The requirement for the DPF to only automatically initiate above 5 mph (8 km/hr) ensures that the exhaust gas temperatures will not change suddenly while the apparatus is parked. This will avoid situations where an apparatus is parked next to a curb and pedestrians are suddenly exposed to excessively hot exhaust gas.
A.12.2.5.6.3 The DPF regeneration inhibit switch allows the operator to keep the DPF from regenerating during times when the apparatus is operating in an environment where extremely hot exhaust gas would be a hazard.
The inhibit function must be used carefully. Repeated use of the inhibit function can lead to soot buildup. Excessive buildup of soot can produce an uncontrolled burn inside the DPF, causing significant vehicle damage and dangerous exhaust temperatures. Watch the DPF indicator and provide opportunity to regenerate the DPF soon after using the inhibit function.
A12.2.5.6.6 Exhaust temperature mitigation devices may be affected by the addition of adaptors commonly used to hook up to exhaust extraction equipment. The purchaser should ensure that this adaptation is approved by the apparatus OEM to and that it will not adversely affect the performance of the device.
Substantiation: This text establishes a common approach to DPF regeneration control so that all fire fighters will get used to the same thing no matter whose engine or apparatus they purchase. The committee believes this requirement is the best balance between simplicity and functionality for all parties involved.
Committee Meeting Action: Accept

1901-58 Log #CP112 Final Action: Accept
(12.3.1.1, 12.3.1.3, 12.3.1.4 and 12.3.1.6.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 12.3.1.1, 12.3.1.3, 12.3.1.4 and 12.3.1.6.2.
Substantiation: These requirements are all covered by the Federal Motor Vehicle Safety Standards (FMVSS) and do not need to be stated here. If FMVSS change, chassis manufacturers would have to change their braking systems regardless of what this standard says.
Committee Meeting Action: Accept

1901-59 Log #2 Final Action: Reject
(12.3.1.5(3))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise text to read as follows:
(3) A pressure protection valve to prevent ~~the use of all~~ air-operated accessories except air-operated windshield wipers and air-assist steering, if provided, from drawing air from the air brake system when the system*'s* air gauge pressure drops below 80 psi (555 kPa).
Substantiation: An originally written, the standard technically did not allow the typical configuration of the protection valve feeding an auxiliary tank that fed the accessories. The revised wording allows this configuration while retaining the original intent of preventing accessories from depleting air brake air supply.
The same change was made in NFPA 1906.
Committee Meeting Action: Reject
Committee Statement: See committee action on proposal 1901-60 (Log #65).

1901-60 Log #65 Final Action: Accept
(12.3.1.5(3))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
12.3.1.5 (3) A pressure protection valve to prevent ~~the use of~~ all air-operated accessories from drawing air from the air brake system ~~except air-operated windshield wipers and air-assist steering, if provided,~~ when the air system's ~~air~~ pressure drops below 80 psi (550 kPa)
Substantiation: This change allows the common practice of operating accessories off of a protected reservoir. This same change was made in NFPA 1906.
Committee Meeting Action: Accept

1901-61 Log #CP29 Final Action: Accept
(12.3.1.6.4 and 12.3.1.6.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete paragraphs 12.3.1.6.4 and 12.3.1.6.5.
Substantiation: The vehicle must meet FMVSS 121, so this wording is not necessary.
Committee Meeting Action: Accept

1901-62 Log #119 Final Action: Reject
(12.3.4.1)

Submitter: Tom Hillenbrand, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
The fuel capacity shall allow the engine to drive the pump for ~~2 1/2~~ 2 hours at rated pump capacity at 150 psi (1000kPA) net pump...or to operate at 60 percent of gross engine horsepower for ~~2 1/2~~ 2 hours, whichever is greater.
Substantiation: Reducing the time to 2 hours will allow manufacturers to determine compliance for fuel capacity during the 2 hour pump test at 150 psi. An alternative would be to increase the pump test at rated capacity to 2 1/2 hours.
Committee Meeting Action: Reject
Committee Statement: The 2 ½ hours is an established customer requirement. No reason to reduce it.

1901-63 Log #CP118 Final Action: Accept
(12.3.6 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new 12.3.6 to read as follows:
12.3.6 Towing Capability. If the apparatus is equipped for towing a trailer the provisions of 12.3.6.1 through 12.3.6.5 shall apply.
12.3.6.1 For hydraulic or electric brake equipped trailer towing capability, a primary electrical receptacle shall be provided near the hitch point and shall match the umbilical cable specified in 27.9.4.4
12.3.6.2 For air brake equipped trailer towing capability, the following shall apply:
(1) A primary electrical receptacle shall be provided near the hitch point and shall match the umbilical cable specified in 27.9.4.5.
(2) Glad-Hands shall be provided for air brake connections.
12.3.6.3 An auxiliary electrical receptacle shall be provided near the hitch point and shall match the umbilical cable specified in 27.9.4.6
12.3.6.4 A label shall be provided in a location that it is visible to an operator while making trailer connections. The label shall state the maximum GVWR and tongue weight of the trailer that can be safely towed with the hitch system.
12.3.6.5 Two safety chain attachment points shall be provided near the hitch point, each designed with an ultimate strength of not less than the maximum GVWR specified on the label required in 12.3.6.4.
Substantiation: The committee is adding a chapter on trailers used in connection with emergency incident operations. These changes in Chapter 12 provide the requirements for the chassis or vehicle that is going to tow the trailer to be able to connect to the trailer properly.
Committee Meeting Action: Accept

1901-64 Log #CP31 Final Action: Accept
(13.2.4.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 13.2.4.2 to read as follows:
13.2.4.2 All ungrounded electrical terminal~~s strips~~ shall have protective covers or be in enclosures.
Substantiation: Electrically grounded studs do not need to be covered or be in an enclosure as they do not present an electrical hazard if touched.
Committee Meeting Action: Accept

1901-65 Log #CP32 Final Action: Accept
(13.3.1, 13.3.4.2, 13.8.15, 13.14, 24.11)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 13.3.1 to read as follows:
13.3.1 A 12 volt or ~~24 volt~~ greater electrical alternator shall be provided.
Revise 13.4.2 to read as follows:
13.3.4.2 If system voltage is monitored, the alarm shall sound if the system voltage at the battery or at the master load disconnect switch drops below 11.8 V for 12 V nominal systems, ~~or~~ 23.6 V for 24 V nominal systems, or 35.4 V for 42 V nominal systems for more than 120 seconds.
Revise 13.8.15.2.3 to read as follows:
13.8.15.2.3 For all tests performed with the power applied, the lighting system, or component thereof, shall be operated at 12.8 V ±0.1 V for 12 V ~~rated~~ nominal equipment, ~~and~~ 25.6 V ±0.2 V for 24 V ~~rated~~ nominal equipment, and 38.4 V ±0.3 V for 42 V nominal equipment.
Revise 13.8.15.2.3.1 to read as follows:
13.8.15.2.3.1 If the equipment is rated for operation on ~~both 12 V and 24 V~~ multiple voltages, the tests shall be performed at ~~both~~ each of the rated voltages used by the equipment.
Revise 13.14.3.4.4 to read as follows:
13.14.3.4.4 An alarm sounded by excessive battery discharge, as detected by the system required in 13.3.4, or a system voltage of less than 11.8 V dc for a 12 V nominal system, ~~or~~ 23.6 V dc for a 24 V nominal system, or 35.4 V dc for a 42 V nominal system; ~~;~~ for more than 120 seconds, shall be considered a test failure.
Revise 13.14.4.4 to read as follows:
13.14.4.4 The test shall be considered a failure if the alarm has not yet sounded 140 seconds after the voltage drops to 11.70 V for a 12 V nominal system, ~~or~~ 23.4 V dc for a 24 V nominal system, or 35.1 V for a 42 V nominal system.
Revise 24.11.3.1 to read as follows:
24.11.3.1 Electrical outlets specifically for computer use, whether ~~12 volt or 120 volt~~ low voltage or line voltage, shall be marked with a label for their intended usage and power output.
Substantiation: Some new electrical systems involve higher, and/or multiple voltages. While traditional systems are referred to by the nominal voltages 12 and 24, the systems using 3 batteries are referred to as 42 volt systems. These changes provide for such systems.
Committee Meeting Action: Accept

1901-66 Log #122 Final Action: Accept in Principle
(13.3.3)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
The lighting necessary to produce ~~1~~2 fc (~~10~~22 lx) of illumination on all walking surfaces on the apparatus and on the ground at all egress points onto and off the apparatus, 5 fc (~~50~~54 lx) of illumination on all control and instrument panels, and 50 percent of the total compartment lighting loads, as defined in Section 13.10.
Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. Egress areas should be illuminated to 2 fc minimum; see my proposl to 13.10. Reference lighting design methodology and values proposed for Section 13.10.
Committee Meeting Action: Accept in Principle
Revise 13.3.3(4) to read:
The lighting necessary to produce 2 fc (20 lx) of illumination on all walking surfaces on the apparatus and on the ground at all egress points onto and off the apparatus, 5 fc (50 lx) of illumination on all control and instrument panels, and 50 percent of the total compartment lighting loads.
Committee Statement: The committee is agreeable to changing the walking surface illumination to 2 fc for consistency with the Illumination Engineering Society recommended minimum level for walking surfaces.
The committee is not changing the conversions, see committee statement at proposal 1901-21 (Log #121).
13.10 is not being changed so the reference to it is being deleted.

1901-67 Log #CP119 Final Action: Accept
(13.3.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a title to 13.3.3 to read, “Minimum Continuous Electrical Load.”
Number the text that is currently 13.3.3 as 13.3.3.1.
Add a new 13.3.3.2 to read:
13.3.3.2 If the apparatus is equipped to tow a trailer, an additional 45 amps shall be added to the minimum continuous electrical load to provide electrical power for the federally required clearance and marker lighting and the optical warning devices mounted on the trailer.
Substantiation: The committee is adding a chapter on trailers used in connection with emergency incident operations. These changes in Chapter 13 provide the requirements for an apparatus equipped to tow a trailer have sufficient electrical capability to power the federally required clearance and marker lighting and the optical warning devices mounted on the trailer.
Committee Meeting Action: Accept

1901-68 Log #CP113 Final Action: Accept
(13.8.6.3 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add an new requirement as 13.8.6.3 to read as follows:
13.8.6.3 The use of some or all of the same warning lights shall be permitted for both modes provided the other requirements of this chapter are met.
Substantiation: Section 13.8.6 stating that “fire apparatus shall be capable of two separate signaling modes” has been interpreted has requiring separate warning lights to identify blocking versus calling for the right-of-way. The proposed text allows for identical warning lights for both modes as long as they meet the requirements, particularly zone colors, for each mode.
Committee Meeting Action: Accept

1901-69 Log #CP33 Final Action: Accept
(Table 13.8.13.5 and Table 13.8.14.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: In Tables 13.8.13.5 and 13.8.14.4, change the column headings “H” to “H Total” and adding an additional footnote to each table that reads:
3. The values in the H Total columns are the total of 19 data point values for each light, with data points on the boundary between zones counted in both zones.
Substantiation: The current table and text do not describe how these numbers are arrived at. This change helps explain the tests.
Committee Meeting Action: Accept

1901-70 Log #CP34 Final Action: Accept
(13.8.15.2.5 and 13.8.15.2.5.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 13.8.15.2.5 to read as follows:

Measurements shall be repeated at 5 degrees up and 5 degrees down from the horizontal plane that passes through the optical center, beginning at a point on ~~a line~~ the vertical plane passing through the optical center~~, and perpendicular to the horizontal plane and passing through the optical center~~.

Revise 13.8.15.2.5.1 to read as follows

The measurements shall be repeated at 5 degree intervals to the left and right of this ~~line~~ vertical plane throughout the active horizontal angle of light emission of the optical source.

Substantiation: "The line" described in 13.8.15.2.4 for the horizontal measurements is just "through the optical center", which is the point of highest intensity (3.3.117). In that case the line is horizontal, in the horizontal plane. The 13.8.15.2.5 measurements are 5 degrees above and below each of the original horizontal plane measurements. This change clarifies and corrects the description. It is not a change in any requirement.
Committee Meeting Action: Accept

1901-71 Log #109 Final Action: Reject
(13.9)

Submitter: Michael Barakey, Virginia Bach (VA) Fire Department
Recommendation: NFPA Apparatus Siren Requirements require NFPA small and large apparatus to have three electric siren (electromechanical) horns positioned to point to the front, driver's side and passenger side. To ensure complete acoustic coverage, siren horns shall be mounted low and forward pointed front, left and right.
Substantiation: Background :
Through my experience of responding to numerous fire and medical incidents in a densely populated suburban fire department, I have identified a scenario repeated on each response that produces a near miss for the firefighters responding on the fire apparatus, as well as the citizens who share the road. The problem is having the fire apparatus safely clear large intersections, safely.
NFPA 1901, Standard on Automotive Fire Apparatus-2003 Edition, does a fantastic job identifying “warning zones” regarding emergency warning light requirements. Divided into eight warning zones, four upper and four lower, the desire of NFPA 1901 is to have the fire apparatus visible from all directions while “calling for right of way”. The zones are distinct and well defined, with each zone consisting of 19 data points where light energy is measured.
“Calling for Right of Way” defines the apparatus responding to an emergency. This is a very dangerous time for firefighters, as well as the citizens who share the road and intersections. Visual identification of the fire apparatus is certainly a desire of NFPA 1901, yet the sense of sound must not be ignored. We rely on the citizen’s senses to formally ask for the right of way. It is incumbent upon us, the emergency responder, to provide all available warnings to the citizens, both visual and audible.
Fire service tradition places all mechanical and electronic warning devices, air horns, electronic sirens and mechanical sirens, facing from the front of the apparatus. Annex D of NFPA 1901, 2003 Edition, states in D.3 (12) “all horns and sirens are relocated from the roof to a position as low and as far forward as possible.” Although for written for refurbishing existing apparatus, this statement is clearly designed for the safety and convenience of the fire fighters in the cab of the fire apparatus. Today, in accordance with NFPA 1901, all sirens and air horns are located as low and far forward as possible. A problem now exists when we balance the comfort and safety of the firefighters when mounting sirens on the fire apparatus.

The picture below, (Photo 1), shows a typical fire apparatus in the City of Virginia (VA) Fire Department. Note the locations of the mechanical and electronic sirens and the air horn. While compliant with NFPA 1901-Edition 2003, the opportunity to be heard when “asking for the right of way” is diminished by the location of the audible warning devices.

Insert Photo 1 Here

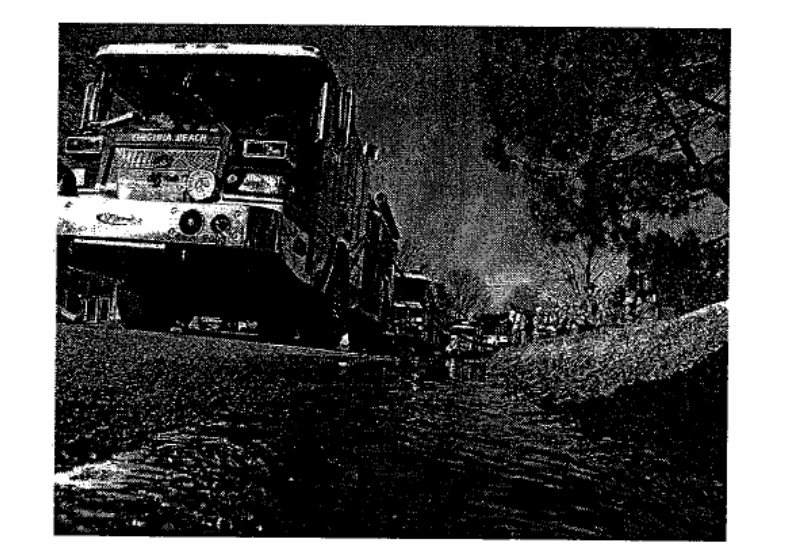
Photo 1: By MFF Martin Grube

This 2006 Pierce Tiller Truck, (Photo 2), illustrates the same problems noted in the above picture. All audible warning devices are located “as low and far forward” as possible.Photo by Martin Grube

Insert Photo 2 Here

Problem:
1. Sirens are an important component of a complete emergency vehicle warning system. As an emergency vehicle calls for the right of way, the audible warning device must be used efficiently. This will ensure the citizens are aware the emergency vehicle is asking to take the right of way. The location of the speaker’s horn directs the sound in an appropriate direction. “The mouth size is dictated by the lowest frequency the horn must produce, and a desire to have a +/- 50 degrees coverage pattern .” This is important to remember as the fire apparatus approaches the intersection and calls for the right of way.
2. As the sound travels through the atmosphere to the listener, it loses its effects in a predictable manner. The “inverse square law” estimates the Sound Pressure Level (SPL) from the siren horn to the listener. “It states that the SPL will decrease at a rate of 6 dB per doubling of distance. So a siren that is 120 dB at 10 feet will be 106 dB by 50 feet, 100

Insert photo 1 for proposal 1901-71 Log #109



Insert photo 2 for proposal 1901-71 Log #109

dB at 100 feet, 94 dB at 200 feet, and so on."

3. The civilian driver faces additional challenges to hear the siren just by being in a vehicle. As vehicles are made quieter, the ability for the fire apparatus's siren to penetrate the citizen's vehicle is reduced by "insertion loss." As much as 30 dB can be lost between the inside and outside of the listener's vehicle.

4. Traveling at 50 miles per hour, the distance traveled in one second is approximately 75 feet. Thus, in six seconds, the vehicle has traveled 450 feet. So, it is imperative to provide as much advanced warning to the citizens as possible so they may safely come to a complete stop to provide the right of way to the emergency vehicle.

Solution:

1. Change NFPA 1901, Standard on Automotive Fire Apparatus, to have a "NFPA Large Apparatus Siren Requirement." This new requirement would require any NFPA large apparatus, defined by 25 feet or more, to have an electronic siren (electromechanical) positioned to point three directions around the apparatus. To continue with the language of the 2003 Edition, the desire will to have three electronic siren speaker horns mounted as low and far forward as possible to ensure sound is directed in three desired directions, forward, drivers side, and passenger side.

2. Change NFPA 1901, Standard on Automotive Fire Apparatus, to have a "NFPA Small Apparatus Siren Requirement." This new requirement would require any NFPA small apparatus, defined by 25 feet or less, to have an electronic siren (electromechanical) positioned to point three directions around the apparatus. To continue with the language of the 2003 Edition, the desire will to have three electronic siren speaker horns mounted as low and far forward as possible to ensure sound is directed in three desired directions, forward, drivers side, and passenger side.

Justification:

1. In suburban and urban fire departments, it is quite common to have fire apparatus clear intersections of 4,6,8,10 or even 12 lanes. These intersections have posted speed limits of 45 mph or greater, with actual travel speeds of 55 mph or greater. As the fire apparatus approach these dynamic intersections, "calling for the right of way" is encompasses three distinct areas: The vehicle traffic in front of the apparatus, the vehicle traffic coming to the apparatus' left, or drivers door, and the traffic approaching from the right, or the officers door. Many times, the citizen's vehicles in the front of the apparatus comply with the request for the right of way because of the position of the audible warning devices. The electric and mechanical sirens and air horns are positioned in that direction with little distance from the bumper to the vehicle. Likewise, the vehicles in front of the fire apparatus are traveling at the same speed or stopped, allowing for compliance with the fire apparatus to be more predictable. Placing electric siren horns on the driver and passenger side of the apparatus will allow for the siren to be heard by more drivers.

See diagrams below to support justification.

Insert photo here

Insert figure here

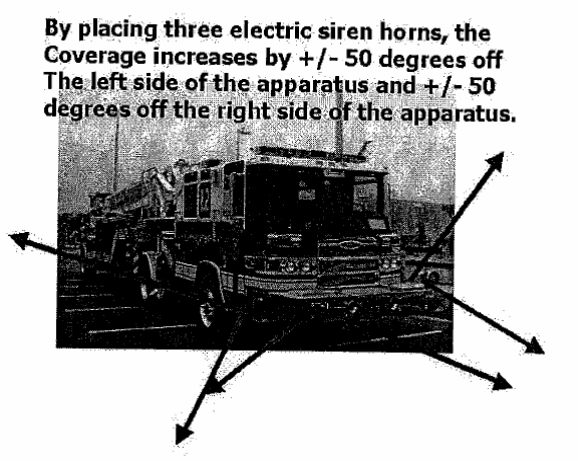
2. The vehicles to the left and right of the forward facing fire apparatus must depend on the depleting +/-50 degree coverage pattern to hear the fire apparatus. Once the fire apparatus makes the intersection, the pattern coming form the front of the bumper is now greatly directed to the front and thus the vehicles approaching from the left and right, opposite travel direction, must now rely on sight of that fire apparatus to react and yield the right of way. See diagram below.

Insert figure here

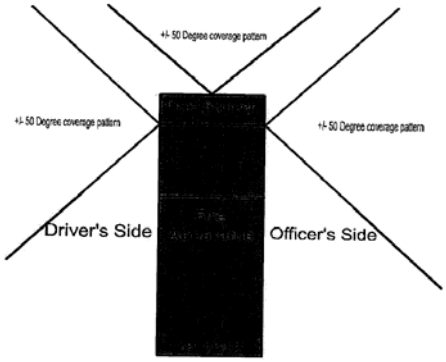
Committee Meeting Action: Reject

Committee Statement: The committee does not recognize any compelling problem with sirens today. Other safety related issues might be caused if this proposal was adopted such as noise bouncing off the side of buildings and projecting back to the cab.

Insert photo 3 for proposal 1901-71 Log #109

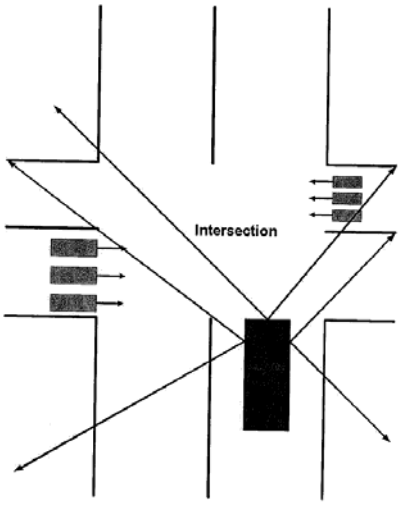


Insert figure 1 for proposal 1901-71 Log #109



This diagram depicts the desired location of three elecrtic sirens.

Insert figure 2 for proposal 1901-71 Log #109



1901-72 Log #123 Final Action: Accept in Principle in Part
(13.10)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation:

****Include 1901_L123_R.doc here****

Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx.

Provide a method to design for correct illumination, following IESNA (Illumination Engineering Society of North America) methodology. For interior and compartment illumination, the IES Lumen Method is an effective standard. This method was modified and simplified for easier application. It is valid for interior spaces and places that are relatively small or confined (such as egress lighting), but it is generally not valid for scene lighting. As such, the IES photometric method is proposed, as it is the only valid way to ensure that appropriate illumination levels can be achieved in that application. Illumination requirements are adjusted to match the IES Lumen Method.

It is very important to account for the human eye's ability to see in low-light conditions. All lumens are not equal—in other words, one lumen of halogen light is perceived much differently from one lumen of metal halide light. The human eye is most sensitive to green light, and its sensitivity changes in low lighting conditions compared to bright conditions. For general-purpose low-lighting conditions, full-spectrum white light in the 4,000K to 5,000K range is best. Driving and reaction time studies have shown how significantly the quality of light affects vision, and ratios comparing the quality of light from different sources have been developed. This method of rating light according to the human eye's ability to see it is called the "effective lumen" method. The values proposed are referenced from research conducted by Ian Lewin and published by IESNA.

All lamps produce less light over time due to degradation of the lamp. For this reason, it is standard practice to use either the light output of the lamp after 40% of its rated life, or the full initial light output with a Light Loss Factor (LLF) for lighting calculations. For commercial lamps, mean lumen output is usually cataloged. However, it is not always readily available for automotive and specialty lamps, so using initial lumens with a LLF has been incorporated here to easily accommodate both scenarios. Other light loss factors, such as dirt accumulation, have been omitted, with the presumption that most fire trucks will be maintained in a relatively clean state.

For LEDs, light output and useful life are determined by the type of LED, its driving circuit, and the nature of the heatsinking provided by the design of the fixture. Therefore, cataloged LED data are often not valid representations of fixture performance. Our own internal testing of competitor's LED fixtures has shown light output to reach 50% in as little as 275 hours due to poor regulation of LED current and inadequate heatsinking. Standard white LEDs typically also have very high color temperatures with poor quality light. For tabulated values, a standard "white" LED model was used, with the assumption that it would be powered and cooled correctly. However, a test and rating methodology is also proposed to accommodate better-quality LEDs and to help protect the buyer from inferior LED fixtures. The buyer should beware when purchasing LED fixtures, especially from smaller manufacturers.

This method of using effective lumens and a light loss factor have been combined into a single illumination requirement based upon lamp type for each recommended illumination level. The recommended illumination levels are taken from IES guidelines, and confirmed with field tests. Only white light sources should be used, as much higher illumination levels would be needed for non-white sources.

For a vehicle exterior, the minimum recommended egress lighting level is 2 fc, and the minimum lighting requirement for a work area is 10 fc.

Compartment lighting should be as uniform as possible so that the human eye can easily distinguish features on the stored items. As such, directional and spot lighting should not be used in compartments.

The lowest recommended illumination level to easily distinguish large objects is 5 fc, and this applies to all compartments. It should be noted that the 5 fc illumination requirement is for an empty compartment. Once the compartment is filled, real-world illumination levels will be much lower, and 5 fc may not be adequate in some cases. However, it should work acceptably for most applications. In places where basic reading may be required, such as inside a cab, a minimum of 7 fc illumination is recommended.

Conventional HID lamps take a significant length of time to reach full brightness when first powered on, and may also take several minutes to relight once power is interrupted. That could present safety concerns if the fixtures do not light or relight quickly enough. It is possible to design HID ballasts to ensure rapid strike and restrike, and all fixtures for fire

Include for proposal 1901-72 Log #123

Revise text to read as follows:

13.10.1 Ground, surface, and task lighting. All design computations are to made using IES photometry obtained from a certified test lab, or per a modified version of the IESNA lumen method, as specified in the applicable sections below. Only white light sources shall be permissible for area illumination in and around a vehicle. If Mercury Vapor lighting is used, required illumination levels are the same as for LEDs. It is recommended that buyers of LED fixtures confirm fixture performance through independent laboratory tests of light falloff over time, with the tests conducted using a production fixture. The Lumen Method is defined as follows:

AFR = (RLL * RLF) / ESA or RLL = (AFR * ESA) / RLF

Where,

AFR = Average illumination in footcandles (lux) required on a surface, as defined below.

RLL = Rated Lamp Lumens—The total of all initial rated lumen values in the space. Only white light sources are permissible.

RLF = Reflection Loss Factor—Estimation of the percentage of lamp lumens that will reach a surface intended to be illuminated. This is shown in Table 13.10.1.1.

ESA = Effective Surface Area—Equivalent area in square feet (square meters) to be lighted, as defined in the sections below.

Table 3.10.1.1: Tabulated Reflection Loss Factors (RLF) values.

Surface Condition	RLF
Exterior of vehicle	0.7
Interior surfaces, painted white	0.7
Interior, bare aluminum or light colors	0.5
Interior surfaces, painted dark colors	0.3
Interior surfaces, painted black	0.2

Tabulated required illumination values are shown for specific color temperatures of incandescent, halogen, LED's, and Metal Halide/Xenon HID. For all other light sources and color temperatures, required illumination values should be computed using the following equation:

RIL = (NIR * 0.83) / (LLF * CTC)

Where,

RIL = Required Illumination Level, in footcandles (lux), for a specific lamp and application.

NIR = Nominal Illumination Required, in footcandles (lux). This is the 4,000 to 5,000K HID/fluorescent values tabulated below.

LLF = Light Loss Factor—Light output at 40% of rated life divided by initial rated lumen output. Many lamp manufacturers provide light output at 40% of rated life, and refer to as mean lumen output or design lumens. As an example, a lamp that produces 1,000 initial lumens and 800 lumens at 40% of rated life will have LLF = 0.80.

CTC = Color Temperature Correction—Correction factor due to differences in color temperature, as shown in Table 3.10.1.2. Lamps with color temperatures outside of the tabulated data should not be used.

Table 13.10.1.2: Tabulated Color Temperature Correction (CTC) values.

Rated Lamp Color Temperature	CTC
2,700K – 3,000K	0.67
3,500K	0.85
4,000K – 5,000K	1.00
5,500K – 6,500K	0.42

For LED fixtures, it is recommended that test data be obtained from a certified testing laboratory with data collected independently for each fixture model.

13.10.1.1 ~~The work area immediately behind the vehicle shall be illuminated to a level of at least 3 fc (30 lx) within a 10 ft x 10 ft (3 m x 3 m) square to the rear of the vehicle.~~ All exterior work areas are to be illuminated to the level shown in Table 13.10.1.1.1. Illumination levels are to be computed using IES formatted photometric data obtained by a certified test lab.

13.0.1.1.1.A work area is defined as a ground area of not less than 5 ft x 5 ft (1.52 m x 1.52 m) adjacent to the fire apparatus that may be used for the assembly, setup, or primary handling of equipment. An area of twice the size of the work area, a minimum of 10 ft x 10 ft (3 m x 3 m), is to be illuminated to a minimum of 50% of the values shown in Table 13.10.1.1.1. Work areas should be adjacent to compartments, and may extend to cover the perimeter of the vehicle. Lighting shall be installed at a minimum elevation of 8 ft (2.43 m) from ground level to the lamp center, or as high as possible on the vehicle.

13.10.1.1.2 A work area of 10 ft x 10 ft (3.04 m x 3.04 m) shall be provided at the rear of the vehicle.

A13.10.1.1 A work area provides an area with sufficient lighting to perform tasks around the apparatus, such as working with hoses, starting power tools, or staging equipment. The lighting requirement can be met in various ways. Close to the apparatus, step lights and underbody lights can provide the required light. To provide the required lighting levels out to 10 ft from the vehicle, lighting high on the rear of the body will be required. Low voltage floodlights mounted on the rear above the hose bed (hose bed lights) may be enough to meet the requirements. Low voltage incandescent, halogen, HID, or LED scene lights can be mounted on the top or rear of the body. If a line voltage system is installed on the apparatus, line voltage lights mounted on the top or rear of the body, or on pole lights near the rear of the apparatus, may be used to provide this illumination.

The 5 ft x 5 ft (1.52 m x 1.52 m) work area illumination requirement can be met with two fixtures, each with 3300 lumen metal halide lamps and a nominal beam spread of 30 degrees vertical by 80 degrees horizontal, spaced nominally 6 ft (1.83 m) apart with light generally aimed downward.

The Illuminating Engineering Society of North America (IESNA) recommends a minimum of 10 fc (108 lx) of illumination in work areas. The purchaser may want to consider asking for lighting to provide more than the minimum required light levels.

Table 13.10.1.1.1: Required minimum illumination levels for work areas.

Rated Lamp Color Temperature	Illumination Requirement
2,700K – 3,000K (Incandescent/Halogen)	13 fc (140 lx)
3,500K (HID or Fluorescent)	11 fc (118 lx)
4,000K – 5,000K (HID or Fluorescent)	10 fc (108 lx)
5,500K – 6,500K (LED)	25 fc (269 lx)

13.10.1.2 The fire apparatus shall be equipped with lighting that is capable of providing illumination at a minimum level ~~of AFR = 1 fc (10 lx)~~ as shown in Table 13.10.1.2.1 on ground areas within 30 in. (~~800~~762 mm) of the edge of the apparatus in areas designed for personnel to climb onto the apparatus or descend from the apparatus to the ground level. The Lumen Method may be used, with the Effective Surface Area (ESA) measured at ground level. Alternatively, IES photometry may be used.

Table 13.10.1.2.1: Required minimum illumination levels for egress lighting.

Rated Lamp Color Temperature	Illumination Requirement
2,700K – 3,000K (Incandescent/Halogen)	2.7 fc (29 lx)
3,500K (HID or Fluorescent)	2.3 fc (25 lx)
4,000K – 5,000K (HID or Fluorescent)	2.0 fc (22 lx)
5,500K – 6,500K (LED)	5.1 fc (55 lx)

13.10.1.3 When HID lamps are used, such as Metal Halide (MH) or Xenon HID, they must incorporate circuitry to ensure that 80% of rated light output is reached within one minute of power-on, and that they will light or re-light within ten seconds after power is applied or reapplied after a power interruption.

13.10.1.4 Ground lighting defined in Section 13.10.1.2 is to illuminate whenever the vehicle's engine is running and the vehicle is set into parked mode. All other lighting is to be switched.

A13.10.1.4 It is recommended that the lighting be illuminated whenever the parking brake or its equivalent is set, and the engine is still running. This is to ensure that the lighting will always be illuminated whenever someone approaches or alights from the vehicle.

13.10.2.1 If a hose bed is provided, lighting on this hose bed shall be at a level ~~of 3 fc (30 lx)~~ as shown in Table 13.10.2.1.1 or higher. The Lumen Method may be used, with the Effective Surface Area (ESA) measured at the bottom surface of the compartment. Alternatively, IES photometry may be used.

Table 13.10.2.1.1: Required minimum illumination levels for hose beds and compartments.

Rated Lamp Color Temperature	Illumination Requirement
2,700K – 3,000K (Incandescent/Halogen)	6.8 fc (73 lx)
3,500K (HID or Fluorescent)	5.7 fc (61 lx)
4,000K – 5,000K (HID or Fluorescent)	5.0 fc (54 lx)
5,500K – 6,500K (LED)	13 fc (140 lx)

13.10.2.2 Lateral hose beds (crosslays) that are permanently covered shall not be required to be illuminated.

13.10.3 Surface Lighting. The apparatus shall have sufficient lighting to provide a minimum level ~~of 1 fc (10 lx)~~ as shown in Table 13.10.1.2.1 on all work surfaces, steps, and walkways. The Lumen Method may be used, with the Effective Surface Area (ESA) measured at ground level. Alternatively, IES photometry may be used.

13.10.4 Interior Lighting. The apparatus shall have sufficient lighting to provide an average level ~~of 2 fc (20 lx)~~ as shown in Table 13.10.4.1 in the driving and crew compartments. The Lumen Method may be used with the Effective Surface Area (ESA) measured as the planar area at seat level inside the cab. If no seats are in the interior space, then the ESA is to be measured at the floor of the compartment. Alternatively, IES photometry may be used.

Table 13.10.4.1: Required minimum illumination levels for driving and crew compartments.

Rated Lamp Color Temperature	Illumination Requirement
2,700K – 3,000K (Incandescent/Halogen)	9.4 fc (101 lx)
3,500K (HID or Fluorescent)	8.0 fc (86 lx)
4,000K – 5,000K (HID or Fluorescent)	7.0 fc (75 lx)
5,500K – 6,500K (LED)	18 fc (140 lx)

13.10.5.1 Each engine compartment and pump compartment shall have a light ~~of at least 20 candlepower (250 lumens)~~ sufficient to provide an average illumination level as shown in Table 13.10.2.1.1 in the compartment. The Lumen Method may be used, with the Effective Surface Area (ESA) is measured as the equivalent planar area of the largest opening of the compartment.

13.10.5.2 Each enclosed tool and equipment compartment greater than 4 ft^3 (0.1 m^3) in volume and having an opening greater than 144 $in.^2$ (~~0.9~~0.09 m^2) shall have an average minimum level of lighting ~~of 1 fc (10 lx)~~ as shown in Table 13.10.2.1.1. The Lumen Method should be used for this application. The Effective Surface Area (ESA) is the combined surface area of mounting surfaces in the compartment. All lighting fixtures are to be installed in such a manner to provide uniform illumination for all mounting surfaces in each compartment. Directional or spot lighting should not be used inside a compartment. Only diffuse flood-type fixtures should be used, with a beam spread of at least 46 degrees in both horizontal and vertical directions.

13.10.5.2.1 Mounting surfaces include:

(1) The bottom of the compartment unless covered by a slide-slide out tray on the bottom of the compartment

(2) The top of each fixed tray or shelf

(3) The top of each slide-out or roll-out tray in its deployed position

(4) Each side of each tool-board used for mounting tools, in the position in which tools are removed for use

(5) The rear wall of compartments less than 20 in. (0.5 m) deep

(6) The left and right sides of the compartment

A.13.10.5.2.1 The 5 fc level average illumination level is before equipment is mounted in the compartment. Once equipment is mounted in the compartment, light levels will be much less uniform due to shadows cast by the equipment in the compartment.

In addition to absolute light levels, visibility is affected by other factors. Where possible, diffuse lighting provides better visibility, so multiple light sources, diffusing lenses, and strip lighting sources can improve the visibility of objects in a compartment. Color temperature of the light source also affects how the human eye sees the light. Light sources with a color temperature of about 4500K provide the best visibility. The reflectivity of the compartment interior affects the light levels in the compartment. Contrast between the objects to be located and the background affects how well the eye sees the objects.

13.10.5.3 The priming lubricant reservoir, if applicable, shall be illuminated.

13.10.5.4 Compartments such as ladder tunnels, pikepole storage tubes, or underbody compartments that are designed around the volumetric requirements of specific equipment that can be removed without the use of article illumination shall not be required to have compartment lighting.

13.10.6 Switching. Switches for all work lighting shall be readily accessible.

13.10.7 Protection. The lights shall be arranged or protected to minimize accidental breakage.

13.10.8 Testing

13.10.8.1 Line voltage exterior lighting. All exterior lighting of 120 VAC nominal input or higher shall be tested and listed according to applicable UL standards by a certified NRTL.

13.10.8.2 Low voltage exterior lighting. All exterior lighting of 12 VDC or 24 VDC nominal input is to be tested for compliance with applicable sections of ANSI/UL 1598, including rain testing, thermal testing, and construction standards. However, no listing shall be required.

13.10.8.3 Vibration testing. All lighting must pass vibration testing as defined in Section 23.14.3.

13.10.8.4 Illumination level testing. Where specific light levels are required by this standard, they shall be measured as specified in this section.

13.10.8.4.1 Measurements shall be made with a hemispherical light sensor that meets the CIE Photopic Curve V(lambda).

13.10.8.4.2 The sensor shall be held against the surface and face perpendicular to the surface. It shall not be deliberately pointed toward the light source.

13.10.8.4.3 Where an average illumination level is specified, the average shall computed from readings taken in each corner and eight other evenly spaced locations.

13.10.8.4.4 Where a minimum level is specified, readings shall be taken at each corner of the area, and enough additional locations to find the point of minimum illumination.

apparatus should incorporate such circuitry for safety reasons. Therefore, illumination time requirements have been added.

Testing methods and standards have been incorporated to eliminate any subjectivity in how measurements are to be taken, and what minimum performance requirements must be met by lighting fixtures.

Correct length and area dimensions, referencing 1 in = 25.4 mm. For example, 30 in = 762 mm, not 800 mm.

Committee Meeting Action: Accept in Principle in Part

Add text to 13.10 to read as follows:

13.10 Work Lighting. All light level measurements shall be made with a light meter with a hemispherical light sensor held against the surface and face perpendicular to the surface, not deliberately pointed toward the light source.

Revise 13.10.5.3 to read as follows:

Each enclosed tool and equipment compartment greater than 4 ft^3 (0.1 m^3) in volume and having an opening greater than 144 $in.^2$ (~~0.9~~ 0.09 m^2) shall have sufficient compartment lighting to provide a minimum of 5 fc (50 lx) at any location on the floor of the compartment without any shelves, dividers, or equipment in the compartment. ~~an average minimum level of lighting of 1 fc (10 lx.~~

Committee Statement: The original proposal was very complex and did not solve the problem of the light measurements and compartment lighting being unclearly defined to implement and test. The revised proposal is simpler and gives additional guidance on how to measure all light levels. The 5 fc level is based on the Illuminating Engineering Society recommendation of 5 fc for lighting in storage areas. Current lighting will typically meet this level as defined without additional lighting fixtures. Note that shelves, dividers, and mounted equipment will create shadows and reduce lighting levels on in-service apparatus.

1901-73 Log #CP36 Final Action: Accept
(13.10.4)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Revise 13.10.4 to read as follows:

13.10.4* Interior Lighting. The apparatus shall have sufficient lighting to provide an average level of 2 fc (20 lx) at each seating surface in the driving and crew compartments.

Add an annex item to 13.10.4 to read as follows:

A.13.10.4 The user may want to consider a map light or additional task lighting in the cab.

Substantiation: Paragraph 13.10.4 calls for lighting to “provide an average level of 2 fc in the driving and crew compartments.” Footcandles (fc) is a measurement of lighting intensity falling on a surface. The existing standard does not specify what surfaces must have this intensity. his change defines what must be delivered, and makes it possible to test that this has been provided.

This light level is sufficient to get in and out, buckle a seat belt, and put on a breathing apparatus. It is not sufficient to read a map or preplan information. Directed task lighting may be needed for these tasks.

Committee Meeting Action: Accept

1901-74 Log #CP37 Final Action: Accept
(13.11.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 13.11.1 to read as follows:
A red flashing or rotating light, located in the driving compartment, shall be illuminated automatically whenever the apparatus's parking brake is not fully engaged and any of the following conditions exist:
(1) Any passenger or equipment compartment door is ~~open~~ not closed.
(2) Any ladder or equipment rack is not in the stowed position.
(3) Stabilizer system is not in its stowed position.
(4) Powered light tower is ~~extended~~ not stowed.
(5) Any other device permanently attached to the apparatus is open, extended, or deployed in a manner that is likely to cause damage to the apparatus if the apparatus is moved.
Add a new 13.11.2 to read as follows:
13.11.2 Compartments meeting all of the following do not need to be connected to the hazard light:
(1) have a volume less than or equal to 4 ft^3 (0.1m^3)
(2) have an opening less than or equal 144 in^2 (0.09 m^2)
(3) the open door does not extend sideways beyond the mirrors or up above the top of the truck
(4) all equipment in the compartment is restrained so that nothing can fall out if the door is open while the apparatus is moving.
Renumber existing 13.11.2 and the following sections.
Substantiation: This makes the wording parallel in 13.11.1.
Smaller compartments without lighting would be expensive to add to the hazard light. If nothing can fall out if the door is left open, and the doors do not extend the profile of the apparatus, small doors can be left off of the hazard light system.
Committee Meeting Action: Accept

1901-75 Log #4 Final Action: Accept in Principle
(13.14.4.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise text to read as follows:
13.14.4.1 ~~Following the completion of the tests described in 13.14.3.2 through 13.14.3.4.4, the engine shall be shut off.~~ The following test shall be started with the engine off and the battery voltage at or above 12 V for a 12 V nominal system or 24 V for a 24 V nominal system.
Substantiation: This concern has been raised that starting this test with fully charged batteries after a 2 hour high speed run causes the test to take a long time before the first measurement can be taken. This long wait for the total continuous load to bring the battery voltage down adds unnecessary time and cost to the test without adding any value to the testing process. Many testers would prefer to run this test before the 13.14.3.2 through 13.14.3.4 tests. As long as the test is started with the battery or above the nominal voltage, the discharge curve is close enough the normal curve to adequately test the low voltage alarm.
This is not original material; its reference/source is as follows:
This idea was originally presented by Tom Hillenbrand of Underwriter's Laboratories, The Text is Original
Committee Meeting Action: Accept in Principle
Revise 13.14.4.1 to read as follows:
The following test shall be started with the engine off and the battery voltage at or above 12 V for a 12 V nominal system, 24 V for a 24V nominal system, or 36 V for a 42 V nominal system.
Committee Statement: The committee is accepting the submitters proposed changes and is adding text to include 42 volt nominal systems.

1901-76 Log #5 Final Action: Reject
(13.14.4(x))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Insert the following text before 13.14.4.4:
13.14.4.x The test shall be considered a failure if the alarm sounds sooner than 100 seconds after the voltage drops to 11.85 V for a 12 V nominal system or 23.7 V for a 24 V nominal system.
Substantiation: This test condition checks for a common installation error of attaching the low voltage alarm to a point at a lower voltage than at the battery or at the master load disconnect switch as per 13.3.4.2. This common error causes frequent false alarms and leads to disregarding the alarm when a real problem occurs. it also checks for failures in the opposite direction (timer too short or voltage threshold too high) from the existing test conditions. The additional test conditions do not add any time or complexity to the testing.
Committee Meeting Action: Reject
Committee Statement: Testing that the alarm comes on too soon is not a safety issue.

1901-77 Log #CP39 Final Action: Accept
(14.1.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 14.1.3 to read as follows:

14.1.3* Each crew riding position shall be provided with a seat and an approved seat belt designed to accommodate a person with and without heavy clothing.

14.1.3.1 Seat belt assemblies shall conform to the Federal Motor Vehicle Safety Standard (FMVSS) No. 209, "Seat belt assemblies."

14.1.3.2* The effective seat belt web length for a Type 1 lap belt for pelvic restraint shall be a minimum of 60 in. (1525 mm) with the seat adjusted all the way back and down when measured using the following procedure.

(1) Locate an imaginary line where the plane of the center of the seat back surface intersects the plane of the center of the seat cushion surface (Line 1 in Figure 14.1.3.2). For seats with an SCBA seat back, use a plane that simulates the position of an SCBA back pad installed in the SCBA holder.
(2) Locate point A on Line 1 at the outside of the seat on the retractor side of the seat.
(3) Locate point C on Line 1 at the outside of the seat on the receiver side of the seat.
(4) Locate point D at the tip of the receiver.
(5) Pull the seat belt webbing entirely out of the retractor and measure along the webbing between point A and the male seatbelt buckle. Record this length as AD.
(6) Measure from point C to point D and record this length as CD.
(7) The effective seat belt web length equals AD + CD.

*** Insert 1901 Log CP39 Rec Figure 14.1.3.2 ***

FIGURE 14.1.3.3 Dimension Lines for Measuring Seat Belt Effective Length

14.1.3.3* The effective seat belt web length for a Type 2 pelvic and upper torso restraint-style seat belt assembly shall be a minimum of 110 in (2800 mm) with the seat adjusted all the way back and down when measured using the following procedure.

(1) Locate an imaginary line where the plane of the center of the seat back surface intersects the plane of the center of the seat cushion surface (Line 1 in Figure 14.1.3.2). For seats with an SCBA seat back, use a plane that simulates the position of an SCBA back pad installed in the SCBA holder.
(2) Locate an imaginary line parallel with line 1 and lying on the center of the seat back surface 29 in. (740 mm) from line 1 (Line 2 in Figure 14.1.3.2).
(3) Locate point A on Line 1 at the outside of the seat on the retractor side of the seat.
(4) Locate point B on Line 2 at the shoulder strap edge of the seat back.
(5) Locate point C on Line 1 at the outside of the seat on the receiver side of the seat.
(6) Locate point D at the tip of the receiver.
(7) Pull the seat belt webbing entirely out of the retractor and measure along the webbing between points A and B. Record this length as AB.
(8) Measure from point C to point D and record this length as CD.
(9) The effective seat belt web length equals AB + 2CD.

14.1.3.4 ~~1 If available from the chassis manufacturer,~~ the seat belt webbing shall be bright red or bright orange in color and the buckle portion of the seat belt shall be mounted on a rigid or semirigid stalk such that the buckle remains positioned in an accessible location.

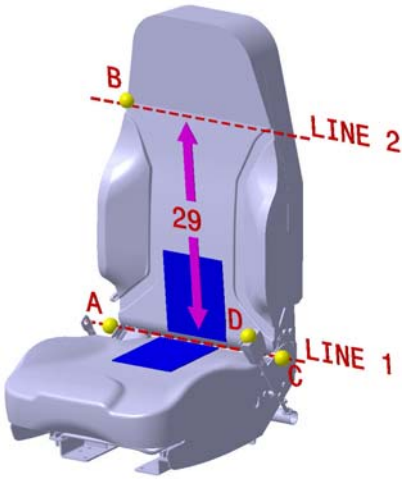
14.1.3.5 ~~2~~ All forward-facing seats adjacent to a side wall shall be provided with a Type 2 pelvic and upper torso restraint-style seat belt assembly ~~conforming to the Federal Motor Vehicle Safety Standard (FMVSS) No. 209, "Seat belt assemblies."~~

14.1.3.6 ~~3~~ All seat belt assembly anchorages shall conform to the Federal Motor Vehicle Safety Standard (FMVSS) No. 210, "Seat belt assembly anchorages."

Add annex material to the new 14.1.3.2 and 14.1.3.3 to read as follows:

A.14.1.3.2 The minimum effective belt length dimensions were determined from a survey of 300 fire fighters wearing bunker gear. When considering a lap belt only, the 95th percentile male fire fighter required 48 in (1220 mm) of belt length, and the largest subject in the survey required 54 inches. The 60 in (1525 mm) minimum will accommodate the largest subject and provide 12 in (305 mm) spare for the 95th percentile subject.

Insert figure for proposal 1901-77 Log #CP39



A.14.1.3.3 When considering a lap and shoulder belt assembly, the 95th percentile fire fighter required 98 in (2490 mm) of effective belt length, and the largest subject in the survey required 109 inches. The 110 in (2800 mm) minimum will accommodate the largest subject and provide 12 in (305 mm) spare for the 95th percentile subject.

Substantiation: The revisions provide for a minimum belt length and a way to measure it that should accommodate the complete range of firefighting personnel in bunker gear. The dimensions are technically feasible given the 89 inches of belt length that can be packed in a standard retractor (89 inches of web) + (29 inches from line 1 to line 2) = 118 inches. This provides 8 inches (118-110) plus twice the length of the receiver stalk from point C to point D as design tolerance.

Other changes are to be sure that all seat belts meet FMVSS No. 209, not just Type 2 seat belts. Also because many Fire Chiefs have insisted that orange is more visible than red, the committee is adding the bright orange option to meet the intent of the visibility of seat belts. The wording "If available from the chassis manufacturer" is being deleted from existing 14.1.3.1 to eliminate a double standard. The requirement for red belts (if available) has been in the standard for over 4 years and chassis manufacturers who want to sell chassis for fire service use have had ample time to make seat belts with red webbing available.

Committee Meeting Action: Accept

1901-78 Log #3 Final Action: Accept in Principle
(14.1.3.7)

Submitter: Thomas A. Stalnaker, Goshen Fire Company

Recommendation: Add text to read as follows:

14.1.3.7 A seat belt warning device shall be provided. The warning device shall consist of an audible warning device that can be heard at all seating positions designed to be occupied while the vehicle is in motion, or a flashing light or lights visible from the driver's and officer's seats. The warning shall be activated anytime the parking brake is released or the automatic transmission is not in park, and the seat belt of any occupied seat is not fastened or the seat belt of any unoccupied seat is fastened.

Substantiation: 70 percent of all firefighters killed in vehicle accidents are not wearing their seat belts. Many departments have SOP's that call for seat belt use, but they are often ignored and no one checks or enforces the seat belt use. This warning device would make it easy for the officer or driver to know that every occupant is belted in. The reason for the warning when an unoccupied seat is belted is to prevent disabling the system by fastening the belts and tucking them not the seats, which would prevent their use. To prevent users from disabling the system, checking this system should be added to the annual maintenance checks as that standard is written.

Committee Meeting Action: Accept in Principle

Add text to read as follows:

14.1.3.7 A seat belt warning device shall be provided.

14.1.3.7.1 The warning device shall consist of an audible warning device that can be heard at all seating positions designed to be occupied while the vehicle is in motion, and a visual display visible to the driver showing each seating position with green/red illumination.

14.1.3.7.2 The warning shall be activated anytime the parking brake is released or the automatic transmission is not in park.

14.1.3.7.3 Seat position lights shall display in accordance with Table 14.1.3.7.3

*** Insert 1901 Log 3 CA Table 14.1.3.7.3 ***

Committee Statement: The committee recognizes the problem the submitter is addressing and is going one step further to have specific lights for each seating position that shows the seat belt use status of that seat.

Insert table for proposal 1901-78 Log #3

Table 14.1.3.7.3 Light Display for Seating Positions

Display	Seat Belt	Seat Sensor
Green	Buckled	Senses Occupant
Red	Buckled	No Occupant
Red	Unbuckled	Senses Occupant
Dark	Unbuckled	No Occupant

1901-79 Log #101 Final Action: Reject
(14.1.8)

Submitter: Mark Gold, Solutia, Inc.
Recommendation: Add new Section 14.1.8 to read:
All vehicle glazing shall meet the Item 1 glazing requirements as stated in ANSI/SAE Z26.1 (1996).
Renumber existing 14.1.8 as 14.1.9 and so on for the rest of Section 14.
Add to Section 2.3.1:
ANSI Publications ANSI/SAE Z26.1.
Substantiation: ANSI/SAE Z26.1 is the "American National Standard for Safety Glazing Materials for Safety Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways - Safety Standard". Item 1 is laminated glass. Use of laminated glass in the glazing systems will protect occupants from shattered glass should the glass be impacted (falling debris, moving equipment, etc.). With this addition the interior of the vehicle will provide a "safe haven" for fire fighters. The use of laminated glass will also assist in the achievement of the noise limitations in Section 14.1.7.
Committee Meeting Action: Reject
Committee Statement: FMVSS already covers safety glass in vehicles. The committee is not aware of any problem today.

1901-80 Log #CP40 Final Action: Accept
(14.1.8.4 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add text as 14.1.8.4 to read as follows:
14.1.8.4 The following statement shall be included in the operator's manual:
"Fire helmets shall not be worn by persons riding in enclosed driving and crew areas. Fire helmets are not designed for crash protection and they will interfere with the protection provided by head rests. The reduction in head clearance creates a greater hazard to personal safety than the helmets will protect. The use of seat belts is essential to protecting fire fighters during driving."
Add an annex to 14.1.8.4 to read as follows:
A.14.1.8.4 Seat head height values in this standard assume that the occupants are not wearing fire helmets. The use of helmets detracts from the head clearance and puts the occupant at greater risk of neck or back injury during a rollover or during a severe road event.
Substantiation: There is an unavoidable trade-off between the height of the cab roof, the height of the aerial ladders, and the space left inside the cab for head clearance. Apparatus that are too high will not fit beneath certain bridges and would therefore be hindered or delayed when responding to fire calls. The minimum values selected for head clearance were determined based on the realization that this trade-off exists, and that a compromise must be reached between these competing factors. If there was a compelling reason for firefighters to wear their helmets while riding in the apparatus, then a greater head clearance value would be necessary and the travel height would suffer.
The best balance of trade-off is to create the standard assuming that helmets will not be used. This decision is further substantiated by the observation that most fire helmets will interfere with the head rests, forcing the occupant to sit with their head pitched forward, and obstructing the proper functioning of the headrest during a crash.
Committee Meeting Action: Accept

1901-81 Log #117 Final Action: Accept in Principle
(14.1.9.3)

Submitter: Tom Hillenbrand, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
A back cushion that extends from the face of the seat vertically at least 18 in. (460 mm) and that is a minimum of 16 ~~18~~ in. (460 mm) wide shall be provided.
Substantiation: There are several commercial seats (typically the driver and safety officer seats) used with fire apparatus that meet FMVSS that have a back measuring 16 in. across at a point extending 18 in. vertically from the face of the seat. Keeping the 18 in. requirement eliminates several seats currently being used.
Committee Meeting Action: Accept in Principle
Revise 14.1.9.3 to read as follows
A back cushion that extends from the face of the seat vertically at least 18 in. (460 mm) and that is a minimum of 18 in. (460 mm) wide at the base shall be provided.
Committee Statement: The seat does not need to be 18 in. wide all the way up as demonstrated by many comfortable seats currently available. However, the committee does feel it should be at least 18 in. at the base of the back cushion.

1901-82 Log #92 Final Action: Accept in Principle
(14.1.14.2)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Delete the following text:
~~Each opening shall be large enough for a person to escape through the opening.~~
Substantiation: The existing text does not provide any meaningful information. It is assumed that a person must be able to fit through the opening. The sentence should be deleted or replaced with a minimum size to better clarify the point.
Committee Meeting Action: Accept in Principle
Revise 14.1.14.2 to read as follows:
14.1.14.2 Each opening shall be a minimum of 24 in. x 24 in. (610 mm x 610 mm). ~~large enough for a person to escape through the opening.~~
Committee Statement: Recent Anthropometric study of 390 fire fighters in bunker gear provides the following:
Stomach depth of 16.0 in. for the 95th percentile male and 19.5 in. maximum depth
Chest depth of 15.0 in. for the 95th percentile male and 18.0 in. maximum depth
Shoulder width of 23.4 in. for the 95th percentile male and 26.0 in. maximum width
The 24 x 24 dimension will provide adequate clearance for the 95th percentile individual, and will be consistent with commercially available hatches.

1901-83 Log #CP41 Final Action: Accept
(14.3.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 14.3.2 to read as follows:
14.3.2 Cabs on apparatus with a GVWR greater than 26,000 lb (11,800 kg) shall meet the requirements of one of the following sets of standards:
(1) SAE J2420, COE Frontal Strength Evaluation– Dynamic Loading Heavy Trucks and SAE J2422, Cab Roof Strength Evaluation – Quasi-Static Loading Heavy Truck;
(2) ECE Regulation number 29 Uniform Provisions Concerning the Approval of Vehicles with Regard to the Protection of the Occupants of the Cab of a Commercial Vehicle
Add an annex to the new 14.3.2 to read as follows:
A14.3.2 The US standards developed by SAE, and the United Nations ECE regulation, mirror each other except that the SAE standard requires a roof preload impact prior to the roof crush. The ECE standard was established in 1958, while the SAE standards only added performance criteria in 2003. Both standards are viable minimum measures of cab integrity. Manufacturers may test in excess of either standard.
Renumber current 14.3.2 going forward.
Substantiation: Fire fighters should be enclosed in a strong cab that has met recognized criteria for rollover and impact protection.
Committee Meeting Action: Accept

1901-84 Log #CP43 Final Action: Accept
(14.3.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new 14.3.4 to read as follows:
14.3.4 All primary rear view mirrors used by the driver shall be adjustable from the driver's seat.
Renumber existing 14.3.4 going forward.
Substantiation: Because fire apparatus are driven by multiple persons, the ability to adjust the mirrors for all drivers is important for the safety of the crew. In many cases, especially volunteer departments, the driver is the only person on board.
Committee Meeting Action: Accept

1901-85 Log #48 Final Action: Reject
(14.3.4.1(22) and 14.3.4.1.1 (New))

Submitter: Steve McKeown, Stability Dynamics Ltd.
Recommendation: Add new text to read as follows:
(22) Lateral acceleration indicator
14.3.4.1.1 Lateral acceleration indicators shall be adjustable for sensitivity and shall provide both visual and audible signals and warnings to the driver.
Substantiation: Lateral "g" forces, the forces exerted when vehicles are cornered or operated on side slopes, are responsible for most large vehicle rollovers. These types of accidents are costly in terms of both loss of life and property damage.
A lateral acceleration indicator monitors lateral "g" forces perpendicular to the vehicle direction of travel and provides stepped alarms to the driver, both visually and audibly, as the vehicle rollover threshold is approached. This alerts the driver to pending loss of control of the vehicle and provides an opportunity to take corrective action.
Lateral acceleration indicators are now considered to be such an important safety and training device that the Federal Aviation Administration (FAA) successfully sponsored inclusion of these devices in NFPA 414, (Standard for Aircraft Rescue and Fire-Fighting Vehicles) as standard equipment in new vehicles.
Extracted from NFPA 414:
4.11.4 Instruments, Warning Lights, and Controls.
4.11.4.4 The following instruments or warning lights, or both, shall be provided as a minimum:
(16) Lateral G-force indicator
4.11.8* A lateral acceleration indicator that is adjustable for sensitivity and that provides both visual and audio signals and warnings to the driver shall be provided.
A.4.11.8 Where specified, a lateral acceleration force indicator that provides both visual and audio signals and warnings to the driver shall be provided. The sensitivity of the indicator shall be adjustable by the fire department to account for the individual operating capabilities of different vehicles.
Lateral acceleration indicators are widely used at airports and fire departments throughout North America. Below are some testimonials from actual users:
"The operators now know how to maintain a safe speed and response without putting the vehicle over its limits and a possible rollover"
William Hutfilz, ARFF Training Officer
McCarran International Airport, Las Vegas, NV
"The Lateral 'G' system has been extremely beneficial as it provides the Driver-0perator with an early warning of pending danger and provides ample opportunity to correct the problem before an accident occurs"
Bill Wekenborg, Division Commander
Dallas Fort Worth International Airport, Dallas, TX
"The drivers have acquired a sense of security and are now able to maximize the performance of the vehicles while maintaining a high level of security particularly during emergency conditions"
Gaetan Perron, Deputy Canadian Forces Fire Marshall
Department of National Defence, Ottawa, ON
The following is included to provide the technical committee with typical product information that may be relevant to the evaluation of this proposal:

INSERT ARTWORK HERE
Lateral Acceleration Indicator
(Sensing Unit)

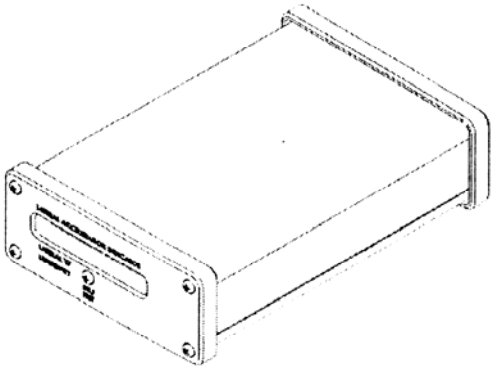
Lateral Acceleration Indicator
(Display Units)

Display units include an advisory light at each 10 percent of the threshold up to 70 percent, and then increases the level of advising lights and audio alarms at the 80 percent, 90 percent, and 100 percent levels.
Advisory Lights:
Green: 10 percent to 60 percent of threshold
Yellow: 70 percent to 80 percent of threshold

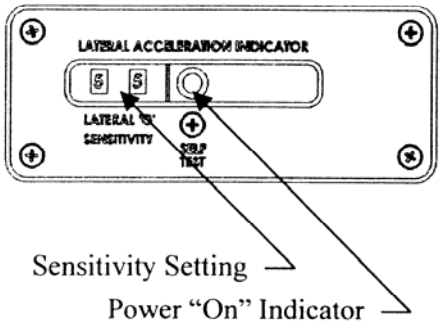
Insert artwork for proposal 1901-85 Log #48

Lateral Acceleration Indicator
(Sensing Unit)

Dimensions: 4.5"W x 2.0"H x 6.5"D
Power Supply: 12 volts DC @ 2.0amps



Isometric View



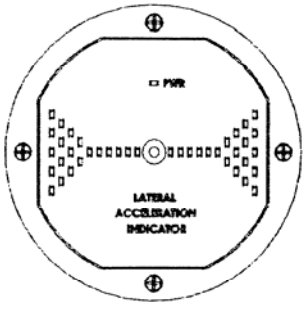
Front View

Lateral Acceleration Indicator
(Display Units)

Unilateral Type (Front View)
Dimensions: 7.25"W x 1.25"H

Power "On" Indicator
Visual Indicator Array
Audible Alarm

Bilateral Type (Front View)
Dimensions: 3.75" DIA



Display units include an advisory light at each 10% of the threshold up to 70%, and then increases the level of advising lights and audio alarms at the 80%, 90% and 100% levels.

Advisory Lights:
Green: 10% to 60% of threshold
Yellow: 70% to 80% of threshold
Red: 90% to 100% of threshold

Red: 90 percent to 100 percent of threshold

Committee Meeting Action: Reject

Committee Statement: The committee has made changes to the standard that address improving roll stability. This device can be used as a training tool and may be of value to purchasers who wish to develop driver training, but not one that should be added to the standard as a requirement on all vehicles. The availability of the device will be added to the annex.

1901-86 Log #13 Final Action: Reject
(15.3 and 15.10)

Submitter: Gary Handwerk, Hale Products, Inc.

Recommendation: Label hose beds and compartments as to their maximum weight and cubic foot limits.

Substantiation: This will help to prevent overweight trucks and body structure failure.

Committee Meeting Action: Reject

Committee Statement: Labeling each compartment individually may encourage overweight trucks by allowing the user to think they can load up each compartment to it's design weight and still have a vehicle that is not overweight. The maximum cubic foot capacity is self apparent.

1901-87 Log #66 Final Action: Accept in Principle
(15.7, 15.8, 3.3.)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

3.3.xx Access Ladder. A series of rungs (of any shape) for climbing, connected on both ends by rails or beams.

15.7 Stepping, Standing, and Walking Surfaces.

15.7.1* Steps, platforms, or permanently attached access ladders shall be provided so that fire fighters have access to all working and storage areas of the apparatus.

A.15.7.1 Ascending into and descending from certain types of driving and crew compartments is ergonomically difficult and has resulted in falls and subsequent fire fighter injuries. When designing and specifying apparatus, it is strongly suggested that chassis and apparatus manufacturers be consulted concerning available alternatives to make driving and crew compartment access as ergonomically convenient and as safe as possible.

Where a ladder or series of steps is provided to access upper areas of the apparatus, it is ideal to have the rungs or steps set back for each step. 75° is considered the ideal climbing angle for ladders, where possible.

15.7.1.1 The maximum stepping height shall not exceed 18 in. (460 mm), with the exception of the ground to first step, which shall not exceed 24 in. (610 mm).

15.7.1.1.1 A permanently attached supplemental access/egress means from the ground to these steps, platforms, or permanently attached access ladders shall be provided where the ground to the first step, platform, or ladder exceeds 24 in. (610 mm).

15.7.1.1.2 The supplemental access means shall consist of a step(s), platform(s), or access ladder(s).

15.7.1.1.3 The ground to first step height shall be determined with the apparatus on level ground.

15.7.1.1.4 Where the apparatus is supplied with stabilizers, the ground to first step height shall be determined with the apparatus on level ground and the stabilizers deployed in accordance with the manufacturer's instructions so that the aerial device meets the stability requirements of Section 20.21.

15.7.1.2* Steps. All steps shall have a minimum area of 35 in.^{2} (22,580 mm^2), shall be of such a shape that a 5 in. (125 mm) diameter disk does not overlap any side when placed on the step, and shall be arranged to provide at least 8 in. (200 mm) of clearance between the leading edge of the step and any obstruction.

A.15.7.1.2 The intent of step size and placement requirements is to ensure that the fire fighter's foot will be supported 7 in. to 8 in. (175 mm to 200 mm) from the toe when the foot is placed on the step in the normal climbing position. The leading edge is not necessarily the side opposite the fastening location.

15.7.1.3 Platforms. All platforms shall have a minimum depth of 8 in. (200 mm) from the leading edge of the platform to any obstruction.

15.7.1.4 Access Ladders. All access ladders shall have at ~~least 7 in. (175 mm)~~ least 8 in. (200 mm) of clearance between the leading edge of any rung and the body or other obstruction.

15.7.2 All steps, platforms, or access ladders shall sustain a minimum static load of 500 lb (200 kg) without deformation.

15.7.3* Slip Resistance.

A.15.7.3 Apparatus are constructed with surface areas that are not intended to be used as stepping, standing, and walking areas. These include cosmetic and protective coverings on horizontal surfaces. During the design stage of the vehicle, purchasers should designate which areas are stepping, standing, or walking areas. It is important that proper materials are selected for the application and local conditions.

When selecting stepping, standing, and walking surfaces, the purchaser should take into consideration the long-term use of the vehicle. The slip resistance of certain surfaces might deteriorate over time. It is also important for the user to properly maintain or replace slip-resistant materials as they deteriorate over time.

15.7.3.1 All materials used for exterior surfaces designated as stepping, standing, and walking areas and all interior steps shall have a minimum slip resistance in any orientation of 0.68 when tested wet using the English XL tester in accordance with ASTM F 1679, *Standard Test Method for Using a Variable Incidence Tribometer (VIT)*, or 0.52 when tested wet using the Brungraber Mark II tester in accordance with ASTM F 1677, *Standard Test Method for Using a Portable Inclinable Articulated Strut Slip Test (PIAST).*

15.7.3.2 All materials used for interior floors shall have a minimum slip resistance in any orientation of 0.58 when tested dry using the English XL tester in accordance with ASTM F 1679, *Standard Test Method for Using a Variable Incidence Tribometer (VIT)*, or 0.47 when tested dry using the Brungraber Mark II tester in accordance with ASTM F 1677, *Standard Test Method for Using a Portable Inclinable Articulated Strut Slip Tester (PIAST)*.

15.7.3.3 A standard Neolite® test sensor shall be used with both the English XL tester and the Brungraber Mark II

tester.

15.7.3.4 Sampling Strategy.

15.7.3.4.1 For uniformly patterned materials, at least 16 readings shall be taken on each sample.

15.7.3.4.1.1 Each reading shall be taken 90 degrees clockwise from the previous orientation, resulting in at least four readings in each orientation.

15.7.3.4.1.2 The readings shall be averaged and reported as the slip resistance for the material.

15.7.3.4.2 For directionally patterned materials, at least 32 readings shall be taken on each sample.

15.7.3.4.2.1 Each reading shall be taken 45 degrees clockwise from the previous orientation, resulting in at least four readings in each orientation.

15.7.3.4.2.2 The four readings in each direction shall be averaged and reported as the slip resistance for the material in that orientation.

15.7.3.5 The contractor shall supply at the time of delivery of the apparatus a certification that all materials used for exterior surfaces designated as stepping, standing, and walking areas, all interior steps, and all interior floors meet the requirements of 15.7.3.

15.7.3.6 Where the fuel fill is located at or near a stepping surface, the surface shall be construction of an open grate–type material to facilitate draining of accidentally spilled fuel to lessen any slipping hazard.

15.7.3.7 Access ladder rungs shall have a skid resistant surface or covering, but do not have to be tested as required above for stepping, standing, and walking areas unless they are flat on the top.

15.7.4 A sign shall be located on the vehicle at the rear step areas and at any cross walkways to warn personnel that riding in or on these areas while the vehicle is in motion is prohibited.

15.8 Access Handholds

15.8.1* Handholds shall be provided for each step, platform, and ladder rung used to climb from one level to another.

A.15.8.1 Handholds and stepping surfaces should be constructed and located so that three points of contact (two hands and one foot, or one hand and two feet) can be maintained at all times while ascending and descending.

15.8.2 Handholds shall consist of any of the following:

(1) Any 5 in. (125 mm) section of a handrail meeting the requirements of 15.9.2 through 15.9.4

(2) Any 5 in. (125 mm) section of a ladder rail, if it meets the requirements of 15.9.2 through 15.9.4

(3) Another ladder rung, if it meets the requirements of 15.9.2 through 15.9.4

(4) Hand holes in another step, platform, or other surface if the thickness to be grabbed is between 1/2 in. and 1 5/8 in. (12 mm and 42 mm) in thickness, the hole is at least 5 in. (125 mm) long and 2 in (51 mm) wide, and the surfaces and edges are slip resistant and smooth enough to not cut or injure an ungloved hand. The ends of the hole may be rounded with a maximum radius of 1 in. (25 mm).

(5) Other means that provides the same stability for the firefighter climbing up and down.

15.8.3 Each step, platform, and ladder rung shall have its own handhold.

A.15.8.3 The handholds can be unique for each step, platform, or ladder rung, or it can be different 5 in. (125 mm) sections of the same longer handrail, ladder rail, ladder rung, or hand hole.

15.8.4 The center of the handhold shall be no more than 65 in. (1.65 m) above the surface from which the firefighter steps up.

A.15.8.4 This allows the firefighter to reach the handhold before stepping up.

15.8.5 The center of the handhold shall be at least 30 in. (760 mm) above the step, platform, or rung after stepping up, unless that places the handhold above the top of the apparatus body, in which case the handhold does not have to extend above the top of the body.

A.15.8.5 This section allows the handhold to be lower than optimal at the top of a ladder to the top of the apparatus, but higher handrails or other handholds are desirable where possible.

15.8.6 The center of the handhold shall be forward of (away from the climber) the leading edge of the step, platform, or ladder rung, but not more than 20 in. (510 mm) forward of the vertical plane through the leading edge.

15.8.7 The center of the handhold shall be no more than 18 in. (460 mm) to the right or left of the center of the leading edge of the step or ladder rung, or more than 12 in. (305 mm) to the left or right beyond the end of a platform when facing the leading edge of the platform, step, or ladder rung.

15.8~~9~~ Access Handrails.

15.8~~9~~.1 Access handrails shall be provided at each entrance to a driving or crew compartment ~~and at each position where steps or ladders for climbing are located~~.

15.8~~9~~.2 Exterior access handrails shall be constructed of, or covered with, a slip-resistant, noncorrosive material.

15.8~~9~~.3 Exterior Access handrails shall be between 1 in. and $1\frac{5}{8}$ in. (25 mm and 42 mm) in diameter and have a minimum clearance between the handrails and any surface of at least 2 in. (52 mm).

15.8~~9~~.4* All handrails shall be designed and mounted to reduce the possibility of hand slippage and to avoid snagging

of hose, equipment, or clothing.

A.15.8.4 Handrails should be mounted in a way to minimize the chances of damage or removal by brushing objects such as trees.

Renumber the following sections

Substantiation: This proposal started as a response to an inquiry to the NFPA about inconsistencies and conflicts in the original text depending on whether a construct was defined as a series of steps or platforms, or defined as a ladder. There was also confusion about requirements for access ladders (new term defined here) vs. aerial ladders. This proposal makes the requirements for various means of access to points above ground consistent, and adds details on handholds. The spacings for handholds are based on ergonomic data for 5th percentile females through 95th percentile males.

Committee Meeting Action: Accept in Principle

Add a definition of access ladder in chapter 3 to read as follows:

Access Ladder. A series of rungs (of any shape) for climbing that have a degree of inclination between 60 and 90 degrees.

Revise 15.7.1.1.2 to read as follows:

The supplemental access means shall consist of a step(s), platform(s), or access ladder(s).

Revise 15.7.1.4 to read as follows:

All access ladders shall have at least ~~7 in. (175 mm) of~~ 8 inches (200 mm) clearance between the leading edge of any rung and the body or other obstruction.

Revise 15.7.2 to read as follows:

All steps, platforms, or access ladders shall be designed and installed to sustain a minimum static load of 500 lb (227 kg) without deformation.

Add a new requirement after 15.7.2 to read:

Ladder rungs on access ladders shall have a skid resistant surface or covering but that surface or covering shall not be required to meet the slip resistance performance requirements of 15.7.4.

Renumber 15.7.3 and 15.7.4 as 15.7.4 and 15.7.5 respectively.

Revise Section 15.8 to read as follows:

15.8 Access Handrails or Hand Holds.

15.8.1 Access handrails or hand holds shall be provided at each entrance to a driving or crew compartment and at each position where steps or ladders for climbing are located.

15.8.2 Exterior access handrails ~~or hand holds~~ shall be constructed of, or covered with, a slip-resistant, noncorrosive material.

15.8.3 Exterior access handrails shall be between 1 in. and 1 $^{5}/_{8}$ in. (25 mm and 42 mm) in diameter and have a minimum clearance between the handrails and any surface of at least 2 in. (52 mm).

15.8.4* All exterior access handrails shall be designed and mounted to reduce the possibility of hand slippage and to avoid snagging of hose, equipment, or clothing.

15.8.5 Handrails and hand holds shall be constructed so that three points of contact (two hands and one foot, or one hand and two feet) can be maintained at all times while ascending and descending.

15.8.6* Access handrails supplied by the chassis manufacturer on a commercial chassis shall be permitted to be used to meet the requirements of this section.

Add an annex to the new 15.8.6 to read as follows:

A.15.8.6 The intent is that the apparatus manufacturer does not need to remove and replace those grab handles designed and built into the chassis by a commercial chassis manufacturer. Grab handles inside the door are acceptable.

Committee Statement: Text in this section is being revised to improve clarity and further define the intent. The most important addition is the requirement to design for three points of contact while climbing. This is an established safe climbing guideline. Rungs on access ladders are being exempt from the slip resistance measurement because the measurement devices will not work on curved surfaces and require a minimum surface area to provide consistent readings. When the committee revised NFPA 1906, it specifically limited the requirement to apply to exterior handrails and wants the same limitation in NFPA 1901. It is not the intent to require handrails inside a driving or crew compartment provided by commercial chassis manufacturers to be replaced. The term “hand hold” is being added without indicating specific design requirements for the hand hold. By keeping this requirement general it can cover a wide variety of possible configurations without constraining the apparatus designer to arbitrary feature dimensions.

1901-88 Log #38 Final Action: Accept in Principle
(15.7.1.1)

Submitter: William McCombs, E-One
Recommendation: Add words to end of current sentence:
which shall not exceed 24 in. (when measured with the vehicle loaded at the estimated in service weight)
Substantiation: The current standard does not clearly define under what condition the step height is measured. When the vehicle is loaded for in service operation, the access step will measure lower due to tire and spring deflection. This is the condition the typical user will encounter during normal operations.
Committee Meeting Action: Accept in Principle
Revise 15.7.1.1 to read as follows:
15.7.1.1 The maximum stepping height shall not exceed 18 in. (460 mm), with the exception of the ground to first step, which shall not exceed 24 in. (610 mm), when the vehicle is loaded to its estimated in-service weight.
Committee Statement: The current wording does not define whether the step height should be measured with the vehicle in a loaded or empty condition. The revised wording eliminates ambiguity and provides a definite condition for measurement that is consistent for all apparatus. The estimated in-service weight is a compromise between unloaded and GVWR.

1901-89 Log #CP4 Final Action: Accept in Principle
(15.7.3.1, and 15.10.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Clarify the text that was the subject of the following Formal Interpretation.
Question: Should a hose storage area that is large enough to require someone to get into the hose storage area to pack fire hose be considered a stepping, standing or walking surface that must comply with 15.7.3?
Answer: No

Substantiation: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued.
Committee Meeting Action: Accept in Principle
Add a new 15.10.5 to read:
15.10.5 The interior of a hose storage area shall not be considered a designated stepping, standing, or walking surface.
Renumber existing 15.10.5 and 15.10.6 as 15.10.6 and 15.10.7 respectively.
Committee Statement: The primary purpose of the hose bed is to carry hose without wear or damage. Designating the hose bed as a stepping, standing, or walking surface would require it to be slip resistant. This aggressive surface would wear the hose as it vibrated during road travel.

1901-90 Log #112 Final Action: Accept in Principle
(15.8.3)

Submitter: Dan W. McKenzie, US Department of Agriculture
Recommendation: Revise text to read as follows:
15.8.3 Exterior access handrails shall be between 1 in. and 1 5/8 in. (25 mm and 42 mm) in diameter and have a minimum clearance between the handrails and any surface of at least 2 in. (~~52~~ 51 mm)
Substantiation: Conversion of 2 in. to metric is 50.8 mm.
Committee Meeting Action: Accept in Principle
Accept the submitters change except change the metric conversion for 2 in. to 50 mm.
Committee Statement: Because this is a clearance measurement and is stated as a minimum clearance, a metric measurement of 51 mm would require a clearance of slightly more than 2 in. The figure of 50 mm is consistent with the requirement in NFPA 1906.

1901-91 Log #36 Final Action: Accept in Principle
(15.9.3)

Submitter: William McCombs, E-One
Recommendation: Revise text to read:
A reflective stripe(s) shall be affixed to the perimeter of the apparatus before it is put in service. (The purchaser shall specify who is to install the stripe. This may consist of the vehicle manufacturer, the vehicle dealer, a third party vendor, or the fire department.)
Substantiation: Many purchasers want to have a local vendor other than the vehicle manufacturer install their lettering, striping, decals and logos. The current wording makes it difficult for the fire department to purchase the vehicle the way they want it.
Committee Meeting Action: Accept in Principle
Add an annex to A15.9.3 to read as follows:
The purchaser should specify whether the striping required under this standard will be provided by the manufacturer on delivery of the apparatus, or will be installed by the purchaser or its designee following delivery. In any event, the required striping must be installed before the unit is placed in emergency service.
Committee Statement: Many purchasers wish to contract their graphics locally. This puts the apparatus manufacturer in the position of denying this request, or risking selling a non-compliant vehicle. The annex wording points out to the purchaser they can determine who will provide the graphics. The important point is that the stripping is in place before the apparatus is placed in emergency service.

1901-92 Log #CP114 Final Action: Accept
(15.9.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 15.9.3 through 15.9.3.3 to read as follows:
15.9.3 Reflective Striping.
15.9.3.1 A retroreflective stripe(s) shall be affixed to ~~the perimeter of the apparatus. At~~ at least 50 percent of the cab and body length on each side, and at least 25 percent of the width of the front of the apparatus.
15.9.3.1.1 The stripe or combination of stripes shall be a minimum of 4 in. (100 mm) in total width ~~and shall conform to the minimum requirements of ASTM D 4956, Standard Specification for Retroreflective Sheeting for Traffic Control, Type I, Class 1 or Class 3.~~
~~15.9.3.2* At least 50 percent of the cab and body length on each side, at least 50 percent of the width of the rear, and at least 25 percent of the width of the front of the apparatus shall have the reflective material affixed to it.~~
15.9.3.1.2 ~~3~~ A graphic design ~~meeting the reflectivity requirements of 15.9.3.1~~ shall be permitted to replace all or part of the required striping material if the design or combination thereof covers at least the same perimeter length(s) required by 15.9.3.1 ~~2~~.
15.9.3.2 At least of 50% of the rear vertical surfaces of the apparatus shall be equipped with a minimum 4 inch alternating yellow and red chevron retroreflective striping sloping downward and away from the centerline of the vehicle at an angle of 45.
15.9.3.3 All retroreflective material required by 15.9.3.1 and 15.9.3.2 shall conform to the ~~minimum~~ requirements of ASTM D 4956, Standard Specification for Retroreflective Sheeting for Traffic Control, Type I or better. ~~Class 1 or Class 3.~~
Substantiation: The committee is adding a requirement for chevron striping on the rear of the apparatus as chevron striping provides striking supplemental visibility to fire apparatus as an added margin of safety for firefighters. A few departments have already adopted this idea with positive results. Yellow, rather than white, is recommended for its fluorescence qualities. Other changes are a reorganization of the existing material to accommodate this change and ensure the chevron striping material meets ASTM D4956.
One of the National Fallen Firefighter Foundation Life Safety Initiatives is: “Safety must be a primary consideration in the design of apparatus and equipment.
Committee Meeting Action: Accept

1901-93 Log #118 Final Action: Accept in Principle
(15.9.3.1)

Submitter: Tom Hillenbrand, Underwriters Laboratories Inc.
Recommendation: Revise text to read as follows:
The stripe...shall conform to the minimum requirements of ~~ASTM D 4956, Standard Specifications for Retroreflective Sheeting for Traffic Control, Type 1, Class 1 or Class 2~~ ASTM E 810, Standard Test Method for Coefficient of Retroreflective Sheeting Utilizing the Coplanar Geometry.
Substantiation: ASTM E 810 is the most widely referenced standard and common geometry test for retroreflective sheeting.
Committee Meeting Action: Accept in Principle
Revise 15.9.3.1 to read as follows:
The stripe or combination of stripes shall be a minimum of 4 in. (100 mm) in total width and shall conform to the minimum requirements of ASTM D 4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, Type 1 ~~Class 1 or Class 3~~.
Committee Statement: The committee is deleting references to Class 1 or Class 3 as they define backing materials and which does not affect the required retroreflectivity. However, the requirement states a minimum of Type 1 so a purchaser could specify a higher level of retroreflectivity.
The committee is not changing the standard reference to ASTM E810 because that is a testing method called for within ASTM D4956 which is the standard for the product.

1901-94 Log #CP44 Final Action: Accept
(15.10.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 15.10.6.
Substantiation: This wording restricts hose beds in running boards and front bumpers.
Committee Meeting Action: Accept

1901-95 Log #23 Final Action: Accept in Principle
(15.10.7 and A.15.10.7)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: 1. Add a new 15.10.7 to read as follows:
15.10.7* Any hose storage area shall be equipped with a positive means to prevent unintentional deployment of the hose from the top, sides, front, and rear of the hose storage area while the apparatus is underway in normal operations.
2. Add a new annex to 15.10.7 to read as follows:
A.15.10.7 Many fire departments have experienced fire hose inadvertently coming off fire apparatus while traveling to and from incidents. Several incidents have resulted in personal injury and damage to property. At least one death is directly attributable to an unintentional deployment of fire hose during a response. It is imperative that the fire apparatus manufacturer provide and the fire department use a means to assure this does not occur.
Fire departments and manufacturers have developed various methods of preventing inadvertent deployment of fire hose including: fully enclosed hose beds covers, buckled straps, hook and loop straps, fabric covers, webbing mesh, wind deflectors, and other material restraints or combination of restraints. It is also important that fire departments develop methods of storing hose connected nozzles and appliances in a manner that does not promote the inadvertent deployment of the hose, nozzle or appliance.
Substantiation: NOTE: This Proposal originates from Tentative Interim Amendment 1901-03-1 issued by the Standards Council on October 2005

Unsecured hose carried in any hose storage area that is open on any side has the potential for falling out while the fire apparatus is in motion. The design of newer fire hose has resulted in the hose jacket being slipperier, making it easier for hose to be deployed at a fire scene but also making it easier for it to be accidentally deployed while the fire apparatus is in motion if the hose storage area does not have a positive means to prevent such deployment. One recent incident of hose falling off an apparatus ended in one child being killed and another injured when hose falling from a responding apparatus caught under the tire of a parked car and whipped in the air as it came loose.
During discussions of the incident at a Fire Department Apparatus Committee meeting, it was learned there have been many incidents of hose being inadvertently deployed during a response or return from an incident. Some of these accidental deployments have resulted in personal injury and property damage, particularly to vehicles in the vicinity. This new language in the standard would require a positive means of ensuring that hose is prevented from accidentally falling out of a hose bed or hose storage area.
Committee Meeting Action: Accept in Principle
Add the text in the standard as proposed but revise the annex material to read as follows:
Many fire departments have experienced fire hose inadvertently coming off of apparatus while traveling to and from incidents. Several incidents have resulted in injuries, damage to property and death. Fire departments and manufacturers have developed various methods of preventing inadvertent deployment including: fully enclosed hose bed covers, buckled straps, hook-and-loop straps, fabric covers, webbing mesh, wind deflectors, and other material restraints or combination of restraints. It is also important that fire departments develop methods of storing hose and appliances in a manner that does not promote the inadvertent deployment of the hose and appliances.
Committee Statement: The committee enhanced the annex discussion when it processed this wording for inclusion in the latest edition of NFPA 1906 and is using that wording in NFPA 1901.

1901-96 Log #CP45 Final Action: Accept
(15.11)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 15.11 to read as follows:

15.11* Receivers and Anchors for Rope and Removable Winches.

15.11.1 Receivers or anchors installed at any location on the apparatus for use as removable winch anchors shall be designed and affixed to provide at least a 2.0 ~~1.5~~ to 1 straight line pull no-yield safety factor over the load rating of the removable winch.

15.11.2 Receivers or anchors installed at any location on the apparatus for use with rope operations shall be designed and affixed to the apparatus to provide at least 9,000 lb no-yield condition with a straight line pull. ~~a 5 to 1 safety factor over the breaking strength of the rope that will be used.~~

15.11.3 A label shall be placed on or near each receiver or anchor that states the maximum straight line pull rating of the anchor. ~~winch load rating and the maximum rope load rating that the receiver or anchor can support.~~

Substantiation: The current wording did not provide yield criteria, and not knowing the rope size that the user would employ left the standard unnecessarily ambiguous. The safety factor for winches was increased to account for the fact that the revised standard rating assumes a straight line pull only. Requiring a side pull rating on a bracket that must extend from the apparatus frame to the edge of the body is impractical. A narrow design requires a structure that is unacceptably heavy and costly. A structurally efficient design triangulated from the outside of the body to the frame rail will take up an unacceptable amount of body storage area. For this reason the committee recommends rating the anchors in straight line pull only. The safety factor employed for rope is much greater due to the fact that the nature of rope wear can lead to weak spots that may not be obvious or quantifiable by the user. The anchor, however, need not employ this large safety factor since wear is less of an issue. The 9000 lb value comes from applying the 9000 lb rope breaking strength common for ½ inch rescue rope which already includes a 15 to 1 safety factor.
Committee Meeting Action: Accept

1901-97 Log #CP111 Final Action: Accept
(15.11 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new section after 15.10 using text extracted from NFPA 1932, Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders, to read:

15.11 Requirements for Mounting of Ground Ladders.

15.11.1 Ground ladders shall be mounted and protected to prevent movement, abrasion, or other damage to the ground ladder while they are on the fire apparatus. [1932:4.1.2]

15.11.2 When mounted on the apparatus, ground ladders shall not be subject to exposure to heat sources (such as engine heat) of 100°C (212°F) or greater. [1932:4.1.3]

15.11.3 Ground ladders shall be supported to prevent any sagging or distortion while they are mounted on the fire apparatus. [1932:4.1.4]

15.11.4 The rollers and other moving parts of the frame holding the ground ladders on the apparatus shall be readily accessible to permit lubrication.

Substantiation: Currently in NFPA 1932 there are requirements for the mounting of ground ladders on fire apparatus. Moving them to NFPA 1901 will emphasize the need to properly mount ground ladders at the point in time when the apparatus is being built.
Committee Meeting Action: Accept

1901-98 Log #CP27 Final Action: Accept
(15.12)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 15.12 to read as follows:

15.12 Slip-On Fire-Fighting Module. If the pump, piping, and tank are built as a slip-on, self-contained unit, it shall meet the requirements of 15.12.1 through 15.12.3 and shall be mounted on the fire apparatus in accordance with 15.12.4. ~~this section.~~

15.12.1 The major components of the slip-on module ~~unit~~, including the pump, pumping engine, water and agent tank(s), ~~electrical, and~~ plumbing system and electrical system shall meet the requirements of the applicable chapters of this standard covering those components.

~~**15.12.2*** The weight of a completed skid-mounted fire-fighting package, including fuel, oil, and standard equipment carried, shall be distributed on the frame so as to provide a balanced unit when the package is lifted or moved.~~

15.12.2 ~~3~~ Intake and discharge piping shall not interfere with the routine maintenance of the pump, engine, or auxiliary systems and shall not unduly restrict the servicing of these components.

15.12.3 The manufacturer of a slip-on fire-fighting module shall provide the following data with the module:

(1) Weight without water but with all other tanks or reservoirs for liquids full.
(2) Weight full of water and other liquids including foam concentrate, fuel, and lubricants
(3) Horizontal center of gravity when full of water and other liquids
(4) Overall dimensions

15.12.4 Mounting.

15.12.4.1 The slip-on module ~~unit~~ shall be mounted in a manner that allows access to the engine, pump, and auxiliary systems for routine maintenance.

15.12.4.2 The slip-on module ~~unit~~ shall be removable using common hand tools.

15.12.4.3 The slip-on module ~~unit~~ shall be mounted in a manner that prevents damage by vibration.

15.12.4.4* Special anchorage shall be provided on the vehicle chassis and on the slip-on ~~skid-mounted~~ fire-fighting module ~~package~~ to secure the ~~skid-mounted~~ fire-fighting module ~~package~~ to the vehicle chassis.

15.12.4.5 The anchorage described in 15.12.4.4 shall be designed to prevent movement of the slip-on module ~~unit~~ during rapid acceleration or deceleration.

15.12.4.6 No drilling on chassis frame flanges or welding to chassis frame shall be permitted.

Renumber A.15.12.2.2 as A.15.12.4.4

A.15.12.2 If the unit is going to be moved ~~on~~ onto and off of a chassis periodically, the purchaser might wish to specify lifting eyes or forklift slots to facilitate the units movement. Provisions to prevent accidental breakaway from the chassis should be provided.

Substantiation: The committee has revised the wording to correspond to changes made in the latest edition of NFPA 1906.
Committee Meeting Action: Accept

1901-99 Log #9 Final Action: Accept in Principle
(Chapter 16 and Chapter 18)

Submitter: Gary Handwerk, Hale Products, Inc.
Recommendation: To Chapter 16 add: 3500 and 4000 gpm pump sizes and add: if pump is for industrial supply usage only and is 3000 gpm or larger the 250 and 165 psi tests are not used.
Eliminate Chapter 18.
Substantiation: The Chapter 18 was added to accommodate one specific application, that application can be done with my changes to Chapter 16.
Committee Meeting Action: Accept in Principle
Delete Chapter 18, the definition of industrial pump in 3.3.87 and references to chapter 18 or industrial supply pumps in 4.19.1.
Revise chapter 16 to include pumps up to 4000 gpm (16,000 L/min).
Exempt pumps of capacity greater than 2500 gpm (10,000 L/min) from having to deliver 50 percent of their rated capacity at 250 psi (1700 kPa) (See 16.2.3.2, 16.4.1, 16.4.2, 16.13.2.3.3 and 16.13.2.3.4 in the draft)
Exempt pumps of capacity greater than 2500 gpm (10,000 L/min) from having to deliver 100 percent of their rated capacity at 165 psi (1100 kPa) (See 16.3.3, 16.13.1.1.1 and 16.13.1.1.2 in the draft)
Committee Statement: The committee feels that the current definition of fire pump can cover these pumps so they can be included in chapter 16. Pumps over 2500 gpm (10,000 L/min) are being exempt from having to pump at 50 percent of rated capacity at 250 psi net pump pressure and at 100 percent of rated capacity at 165 psi net pump pressure as engine horsepower is generally not available to reach these points on the pump curve.

1901-100 Log #CP47 Final Action: Accept
(16.2.3.3.1, 16.10.14, 16.10.14.1, 16.10.14.2, 16.13.1.1.1, 16.13.1.2.1, 16.13.5 and 16.13.6.)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Change the term “priming device” to “priming system” in 16.2.3.3.1, 16.10.14, 16.10.14.1, 16.10.14.2, 16.13.1.1.1, 16.13.1.2.1, 16.13.5 and 16.13.6.
Substantiation: A priming device is one component of a priming system. It is the priming system that needs to be able to meet the requirements in the standard.
Committee Meeting Action: Accept

1901-101 Log #11 Final Action: Accept in Principle
(16.2.4.1)

Submitter: Gary Handwerk, Hale Products, Inc.
Recommendation: Limit the sizes of suction hose and inlet connections used on fire apparatus, 3 in., 4 1/2 in., and 6 in. But keep the hose numbers as they are for the pump certification.
Substantiation: At a fire, long horizontal suction layouts are common, finding enough suction hose of the same size is a big problem. Using 7 lengths of 10 ft suction hose is common.
This is not original material; its reference/source is as follows:
FAMA Technical Pump and Plumbing Subcommittee.
Committee Meeting Action: Accept in Principle
Eliminate the 3 ½ in (90 mm) size connection from the standard.
Revise 5.8.3.2, 6.7.3.1, 7.7.3.2, 8.8.3.3, 9.8.3.2, 11.9.3.2 to read: Any intake connection ~~3½ in. (90 mm) or~~ larger than 3 in. (75 mm) shall include a pressure relief device that meets the requirements of 16.6.6.
Delete the column in table 16.2.4.1(b) for 3 ½ in. suction hose.
Delete the column in table 16.2.4.1(c) for 90 mm suction hose.
Revise 16.6.6 to read: Each valved intake having a connection size ~~of 3½ in. (90 mm) or~~ larger than 3 in. (75 mm) shall be equipped with an adjustable automatic pressure relief device installed on the supply side of the valve to bleed off pressure from a hose connected to the valved intake.
Revise 16.6.7 to read: If the pump is equipped with one or more intakes larger than 3 in. (75 mm) ~~3½ in. (89 mm)~~ that are not valved, an adjustable automatic pressure relief device shall be installed on the pump system to bleed off excess pressure from a hose connected to the pump intake.
Revise 16.6.9 and 17.5.2.3 to read: Caps or closures for ~~3½ in. (90 mm) and smaller~~ intake ~~s~~ connections smaller than 4 in (100 mm) shall be removable from the intakes but remain secured to the apparatus when removed from the connection.
In A.16.6.1 revise the first paragraph to read: Intakes can be larger than the size of the suction hose specified in Table 16.2.4.1(a). The sizing of suction hose in Table 16.2.4.1(a) is for pump manufacturer's certification of the pump's capability only. It is recommended that a fire department standardize on suction hose size regardless of fire pump size on its apparatus as this will allow extra suction hose to be available if a long horizontal reach is needed to get to the water source. Regional standardization of suction hose sizes will improve interoperability within the region in the event of a major disaster.
Make the current second and third sentence of the first paragraph a new paragraph.
Committee Statement: The 3 ½ in. (90 mm) size hose is no longer made or used so the committee is eliminating that size. However, this is a minimum standard and the committee does not want to be design restrictive. Adding the text in A.16.6.1 is encouraging fire departments to do what the submitter is striving for.

1901-102 Log #42 Final Action: Accept in Principle
(Table 16.2.4.1(a))

Submitter: William von Zehle, Jr., Ridgefield Fire Department
Recommendation: Change wording in fourth column from "Maximum Lift" to "Required Lift".
Substantiation: Present column title confusing in that it could be read to mean any lift up to the "maximum" listed in the table. "Required" is much less ambiguous.
Committee Meeting Action: Accept in Principle
Change the title of the forth column to "Lift."
Committee Statement: This establishes a single lift point that the pump manufacturer must certify the pump to.

1901-103 Log #68 Final Action: Accept in Principle
(Table 16.2.4.1(a), Table 18.2.4.1 (a))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise Table 16.2.4.1(a) to read as follows:

INSERT Table 16.2.4.1(a) HERE

Substantiation: Pump manufacturers sell, and apparatus manufacturers install and successfully test, pump configurations such as 1000 gpm pumps with 5" intakes. Sections 16.6.1 and 18.6.1 requires the number and size of intakes to be at least the number specified in these tables, which requires 6" for this configuration. While the purchaser always has the option to purchase larger intakes or suction hose for his truck, but few will and the configurations specified should be the best recommendation. The changes were based on not exceeding 8.5 ft water friction and entrance loss.

Committee Meeting Action: Accept in Principle
Revise 16.2.4.1 to read as follows:
16.2.4.1* The pump manufacturer shall certify that the fire pump is capable of pumping 100 percent of rated capacity at 150 psi (1000 kPa) net pump pressure from draft through 20 ft (6 m) of suction hose with a strainer attached under the following conditions:
(1) An altitude of 2000 ft (600 m) above sea level
(2) Atmospheric pressure of 29.9 in. Hg (101 kPa) (corrected to sea level)
(3) Water temperature of 60°F (15.6°C)
(4) Suction hose size and ~~;~~ number of hose not to exceed those ~~, and lift as~~ indicated in Table 16.2.4.1(a)
(5) Lift as indicated in Table 16.2.4.1(a)
(6 ~~5~~) Friction and entrance loss in suction hose, including strainer, as given in Table 16.2.4.1(b) or Table 16.2.4.1(c)
Revise table 16.2.4.1(a) to read as follows:

*** Insert 1901 Log 68 CA Table 16.2.4.1(a) ***

Revise 16.6.1 to read as follows:
The pump shall have a sufficient number and size of intakes to perform the apparatus pump system certification test.
Committee Statement: Pump manufacturers sell, and apparatus manufacturers install and successfully test, pump configurations such as 1000 gpm pumps with 5" intakes. Sections 16.6.1 requires the number and size of intakes to be at least the number specified in these tables, which requires 6" for this configuration. While the purchaser always has the option to purchase larger intakes or suction hose for his truck, but few will and the configurations specified should be the best recommendation. The changes were based on not exceeding 8.5 ft water friction and entrance loss.
The addition of pump sizes of 3500 gpm and 4000 gpm to Table 16.2.4.1(a) is for incorporation of the requirements in Chapter 18 into Chapter 16 - see committee action on proposal 1901-99 (Log #9).
The suction size for 500 gpm (2000 L/min) pumps is being changed to 4 1/2 in. (110 mm) as 500 gpm pumps are typically used with 4 1/2 in. (110 mm) suction hose and should be certified to that size. The change for suction hose size for 350 gpm pumps is not being made as the committee is trying to eliminate that as a suction hose size.

Insert Table 16.2.4.1(a) for Recommendation - proposal 1901-103 Log #68

Table 16.2.4.1(a) Suction Hose Size, Number of Suction Lines, and Lift for Fire Pumps

Rated Capacity		Maximum Suction Hose Size†		Maximum Number of Suction Lines†*	Maximum Lift	
gpm	L/min	in.	mm		ft	m
250	1,000	3	75	1	10	3
300	1,100	3	75	1	10	3
350	1,300	~~4~~ 3½	100	1	10	3
500	2,000	4	100	1	10	3
750	3,000	4½	110	1	10	3
1,000	4,000	~~6~~ 5	150	1	10	3
1,250	5,000	6	150	1	10	3
1,500	6,000	6	150	2	10	3
1,750	7,000	6	150	2	8	2.4
2,000	8,000	6	150	2	8	2.4
2,000	8,000	8	200	1	6	1.8
2,250	9,000	6	150	~~3~~ 2	6	1.8
2,250	9,000	8	200	1	6	1.8
2,500	10,000	6	150	~~3~~ 2	6	1.8
2,500	10,000	8	200	1	6	1.8
3,000	12,000	6	150	~~4~~ 2	6	1.8
3,000	12,000	8	200	2	6	1.8

*Where more than one suction line is used, all suction lines do not have to be the same hose size.
†These are also minimums for number and size of intakes per 16.6.1

Insert Table 16.2.4.1(a) for Committee action - proposal 1901-103 Log #68

Table 16.2.4.1(a) Suction Hose Size, Number of Suction Lines, and Lift for Fire Pumps

Rated Capacity		Maximum Suction Hose Size		~~Maximum~~ Number of Suction Lines*	~~Maximum~~ Lift	
gpm	L/min	in.	mm		ft	m
250	1,000	3	75	1	10	3
300	1,100	3	75	1	10	3
350	1,300	4	100	1	10	3
500	2,000	4 ½	110	1	10	3
750	3,000	4½	110	1	10	3
1,000	4,000	6	150	1	10	3
1,250	5,000	6	150	1	10	3
1,500	6,000	6	150	2	10	3
1,750	7,000	6	150	2	8	2.4
2,000	8,000	6	150	2	8	2.4
2,000	8,000	8	200	1	6	1.8
2,250	9,000	6	150	3	6	1.8
2,250	9,000	8	200	1	6	1.8
2,500	10,000	6	150	3	6	1.8
2,500	10,000	8	200	1	6	1.8
3,000	12,000	6	150	4	6	1.8
3,000	12,000	8	200	2	6	1.8
3500	14000	6	150	4	6	1.8
3500	14000	8	200	2	6	1.8
4000	16000	6	150	4	6	1.8
4000	16000	8	200	2	6	1.8

*Where more than one suction line is used, all suction lines do not have to be the same hose size.

1901-104 Log #67 Final Action: Accept
(16.3.4, 17.9.4, 18.3.3)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
16.3.4 [17.9.4, 18.3.3]* If a separate pumping engine is provided, it shall meet the requirements of 12.2.1.1, 12.2.1.2, 12.2.1.6, 12.2.2, 12.2.3.1, 12.2.3.2, 12.2.4, 12.2.5, ~~and Sections 13.4~~ 13.2, 13.4.3, 13.4.4, 13.4.4.1, 13.4.4.3, 13.4.4.4, 13.4.5, and 13.5.
Substantiation: Correct referenced sections. Some sections are not relevant to a separate pump engine.
Committee Meeting Action: Accept

1901-105 Log #24 Final Action: Accept
(16.4.3)

Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
16.4.3 A means shall be provided to limit the nominal net engine output during pumping operation to a torque level equal to the nominal continuous duty torque rating of the weakest component, or to a level equal to the sum of the nominal continuous duty torque ratings of multiple components, if there are multiple devices to be driven simultaneously.
Substantiation: Present wording doesn't clearly limit the requirement to pumping situations and could be interpreted to limit the engine output at all times to the limits of the paragraph. It would not make sense to limit the output while in road to a limit established for a weaker component in the power train associated with the pump.
Committee Meeting Action: Accept

1901-106 Log #CP48 Final Action: Accept
(16.5.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Move 16.5.3 to become 17.2.5 and revised to read as follows:
Where an auxiliary pump is provided in combination with a fire pump and ~~where~~ the pumps are interconnected so that pressure from one pump can be transmitted to the other pump, check valves, intake or discharge relief valves, pump drive gear ratios, or other automatic means shall be provided to avoid pressurizing either pump beyond its maximum ~~rated~~ hydrostatic test pressure.
Substantiation: This requirement is only applicable when there is an auxiliary pump so it makes more sense for this requirement to be in the chapter covering auxiliary pumps.
Committee Meeting Action: Accept

1901-107 Log #37 Final Action: Reject
(16.5.4)

Submitter: Claude Wait, Seagrave, LCC
Recommendation: Revise text to read as follows:
The entire discharge and intake piping system, valves, drain cocks and lines, and intake and outlet closures, excluding the tank fill and tank-to-pump lines on the tank side of the valves in those lines, shall be ~~capable of~~ rated to withstand a minimum working pressure as listed below. ~~hydrostatic burst gauge pressure of 500 psi (3400 kpa).~~

Temperature	Pressure
-20° F to 150°F	300 PSI
200°F	265 PSI
250°F	225 PSI
300°F	185 PSI
350°F	150 PSI

Substantiation: Many pipe fitting OEM's and distributors do not recognize hydrostatic pressure as a way to rate pipe fittings making it difficult to specify the type of fitting needed to stock for assembly. Many distributors will jump up to a higher pressure pipe fitting to meet this specification causing an increase in cost to the customer. The pressure listing above is correlated to match. ANSI/ASME B16.3 which is the common specification used among piping OEM's and distributors. Hydrostatic testing can still be achieved by the pump manufacturer and the OEM per 16.5.2.1 and per 16.13.8 but making a statement that a system shall be "capable" of 500 hydrostatic pressure is too generalized and should be further defined so as to avoid confusion.
Committee Meeting Action: Reject
Committee Statement: The recommended pressure ratings listed do not guarantee system integrity at pressures over 300 psi which can be obtained on most apparatus.

1901-108 Log #25 Final Action: Accept in Principle
(16.5.6)

Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
16.5.6 The pump shall allow a positive pressure source to directly add to the pump's net pump pressure~~.~~, thereby increasing the pump discharge pressure.
Substantiation: Present wording is confusing because readers may conclude that the net pump pressure increases. It remains the same and the discharge pressure increases. Confusion could also be avoided with alternative wording "The pump shall allow a positive pressure source to directly add to the pump's discharge pressure."
Committee Meeting Action: Accept in Principle
Revise 16.5.6 to read as follows:
The pump shall allow a positive pressure water source to directly add to the pump's discharge pressure.
Committee Statement: The committee is accepting the submitter's alternate wording.

1901-109 Log #7 Final Action: Reject
(16.6.4, 16.3.5.2, 3.3.15.2)

Submitter: Gary Handwerk, Hale Products, Inc.
Recommendation: Add slow close performance; 3.3.152 to end of sentence:
With a force of 70# at the control handle.
Substantiation: 70# is the maximum force allowed on a control per mil STD's, some slow close systems on the market can be closed too easily at a speed faster than 3 seconds.
Committee Meeting Action: Reject
Committee Statement: The current standard is working and adding a force will not resolve a perceived problem.

1901-110 Log #12 Final Action: Accept in Principle
(16.7.1)

Submitter: Gary Handwerk, Hale Products, Inc.
Recommendation: Eliminate the following discharge outlet connection sizes; 4 1/2 in. and 3 1/2 in.
Substantiation: These sizes are not common, they limit the interconnecting of apparatus on the fire ground.
Committee Meeting Action: Accept in Principle
Accept the submitter's changes and also revise 16.7.4.2 and 17.6.4.2 to read: Caps or closures for outlet connections smaller than 4 in (100 mm) ~~3½ in. (90 mm) and smaller in size~~ shall ~~be removable from the outlet but~~ remain secured to the apparatus when removed from the connection.
Revise 16.12.3.2 to read: Any discharge outlet ~~3½ in. (90 mm) or~~ larger than 3 in. (75 mm) that is equipped with a flowmeter shall also be provided with a pressure gauge ~~-indicating device~~.
Committee Statement: The committee is accepting the submitters recommendation but with the change to 16.7.1, references to 3 ½ in. connections need to be changed in 16.7.4.2, 16.12.3.2 and 17.6.4.2.

1901-111 Log #40 Final Action: Reject
(16.7.2.3)

Submitter: Jeff Wegner, Smeal Fire Apparatus Co.
Recommendation: When the pump discharge terminates out the pump with National Hose Threads, the sweep elbow supplied to meet paragraph 16.7.7 may have be equipped with special threads or special coupling such as a Storz adapter.
Substantiation: The way the standard is currently written it is not clear. It leaves one to assume that a sweep elbow must terminate NST and then additional adapters must be supplied. In some cases when the elbow terminates NST and then a 2-1/2 in. x 2-1/2 in. special thread adapters and then 2-1/2 in. x 2-1/2 in. special thread reducer with cap is being supplied, then the adapter will stick out past the side of the truck.
If a sweep elbow must be supplied with NST, then using this logic a 30 degree NST x Storz elbows can no longer be supplied.
By allowing the sweep elbow to terminate special threads it allows three things:
1) The discharge still terminates NST to meet the intent of the standard.
2) The cost is reduced, as more special adapters do not have to be supplied.
3) The discharge fittings do not extend past the overall width of the apparatus.
Committee Meeting Action: Reject
Committee Statement: The first permanent hose connection must be National Hose (NH) thread but screw on sweep elbow can terminate in another thread or fire hose connection. The current wording in the standard allows what the submitter is requesting.

1901-112 Log #18 Final Action: Accept in Principle
(16.9)

Submitter: A. K. Rosenhan, Mississippi State University
Recommendation: Add new text:
Operation of pump and discharge controls should not compromise the clearances of the operator's space on a top-mount pump panel nor provide sharp edges, projections, or barriers to movement.
Substantiation: As may be noted from the photograph, improper placement and actuation patterns of discharge handles can compromise the clearance/operator space between the pump panel and the back of the crew cab on a top mount control panel. The projection of the discharge handles is a rather self-evident hazard.

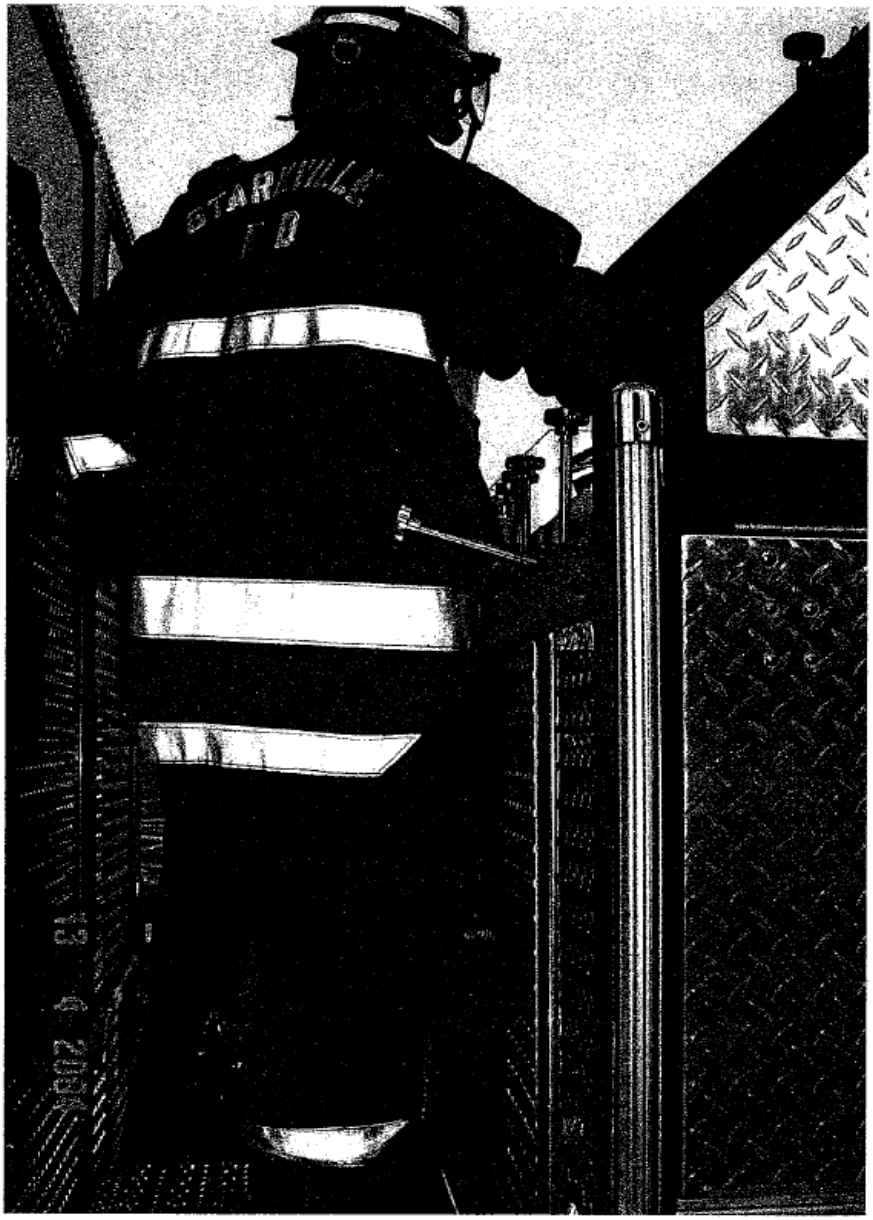
INSERT Photograph HERE

Committee Meeting Action: Accept in Principle
Add an additional paragraph to A.16.9.1 following the first paragraph to read as follows:
Operation of pump and discharge controls should not compromise the clearances of the operator's space on a top-mount pump panel nor provide sharp edges, projections, or barriers to movement. The purchaser might want to state the clear walkway minimum space that is required.
Committee Statement: The standard does not stipulate a minimum walkway size so stipulating a specific loss of space will not work.

1901-113 Log #124 Final Action: Reject
(16.9.2)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
All gauges, discharge outlets, pump intakes, and controls shall be illuminated to a minimum lighting level of 5 fc (~~50~~54 lx).
Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. This should be consistent throughout the Standard
Committee Meeting Action: Reject
Committee Statement: These, and many other, conversion values were corrected with the 2003 edition of 1901 to be in accordance with the NFPA Manual of Style (MOS). Chapter 4 and Annex B.8.3 of the MOS provide extensive information on this subject. The MOS required that "The precision used to express a measurement shall not exaggerate the accuracy intended for the measurement." (4.2.1.2) and "The converted value shall be rounded such that the last place digit of the converted value is equal to or less than the converted value of the intended precision. (See conversion steps outlined in B.8.3.)" Unless the inch-pound measurement of 5 fc should be 5.0 fc, the correct statement of the conversion is 50 fc not 54 fc.

Insert photo for proposal 1901-112 Log #18



1901-114 Log #16 Final Action: Reject
(16.10)

Submitter: A. K. Rosenhan, Mississippi State University
Recommendation: For pumpers equipped and configured for “pump and roll” operations, provision shall be made to disable any throttle or discharge pressure controls on the pump panel when in the pump and roll mode.
Substantiation: In all operations it is imperative the driver have complete control of the vehicle. In the case of pump and roll configurations it is possible for pump panel controls to override the foot throttle. A simple wiring change can disable the throttle and pressure controls on a pump panel and leave the driver alone capable of controlling engine rpm and thusly the vehicle speed. Further, on some pump panel controls there is a “preset” control which, if actuated on purpose or by accident, can accelerate the engine to a high rpm which in turn can cause the driver to lose control of the vehicle.
Note: Supporting material is available for review at NFPA Headquarters.
Committee Meeting Action: Reject
Committee Statement: The committee believes that 16.10.6.2.3 and 16.10.10 already accomplish this.

1901-115 Log #26 Final Action: Accept
(16.10.6.2)

Submitter: Tom Mettler, Waterous Company
Recommendation: Delete text.
~~16.10.6.2 Indicators.~~ And renumber subsequent 16.10.6 paragraphs.
Substantiation: Editorial. This is the only section addressing the various pump drives and indicators that has such a heading. Reference 16.10.1 through 16.10.5.
Committee Meeting Action: Accept

1901-116 Log #CP56 Final Action: Accept
(16.10.10 and 16.10.11)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 16.10.2.3, 16.10.3.3, 16.10.4.3, 16.10.5.3, 16.10.6.5, 16.10.7.5, 16.10.8.3, and 16.10.9.3.
Revise existing subsection 16.10.10 with text that reads:
16.10.10 Pump Operator's Panel Engine Speed Advancement -- Automatic Chassis Transmission
16.10.10.1 An engine speed control shall be provided at the pump operator's panel.
16.10.10.2 A "Throttle Ready" indicator that lights when the pump is in the "OK to Pump" mode shall be provided on the pump operator's panel.
16.10.10.3* The "Throttle Ready" indicator at the pump operator's panel shall be permitted to light when the chassis transmission is in neutral, and the parking brake is engaged.
16.10.10.4 An interlock system shall be provided to prevent advancement of the engine speed at the pump operator's panel unless the apparatus has "Throttle Ready" indication
16.10.10.5 Loss of power to the interlock system in 16.10.10.4 shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Add an annex to 16.10.10.3 to read:
A.16.10.10.3 Engine speed advancement control at the operator's panel may be required for apparatus with need to control the engine speed for operation of a generator, aerial device, alternator, or other chassis engine driven device. The indicating device for this "Throttle Ready" condition is the same indicating device as in 16.10.10.2.
Other apparatus may not have equipment for which there is a need to control engine speed from the pump operator's panel. Engine speed control at the pump operator's panel for these apparatus may not be desirable since, on many chassis engines, activating remote throttle operation will automatically disable the in-cab accelerator pedal. For such apparatus, engine speed advancement control at the pump operator's panel is not required when the chassis transmission is in neutral and the parking brake is engaged, and "Throttle Ready" indication for this condition is not required.
Revise existing subsection 16.10.11 with text that reads:
16.10.11 Pump Operator's Panel Engine Speed Advancement -- Manual Chassis Transmission
16.10.11.1 An engine speed control shall be provided at the pump operator's panel.
16.10.11.2 A "Throttle Ready" indicator that lights when the pump is in the "OK to Pump" mode shall be provided on the pump operator's panel.
16.10.11.3* The "Throttle Ready" indicator at the pump operator's panel shall be permitted to light when the parking brake is engaged.
16.10.11.4 Loss of power to the interlock system in 16.10.11.3 shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Add an annex to 16.10.11.3 to read:
A16.10.11.3 Engine speed advancement control at the operator's panel may be required for apparatus with need to control the engine speed for operation of a generator, aerial device, alternator, or other chassis engine driven device. The indicating device for this "Throttle Ready" condition is the same indicating device as in 16.10.11.2.
Other apparatus may not have equipment for which there is a need to control engine speed from the pump operator's panel. Engine speed control at the pump operator's panel for these apparatus may not be desirable since, on many chassis engines, activating remote throttle operation will automatically disable the in-cab accelerator pedal. For such apparatus, engine speed advancement control at the pump operator's panel is not required when the chassis transmission is in neutral and the parking brake is engaged, and "Throttle Ready" indication for this condition is not required.
Add to Annex B, Figure B.2, Chapter 16 (p. 10 of 21) after the question about special gauges, instruments, … :
Should the engine speed control at the pump operator's panel be enabled when the apparatus is parked but not in pump mode? □ Yes □ No

Substantiation: The proposed rewording in 16.10.10 allows the "high idle" function of an engine speed control at the pump panel (throttle control when parked not in pump mode) to be optional. The wording changes make this change everywhere that the "Throttle Ready" indicator, pump panel engine speed advancement control, and its interlock are referenced. With these changes, the wording in 16.10.2.3, 16.10.3.3, 16.10.4.3, 16.10.5.3, 16.10.6.5, 16.10.7.5,16.10.8.3, and 16.10.9.3 is not needed.
Committee Meeting Action: Accept

1901-117 Log #27 Final Action: Accept in Principle
(16.10.10.1)

Submitter: Tom Mettler, Waterous Company
Recommendation: 16.10.10.1 (add new section) Loss of power to the interlock system shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Substantiation: Safety. System should fail safe. Interlocks rely on electrical circuits and failure mode is currently not addressed. Return to idle will maintain delivery of water to discharges although at reduced flow and pressure. The proposed requirement would prevent unintended increase in engine speed that could subject discharges to significant increase in pressure and affect firefighter safety.
Committee Meeting Action: Accept in Principle
See Committee Action on proposal 1901-116 (Log #CP56).
Committee Statement: The committee is accepting the submitter's wording but adding a specific cross reference back to the paragraph that requires the interlock. Subsection 16.10.10 is being reworked and this requirement has been incorporated as 16.10.10.5

1901-118 Log #28 Final Action: Accept in Principle
(16.10.11.1)

Submitter: Tom Mettler, Waterous Company
Recommendation: 16.10.11.1 (add new section) Loss of power to the interlock system shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Substantiation: Safety. System should fail safe. Interlocks rely on electrical circuits and failure mode is currently not addressed. Return to idle will maintain delivery of water to discharges although at reduced flow and pressure. The proposed requirement would prevent unintended increase in engine speed that could subject discharges to significant increase in pressure and affect firefighter safety.
Committee Meeting Action: Accept in Principle
See Committee Action on proposal 1901-116 (Log #CP56).
Committee Statement: The committee is accepting the submitter's wording but adding a specific cross reference back to the paragraph that requires the interlock. Subsection 16.10.11 is being reworked and this requirement has been incorporated as 16.10.11.4.

1901-119 Log #47 Final Action: Accept
(16.10.12 (New))

Submitter: Tom Mettler, Waterous Company
Recommendation: Add new text to read as follows and renumber subsequent paragraphs:
16.10.12 If a pump shift manual override device is provided, the "Pump Engaged", "OK to Pump" and "Throttle Ready" indicators and the pump operator's panel engine speed advancement interlock system shall be operationally functional when the manual override device is used to shift the pump.
Substantiation: Apparatus configurations are known to exist where the pump status indicators and engine speed advancement interlock system are not functional when the normal pump shift device is not operable or is not used and the manual override pump shift is used. This prevents the apparatus from providing pumping performance that users would reasonably expect.
Committee Meeting Action: Accept

1901-120 Log #29 Final Action: Accept
(16.10.13.1)

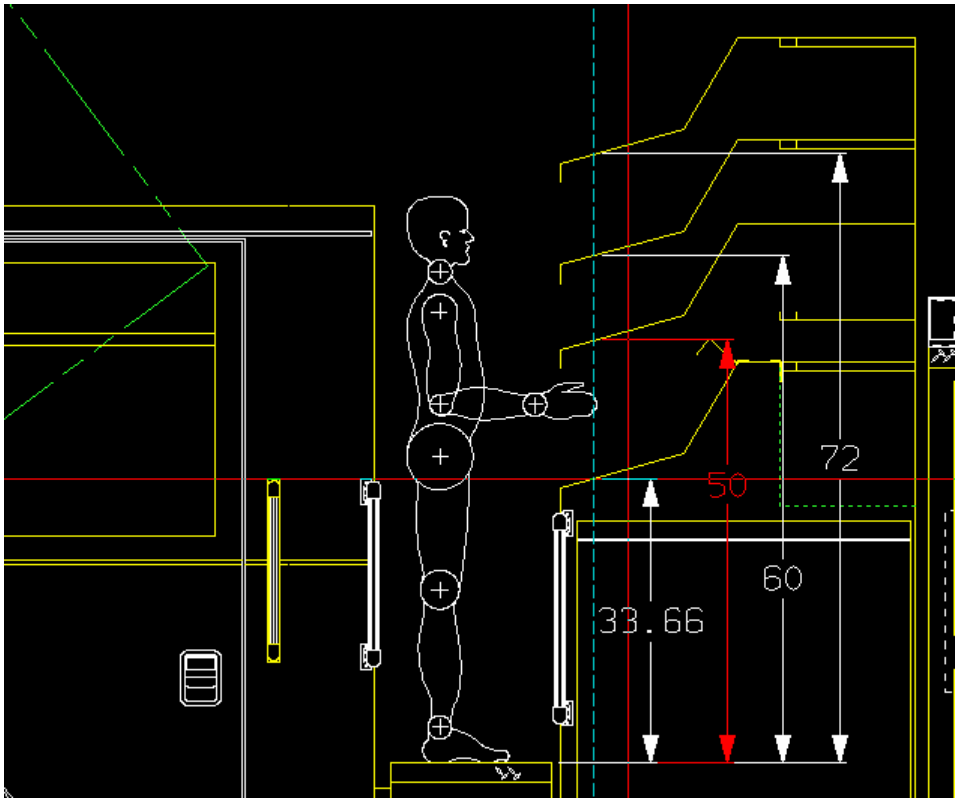
Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
16.10.13.1 A system shall be provided that, when set in accordance with the manufacturer's instructions, will automatically control the ~~discharge~~ increase in net pump pressure to a maximum of 30 psi (200 kPa) pressure rise ~~above the set pressure(s)~~ when all discharge valves are closed not more rapidly than in 3 seconds and not more slowly than in 10 seconds during the following condition:
Substantiation: Present wording doesn't recognize real world situation when pump is supplied from a remote water source. While flowing water to the pump, the intake gauge pressure at the pump reflects the gauge pressure of the source, such as a hydrant connected to a municipal water system, minus friction loss in the hose(s) from the water source to the pump. Upon closure of all discharge valves of the pump, the flow and friction loss through the hose supplying the pump will drop to zero, the intake gauge pressure at the pump will increase to the static pressure of the hydrant/municipal water system. This change in intake pressure will add directly to the pump discharge pressure and can by itself exceed the 30 psi rise the current wording requires. For relief valve systems that do not control engine speed, the current wording under these situations cannot be met and such relief valve systems have been used successfully in fire apparatus for decades.
Committee Meeting Action: Accept

1901-121 Log #CP49 Final Action: Accept
(16.11.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 16.11.2 to read as follows:
16.11.2 The throttle control on vertically (greater than 45º) arranged pump panels shall be located not higher than 72 in. (1800 mm) nor lower than 42 in. (1070 mm) from the operator's standing position with all instruments in full view.
Add a 16.11.3 to read as follows:
16.11.3 The throttle control on horizontally (less than 45º) arranged pump panels shall be located not higher than 50 in. (1270 mm) nor lower than 32 in. (813 mm) from the operator's standing position with all instruments in full view.
Substantiation: Top mount throttle controls can be mounted lower than 42 in (1070 mm) as measured from the walkway surface to the throttle control. However, since they are mounted on a horizontal surface that faces the operator, a lower mounting is actually easier to operate. Imagine reading a book on a table (typically less than 36 in) while standing versus reading a book against a wall at the same height. Likewise a horizontal surface would be difficult, if not impossible to utilize at 72 in (1800 mm). The drawing below shows the operator (at an average height of 5 ft 7 in.) on the top mount operator's platform. The lowest part of the throttle control panel is 11 in from the edge of the intersection of the lower and upper top mount panels. The lowest part of the throttle control is 33.66" from the top mount platform.

*** Insert 1901 Log CP49 Sub Figure 1901***
Committee Meeting Action: Accept

Insert figure for proposal 1901-121 Log #CP49



1901-122 Log #50 Final Action: Accept in Principle
(16.12.2.1.5.1)

Submitter: John E. Bunting, New Boston, NH Fire Department
Recommendation: Rewrite 16.12.2.1.5.1 as follows:
16.12.2.1.5.1 Accuracy of Gauges.
16.12.2.1.5.1(a) Analog gauges displaying the vacuum portion in <=45 degrees of arc shall have accuracy complying with Grade 1A as defined by ASME B40.100 Pressure Gauges and Gauge Attachments.
16.12.2.1.5.1(b) Analog gauges displaying 0-30 vacuum scale in >45 degrees of arc shall have an accuracy of 3 percent on vacuum and 5 percent on pressure. These accuracies shall be over their entire respective scale.
Substantiation: Conventional master pump intake gauges are of marginal utility for those fire departments that do not have pressurized hydrants and must rely on drafting. Because of their small arc of scale in the 0-30 in./Hg portion, it is difficult to determine if there is any meaningful vacuum developing while the primer is operating.
The illustrated gauge is an example of a master pump intake gauge that is of a diaphragm mechanism rather than the more common Bourdon tube style. The diaphragm mechanism allows the vacuum scale to be much larger than is customarily available. Apparently this type of gauge mechanism is quite common in Europe.
Additionally, because of the 0-300 psi scale, the gauge is also protected from damage due to pressure and the scale permits more than satisfactory display of intake pressures.
The proposed change in the text specifies the accuracy requirements for the diaphragm-style of gauge.

INSERT Figure HERE

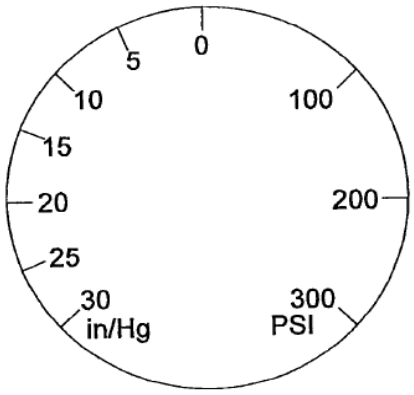
Committee Meeting Action: Accept in Principle
Revise 16.12.2.1.5.1 to read:
Analog gauges displaying the vacuum portion in 45 degrees of arc or less shall have an accuracy complying with Grade 1A as defined by ASME B40.100 Pressure Gauges and Gauge Attachments.
Add a new 16.12.2.1.5.2 to read:
Analog gauges displaying the vacuum portion in greater than 45 degrees of arc shall have an accuracy of 3 percent on vacuum and 5 percent on pressure over their entire respective scale.
Renumber current 16.12.2.1.5.2 through 16.12.2.1.5.4 as 16.12.2.1.5.3 through 16.12.2.1.5.5
Committee Statement: The committee is accepting the submitters recommendation but editorially revising the wording and numbering.

1901-123 Log #CP50 Final Action: Accept
(16.13.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Change the title of 16.13.1 to "Apparatus Pump System Certification."
Substantiation: This is a more descriptive title as it is the pump system as installed that is being certified.
Committee Meeting Action: Accept

Insert figure for proposal 1901-122 Log #50

Dial face of typical gauge as described in 16.12.2.1.5.1.b



For illustration purposes only. Not all graduations shown.

John Bunting
New Boston, NH, Fire Dept.
603-487-3400
mail@jbunting.info

1901-124 Log #45 Final Action: Accept
(16.13.1.1.3)

Submitter: Tom Mettler, Waterous Company
Recommendation: 16.13.1.1.3 (Insert new wording and renumber existing to 16.13.1.1.4) If the fire pump is driven by the chassis engine, the engine speed advancement interlock test *(see 16.13.8)* shall be included.
Substantiation: This proposal is tied to a separate proposal to create a new section 16.13.8. These two proposals require third party verification of the engine speed advancement interlock system for pumps with rated capacity of 750 GPM or larger.
Committee Meeting Action: Accept

1901-125 Log #46 Final Action: Accept
(16.13.1.2.3)

Submitter: Tom Mettler, Waterous Company
Recommendation: 16.13.1.2.3 (Insert new wording and renumber existing to 16.13.1.2.4) If the fire pump is driven by the chassis engine, the engine speed advancement interlock test *(see 16.13.8)* shall be included.
Substantiation: This proposal is tied to a separate proposal to create a new section 16.13.8. These two proposals require the apparatus manufacturer to certify proper functioning of the engine speed advancement interlock system for pumps with rated capacity of less than 750 GPM.
Committee Meeting Action: Accept

1901-126 Log #41 Final Action: Accept in Principle
(16.13.2.1.1)

Submitter: Dan W. McKenzie, USDA Forest Service
Recommendation: Revise text to read as follows:
16.13.2.1.1 The test site shall be adjacent to a supply of clear water at least 4 ft (1.2 m) deep, with the water level surface not less than 3 ft or more than 10 ft (3 m) below the center of the pump intake, and close enough to allow the suction strainer to be submerged at least 2 ft (0.6 m) below the surface of the water when connected to the pump by 20 ft (6 m) of suction hose.
Substantiation: The standard does not now state the minimum pump lift.
Committee Meeting Action: Accept in Principle
Revise 16.13.2.1.1 to read as follows:
The test site shall be adjacent to a supply of clear water at least 4 ft (1.2 m) deep, ~~with the water level not more than 10 ft (3 m) below the center of the pump intake,~~ and close enough to allow the suction strainer to be submerged at least 2 ft (0.6 m) below the surface of the water when connected to the pump by 20 ft (6 m) of suction hose.
Revise 16.13.2.1.2 to read as follows:
Tests shall be performed when conditions are as follows:
(1) Air temperature: 0°F to 110°F (-18°C to 43°C)
(2) Water temperature: 35°F to 90°F (2°C to 32°C)
(3) Barometric pressure: 29 in. Hg (98.2 kPa), minimum (corrected to sea level)
(4) Minimum lift: 3 ft (1 m) from center of pump intake to the surface of the water.
Committee Statement: The water level will vary but the committee feels it is important that the lift be at least 3 ft (1 m) during the pump certification testing. The certification is based on net pump pressure so it is not necessary to state a maximum lift. If the lift is too high, the pump will not meet the certification requirements. The purchaser can specify that the pump certification testing be performed with a certain lift if they have specific pumping conditions they need to meet.

1901-127 Log #CP51 Final Action: Accept
(16.13.2.2.1.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 16.13.2.2.1.1 to read as follows:
The suction hose size and maximum number of lines when performing the apparatus pump system certification testing shall be as defined in Table 16.13.2.2.1.1.
Add a table to 16.13.2.2.1.1 with the suction hose size and maximum number of lines when performing the pump certification testing.

*** Insert 1901 Log CP51 Rec Table 16.13.2.2.1.1 ****

Substantiation: Referring the user back to Table 16.2.4.1(a) has created confusion as that table is for the pump manufacturer when certifying the pump suction capability, not when the apparatus manufacturer is certifying the finished pump installation.
Committee Meeting Action: Accept

1901-128 Log #CP52 Final Action: Accept
(16.13.2.3.3 and 16.13.2.3.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 16.13.2.3.3 and 16.13.2.3.4, add the words “a minimum of” in front of each pressure value so they read as follows:
16.13.2.3.3 If the apparatus is equipped with a fire pump rated at 750 gpm (3000 L/min) or greater, the pump shall be subjected to a 3 hour pumping test from draft consisting of 2 hours of continuous pumping at rated capacity at a minimum of 150 psi (1000 kPa) net pump pressure, followed by ½ hour of continuous pumping at 70 percent of rated capacity at a minimum of 200 psi (1400 kPa) net pump pressure and ½ hour of continuous pumping at 50 percent of rated capacity at a minimum of 250 psi (1700 kPa) net pump pressure.
16.13.2.3.4 If the apparatus is equipped with a fire pump rated at less than 750 gpm (3000 L/min), the pump shall be subjected to a 50 minute pumping test from draft consisting of ½ hour of continuous pumping at rated capacity at a minimum of 150 psi (1000 kPa) net pump pressure, followed by 10 minutes of continuous pumping at 70 percent of rated capacity at a minimum of 200 psi (1400 kPa) net pump pressure, and 10 minutes of continuous pumping at 50 percent of rated capacity at a minimum of 250 psi (1700 kPa) net pump pressure.
Substantiation: The committee is establishing that the pump must be tested at that net pump pressure or greater but not less.

Committee Meeting Action: Accept

Insert Table 16.13.2.2.1.1 for proposal 1901-127 Log #CP51

Table 16.13.2.2.1.1 Suction Hose Size and Number of Suction Lines for Fire Pumps System Certification

Rated Capacity		Maximum Suction Hose Size		Maximum Number of Suction Lines*
gpm	L/min	in.	mm	
250	1,000	3	75	1
300	1,100	3	75	1
350	1,300	4	100	1
500	2,000	4½	100	1
750	3,000	4½	110	1
1,000	4,000	6	150	1
1,250	5,000	6	150	1
1,500	6,000	6	150	2
1,750	7,000	6	150	2
2,000	8,000	6	150	2
2,000	8,000	8	200	1
2,250	9,000	6	150	3
2,250	9,000	8	200	1
2,500	10,000	6	150	3
2,500	10,000	8	200	1
3,000	12,000	6	150	4
3,000	12,000	8	200	2
3500	14000	6	150	4
3500	14000	8	200	2
4000	16000	6	150	4
4000	16000	8	200	2

*Where more than one suction line is used, all suction lines do not have to be the same hose size.

1901-129 Log #CP53 Final Action: Accept
(16.13.2.3.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add new text as to read as follows:
16.13.2.3.4 If the apparatus is equipped with a fire pump rated at greater than 2500 gpm (10,000 L/min), the pump shall be subjected to a 3 hour pumping test from draft consisting of 2 hours of continuous pumping at rated capacity at a minimum of 150 psi (1000 kPa) net pump pressure, followed by 1 hour of continuous pumping at a minimum of 70 percent of rated capacity at 200 psi (1400 kPa) net pump pressure.
16.13.2.3.4.1 The pump shall not be stopped until after the 2 hour test at rated capacity, unless it becomes necessary to clean the suction strainer.
16.13.2.3.4.2 The pump shall be permitted to be stopped between tests in order to change the hose or nozzles, clean the strainer, or add fuel for the pump drive engine.
16.13.2.3.4.3 The capacity, discharge pressure, intake pressure, and engine speed shall be recorded at least every 15 minutes but not fewer than three times for each test sequence.
16.13.2.3.4.4 The average net pump pressure shall be calculated and recorded based on the average values for discharge and intake pressure.
Renumber existing 16.13.2.3.4 as 16.13.2.3.5
Substantiation: With the changes to integrate larger pumps into chapter 16, it is necessary to have a different pump certification test as the pump is not tested at 250 psi net pump pressure.
Committee Meeting Action: Accept

1901-130 Log #CP54 Final Action: Accept
(16.13.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Renumber the text associated with 16.13.4 as 16.13.4.1 and revise the first sentence to read:
If the pump is rated at 2500 gpm (10,000 L/min) or less, the pressure control system on the pump shall be tested as follows:
Add new text as 16.13.4.2 to read as follows:
16.13.4.2 If the pump is rated at greater than 2500 gpm (10,000 L/min), the pressure control system on the pump shall be tested as follows:
(1) The pump shall be operated at draft, delivering rated capacity at a discharge gauge pressure of 150 psi (1000 kPa).
(2) The pressure control system shall be set in accordance with the manufacturer's instructions to maintain the discharge gauge pressure at 150 psi (1000 kPa) ±5 percent.
(3) All discharge valves shall be closed not more rapidly than in 3 seconds and not more slowly than in 10 seconds.
(4) The rise in discharge pressure shall not exceed 30 psi (200 kPa) and shall be recorded.
(5) The original conditions of pumping rated capacity at a discharge gauge pressure of 150 psi (1000 kPa) shall be reestablished.
(6) The discharge pressure gauge shall be reduced to 90 psi (620 kPa) by throttling the engine fuel supply, with no change to the discharge valve settings, hose, or nozzles.
(7) The pressure control system shall be set according to the manufacturer's instructions to maintain the discharge gauge pressure at 90 psi (620 kPa) ±5 percent.
(8) All discharge valves shall be closed not more rapidly than in 3 seconds and not more slowly than in 10 seconds.
(9) The rise in discharge pressure shall not exceed 30 psi (200 kPa) and shall be recorded.
(10) The pump shall be operated at draft, pumping 70 percent of rated capacity at a discharge gauge pressure of 200 psi (1400 kPa).
(11) The pressure control system shall be set in accordance with the manufacturer's instructions to maintain the discharge gauge pressure at 200 psi (1400 kPa) ±5 percent.
(12) All discharge valves shall be closed not more rapidly than in 3 seconds and not more slowly than in 10 seconds.
(13) The rise in discharge pressure shall not exceed 30 psi (200 kPa) and shall be recorded.
Substantiation: With the changes to integrate larger pumps into Chapter 16, it is necessary to have a different pressure control test for the larger pumps. The third part of the test will be as outlined in (10) trough (13).
Committee Meeting Action: Accept

1901-131 Log #CP55 Final Action: Accept
(16.13.6.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Move current 16.13.6.2 to after 16.13.6.4.
Substantiation: This makes a more logical flow of the test process.
Committee Meeting Action: Accept

1901-132 Log #44 Final Action: Accept in Principle
(16.13.8)

Submitter: Tom Mettler, Waterous Company
Recommendation: 16.13.8* (New section - renumber subsequent) Engine Speed Advancement Interlock Test. The engine speed advancement interlock system shall be tested to verify that engine speed cannot be increased at the pump operator's panel unless the chassis transmission is in neutral and the parking brake is engaged or the apparatus is in the "OK to Pump" mode.

Add new annex item A.16.13.8: The test of the engine speed advancement interlock system should verify proper functioning for the conditions of chassis transmission, parking brake and pump shift status indicated in Tables A.16.3.8(a), (b) and (c). Testing should be performed with a qualified person positioned in the driving compartment and a qualified person verifying engine speed control status at the pump operator's panel. Shifting of the pump transmission/PTO should be done in accordance with the manufacturer's instructions.

Insert Table A.16.3.8(a) Here

Insert Table A.16.3.8(b) Here

Insert Table A.16.3.8(c) Here

Substantiation: Safety. This is a simple test that will ensure that the engine speed cannot be advanced at the operator's panel unless the apparatus control system is functioning in accordance with the requirement of paragraph 16.10.10 and 16.10.11. This will address known instances where the engine speed interlock system did not function properly and resulted in unexpected movement of a fire apparatus with resultant injuries.

Committee Meeting Action: Accept in Principle

Add new text as 16.13.8 to read as follows:

16.13.8 Engine Speed Advancement Interlock Test. The engine speed advancement interlock system shall be tested to verify that engine speed cannot be increased at the pump operator's panel unless the chassis transmission is in neutral and the parking brake is engaged or the apparatus is in the "OK to Pump" mode.

16.13.8.1 If the apparatus is equipped with a stationary pump driven through split-shaft PTO, the test shall verify that the engine speed control at pump operator's panel cannot be advanced when either of the following conditions exist.

(1) The chassis transmission is in neutral, the parking brake is off, and the pump shift in the driving compartment is in the road position.

(2) The chassis transmission has been placed in the position for pumping as indicated on label provided in the driving compartment, the parking brake is on, and the pump shift in the driving compartment is in the road position.

16.13.8.2 If the apparatus is equipped with a stationary pump driven through a transmission mounted PTO, front-of-engine crankshaft PTO, or engine flywheel PTO, the test shall verify that the engine speed control at pump operator's panel cannot be advanced when either of the following conditions exist.

(1) The chassis transmission is in neutral, the parking brake is off, and the pump shift status in the driving compartment is disengaged.

(2) The chassis transmission is in any gear other than neutral, the parking brake is on, and the pump shift in the driving compartment is in the "Pump Engaged" position.

16.13.8.3 If the apparatus is equipped with a pump driven by the chassis engine designed for both stationary pumping and "Pump-and-Roll," the test shall verify that the engine speed control at pump operator's panel cannot be advanced when either of the following conditions exist.

(1) The chassis transmission is in neutral, the parking brake is on, and the pump shift status in the driving compartment is disengaged.

Insert Tables 16.13.8 for Recommendation - proposal 1901-132 Log #44

Table A16.3.8(a) Stationary Pump Driven through Split-Shaft PTO

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Test Point
N	On	Road	Yes	
N	Off	Road	No	✓
N	On	"Pump Engaged"	Yes	
N	Off	"Pump Engaged"	No	
Pump Gear[1]	On	"Pump Engaged" "OK to Pump"	Yes	
Pump Gear[1]	Off	"Pump Engaged"	No	
Pump Gear [1]	On	Road	No	✓
Pump Gear[1]	Off	Road	No	
Any gear other than N and Pump Gear[1]	On or Off	Road	No	
Any gear other than N and Pump Gear[1]	On or Off	"Pump Engaged"	No	

[1]Chassis transmission shift selector placed in position for pumping as indicated on label provided in the driving compartment.

Table A16.3.8(b) Stationary Pump Driven through Transmission Mounted PTO, Front-of-Engine Crankshaft PTO, or Engine Flywheel PTO

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Test Point
N	On	Disengaged	Yes	
N	Off	Disengaged	No	✓
N	On	"Pump Engaged" "OK to Pump"	Yes	
N	Off	"Pump Engaged"	No	
Any gear other than N	On	"Pump Engaged"	No	✓
Any gear other than N	Off	"Pump Engaged"	No	
Any gear other than N	On or Off	Disengaged	No	

Table A16.3.8(c) Stationary and "Pump-and-Roll" Pump

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Test Required
N	On	Disengaged	Yes	
N	Off	Disengaged	No	✓
N	On	"Pump Engaged" "OK to Pump"	Yes	
N	Off	"Pump Engaged"	No	
Any gear other than N	On	"Pump Engaged" "OK to Pump & Roll"	No	✓
Any gear other than N	Off	"Pump Engaged" "OK to Pump & Roll"	No	
Any gear other than N	On or Off	Disengaged	No	

(2) The chassis transmission is in any gear other than neutral, the parking brake is on, and the pump shift in the driving compartment is in the "Pump Engaged" or the "OK to Pump & Roll" position.

Add new annex as A.16.13.8 to read:

The test of the engine speed advancement interlock system should verify proper functioning for the conditions of chassis transmission, parking brake and pump shift status indicated in Tables A.16.13.8(a), A.16.13.8(b) and A.16.13.8(c). Testing should be performed with a qualified person positioned in the driving compartment and a qualified person verifying engine speed control status at the pump operator's panel. Shifting of the pump transmission/PTO should be done in accordance with the manufacturer's instructions.

Insert 1901 Log 44 CA Table A.16.13.8(a)

Insert 1901 Log 44 CA Table A.16.13.8(b)

Insert 1901 Log 44 CA Table A.16.13.8(c)

Renumber existing 16.13.8 through 16.13.8.2 as 16.13.9 through 16.13.9.2.

Committee Statement: The committee is moving the 2 required tests into the body of the standard but leaving the tables in the annex to show the user the various configurations that can exist when testing. In addition. The proposed rewording in 16.10.10 and 16.10.11 [see proposal 1901-116 (Log #CP56)] allow the "high idle" function of an engine speed control at the pump panel (throttle control when parked not in pump mode) to be optional. The wording changes in the tables are to acknowledge that change.

1901-133 Log #125 Final Action: Reject
(17.7.2)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.

Recommendation: Revise text to read as follows:

All gauges, instruments, discharge outlets, pump intakes, and controls located on the auxiliary pump operator's panel shall be illuminated to a minimum lighting level of 5 fc (~~50~~54 lx).

Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. This should be consistent throughout the Standard.

Committee Meeting Action: Reject

Committee Statement: These, and many other, conversion values were corrected with the 2003 edition of 1901 to be in accordance with the NFPA Manual of Style (MOS). Chapter 4 and Annex B.8.3 of the MOS provide extensive information on this subject. The MOS required that "The precision used to express a measurement shall not exaggerate the accuracy intended for the measurement." (4.2.1.2) and "The converted value shall be rounded such that the last place digit of the converted value is equal to or less than the converted value of the intended precision. (See conversion steps outlined in B.8.3.)" Unless the inch-pound measurement of 5 fc should be 5.0 fc, the correct statement of the conversion is 50 fc not 54 fc.

Insert Tables 16.13.8 for committee action - proposal 1901-132 Log #44

Table A.16.13.8(a) Stationary Pump Driven through Split-Shaft PTO

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Required Test
N	On	Road	Yes [2]	
N	Off	Road	No	X
N	On	"Pump Engaged"	Yes[2]	
N	Off	"Pump Engaged"	No	
Pump Gear[1]	On	"Pump Engaged" "OK to Pump"	Yes	
Pump Gear[1]	Off	"Pump Engaged"	No	
Pump Gear [1]	On	Road	No	X
Pump Gear[1]	Off	Road	No	
Any gear other than N and Pump Gear[1]	On or Off	Road	No	
Any gear other than N and Pump Gear[1]	On or Off	"Pump Engaged"	No	

[1]Chassis transmission shift selector placed in position for pumping as indicated on label provided in the driving compartment.
[2]Applies only for those apparatus that have "Throttle Ready" indication on pump operator's panel when the chassis transmission is in Neutral and Parking Brake engaged. If there is no "Throttle Ready" indication, there is no engine speed control at Pump Operator's panel.

Table A.16.13.8(b) Stationary Pump Driven through Transmission Mounted PTO, Front-of-Engine Crankshaft PTO, or Engine Flywheel PTO

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Required Test
N	On	Disengaged	Yes[1]	
N	Off	Disengaged	No	X
N	On	"Pump Engaged" "OK to Pump"	Yes[1]	
N	Off	"Pump Engaged"	No	
Any gear other than N	On	"Pump Engaged"	No	X
Any gear other than N	Off	"Pump Engaged"	No	
Any gear other than N	On or Off	Disengaged	No	

[1] Applies only for those apparatus that have "Throttle Ready" indication on pump operator's panel when the chassis transmission is in Neutral and Parking Brake engaged. If there is no "Throttle Ready" indication, there is no engine speed control at Pump Operator's panel.

Table A.16.13.8(c) Stationary and "Pump-and-Roll" Pump

Chassis Transmission Gear Selected	Parking Brake Status	Pump Shift Status (Driving Compartment)	Engine Speed Control at Pump Operator's Panel	Required Test
N	On	Disengaged	Yes[1]	
N	Off	Disengaged	No	X
N	On	"Pump Engaged" "OK to Pump"	Yes[1]	
N	Off	"Pump Engaged"	No	
Any gear other than N	On	"Pump Engaged" "OK to Pump & Roll"	No	X
Any gear other than N	Off	"Pump Engaged" "OK to Pump & Roll"	No	
Any gear other than N	On or Off	Disengaged	No	

[1] Applies only for those apparatus that have "Throttle Ready" indication on pump operator's panel when the chassis transmission is in Neutral and Parking Brake engaged. If there is no "Throttle Ready" indication, there is no engine speed control at Pump Operator's panel.

1901-134 Log #30 Final Action: Reject
(18.4.3)

Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
18.4.3 A means shall be provided to limit the nominal net engine output during pumping operation to a torque level equal to the nominal continuous duty torque rating of the weakest component, or to a level equal to the sum of the nominal continuous duty torque ratings of multiple components, if there are multiple devices to be driven simultaneously.
Substantiation: Present wording doesn't clearly limit the requirement to pumping situations and could be interpreted to limit the engine output at all times to the limits of the paragraph. It would not make sense to limit the output while in road to a limit established for a weaker component in the power train associated with the pump.
Committee Meeting Action: Reject
Committee Statement: Chapter 18 is being deleted and relevant changes made to Chapter 16 to accommodate larger pumps [see proposal 1901-99 (Log #9)]. The committee has taken action on a similar proposal to Chapter 16 [see proposal 1901-105 (Log #24)].

1901-135 Log #31 Final Action: Reject
(18.5.6)

Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
18.5.6 The pump shall allow a positive pressure source to directly add to the pump's net pump pressure~~.~~, thereby increasing the pump discharge pressure.
Substantiation: Present wording is confusing because readers may conclude that the net pump pressure increases. It remains the same and the discharge pressure increases. Confusion could also be avoided with alternative wording "The pump shall allow a positive pressure source to directly add to the pump's discharge pressure."
Committee Meeting Action: Reject
Committee Statement: Chapter 18 is being deleted and relevant changes made to Chapter 16 to accommodate larger pumps [see proposal 1901-99 (Log #9)]. The committee has taken action on a similar proposal to Chapter 16 [see proposal 1901-108 (Log #25)].

1901-136 Log #126 Final Action: Reject
(18.9.2)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
All gauges, discharge outlets, pump intakes, and controls shall be illuminated to a minimum lighting level of 5 fc (~~50~~54 lx).
Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. This should be consistent throughout the Standard.
Committee Meeting Action: Reject
Committee Statement: This change is not relevant as Chapter 18 is being deleted. However, these, and many other, conversion values were corrected with the 2003 edition of 1901 to be in accordance with the NFPA Manual of Style (MOS). Chapter 4 and Annex B.8.3 of the MOS provide extensive information on this subject. The MOS required that "The precision used to express a measurement shall not exaggerate the accuracy intended for the measurement." (4.2.1.2) and "The converted value shall be rounded such that the last place digit of the converted value is equal to or less than the converted value of the intended precision. (See conversion steps outlined in B.8.3.)" Unless the inch-pound measurement of 5 fc should be 5.0 fc, the correct statement of the conversion is 50 fc not 54 fc.

1901-137 Log #69 Final Action: Accept
(18.10.6, 18.10.7)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Delete 18.10.6, 18.10.7 and sub-sections.
Substantiation: These sections are for pump-and-roll operations. There are no pump-and-roll operations defined for apparatus with industrial supply pumps (there is no equivalent to section 16.2.2).
Committee Meeting Action: Accept
Committee Statement: Chapter 18 is being deleted in its entirety.

1901-138 Log #32 Final Action: Reject
(18.10.10.1)

Submitter: Tom Mettler, Waterous Company
Recommendation: 18.10.10.1 (add new section) Loss of power to the interlock system shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Substantiation: Safety. System should fail safe. Interlocks rely on electrical circuits and failure mode is currently not addressed. Return to idle will maintain delivery of water to discharges although at reduced flow and pressure. The proposed requirement would prevent unintended increase in engine speed that could subject discharges to significant increase in pressure and affect firefighter safety.
Committee Meeting Action: Reject
Committee Statement: Chapter 18 is being deleted and relevant changes made to Chapter 16 to accommodate larger pumps [see proposal 1901-99 (Log #9)]. The committee has taken action on a similar proposal to Chapter 16 [see proposal 1901-117 (Log #27)].

1901-139 Log #33 Final Action: Reject
(18.10.11.1)

Submitter: Tom Mettler, Waterous Company
Recommendation: 18.10.11.1 (add new section) Loss of power to the interlock system shall return the engine speed to idle and prevent advancement from the pump operator's panel.
Substantiation: Safety. System should fail safe. Interlocks rely on electrical circuits and failure mode is currently not addressed. Return to idle will maintain delivery of water to discharges although at reduced flow and pressure. The proposed requirement would prevent unintended increase in engine speed that could subject discharges to significant increase in pressure and affect firefighter safety.
Committee Meeting Action: Reject
Committee Statement: Chapter 18 is being deleted and relevant changes made to Chapter 16 to accommodate larger pumps [see proposal 1901-99 (Log #9)]. The committee has taken action on a similar proposal to Chapter 16 [see proposal 1901-118 (Log #28)].

1901-140 Log #34 Final Action: Reject
(18.10.13.1)

Submitter: Tom Mettler, Waterous Company
Recommendation: Revise text to read as follows:
18.10.13.1 A system shall be provided that, when set in accordance with the manufacturer's instructions, will automatically control the ~~discharge~~ increase in net pump pressure to a maximum of 30 psi (200 kPa) pressure rise ~~above the set pressure(s)~~ when all discharge valves are closed not more rapidly than in 3 seconds and not more slowly than in 10 seconds during the following condition:
Substantiation: Present wording doesn't recognize real world situation when pump is supplied from a remote water source. While flowing water to the pump, the intake gauge pressure at the pump reflects the gauge pressure of the source, such as a hydrant connected to a municipal water system, minus friction loss in the hose(s) from the water source to the pump. Upon closure of all discharge valves of the pump, the flow and friction loss through the hose supplying the pump will drop to zero, the intake gauge pressure at the pump will increase to the static pressure of the hydrant/municipal water system. This change in intake pressure will add directly to the pump discharge pressure and can by itself exceed the 30 psi rise the current wording requires. For relief valve systems that do not control engine speed, the current wording under these situations cannot be met and such relief valve systems have been used successfully in fire apparatus for decades.
Committee Meeting Action: Reject
Committee Statement: Chapter 18 is being deleted and relevant changes made to Chapter 16 to accommodate larger pumps [see proposal 1901-99 (Log #9)]. The committee has taken action on a similar proposal to Chapter 16 [see proposal 1901-120 (Log #29)].

1901-141 Log #113 Final Action: Accept in Principle
(18.13.5.5)

Submitter: Dan W. McKenzie, US Department of Agriculture
Recommendation: Add text to read as follows:
18.13.5.5* Repeat test but with intake valves closed and intake caps removed.
Substantiation: If the test is done with intake valves open and intakes capped, the apparatus could have a bad intake valve which would not be detected. By conducting a second test with the intake valves closed and intakes not capped a leaking intake valve would be detected.
Committee Meeting Action: Accept in Principle
Add a new requirement as 16.13.6.5 to read:
The vacuum test shall then be repeated with all intake valves closed and the caps or plugs on all gated intakes removed.
Committee Statement: Chapter 18 is being deleted but the committee agrees with this requirement is adding it to Chapter 16.

1901-142 Log #CP57 Final Action: Accept
(19.4.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 19.4.1 to read as follows:
19.4.1 Fill Opening. A readily accessible ~~convenient~~ covered fill opening designed to prevent spillage shall be provided.
Revise 19.4.1.1 to read as follows:
19.4.1.1 The fill opening shall have a minimum inside diameter of 3 1/4 in. (83 mm). ~~be designed to allow the insertion of a 2½ in. (65 mm) hose with coupling.~~
Substantiation: In 19.4.1, the term readily accessible is defined where as convenient is ambiguous
In 19.4.1.1, the requirement as currently written is difficult as there are different outside diameters to couplings for 2 ½ inch hose.
This is also consistent with changes the committee made to the last edition of NFPA 1906.
Committee Meeting Action: Accept

1901-143 Log #43 Final Action: Accept
(19.4.1.1)

Submitter: William von Zehle, Jr., Ridgefield Fire Department
Recommendation: Recommend addition of annex item.
A.19.4.1.1 The intent of 19.4.1.1 is to allow filling the tank by the insertion of a common 2 1/2 in. (65 mm) hose with coupling into the fill opening. The opening does not need to be round in shape.
Substantiation: Clarification of intent of 19.4.1.1.
Committee Meeting Action: Accept

1901-144 Log #107 Final Action: Reject
(20.2.9)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Revise text to read as follows:
If a manually operated monitor is provided at the ladder tip, two folding steps..."
Substantiation: No steps are necessary if the aerial is equipped with an electric ladder pipe.
Committee Meeting Action: Reject
Committee Statement: These steps are good to have anytime fire fighters need to be at the tip.

1901-145 Log #20 Final Action: Reject
(20.6.1, 20.12.1, 20.14.1, 20.16.1, 20.24.4.3, 20.25)

Submitter: William McCombs, Emergency One, Inc.
Recommendation: In 20.6.1, 20.12.1, 20.14.1, 20.16.1, 20.24.4.3, and Section 20.25, delete [100 psi (700 kPa).] Add revised wording:

The water system shall be capable of flowing 1000 gpm (4000 L/min) at "the rated nozzle pressure of the nozzle supplied with the aerial") with the aerial device at full elevation and extension.

Substantiation: Most water nozzles being supplied on aerials today operate at 80 psi when generating their rated flow not 100 psi as currently implied by the 100 psi requirements currently written in the standard. The standard is written around older technology that is commonly being superceded by the latest generation of more efficient automatic nozzles.

I propose the wording be changed to test the 1,000 gpm nozzle flow at the rated pressure of the nozzle supplied with the aerial. If it is 100 psi, that would be the test pressure. A nozzle rated to flow 1,000 gpm at 80 psi would be tested at 80 psi.

When flowing the aerial waterway at 1,000 gpm with a 2 in. straight bore tip, only 72 psi is required to obtain the flow through the tip. This pressure and flow rating more closely matches the 80 psi automatic nozzles now commonly used.

By allowing the flow to be tested at the more efficient rated nozzle pressure, this reduces the amount of pressure required in LDH hoses feeding the aerial if it does not have an on board pump as well as allows the relief valve settings in the waterway to be reduced by an equivalent amount.

It also reduces the amount of pressure required at the water pump when the aerial is equipped with an on board pump as well as reduces the engine rpm required to generate the required pressure.

Note: Supporting material is available for review at NFPA Headquarters.

Committee Meeting Action: Reject
Committee Statement: This would lower the present aerial performance requirement, which will affect aerial structural design. Monitor nozzles still exist that are designed for 100 psi at 1000 gpm.

1901-146 Log #35 Final Action: Accept in Principle
(20.6.2)

Submitter: William McCombs, E-One
Recommendation: Revise text to read:

Where a prepiped waterway is not provided, the following equipment shall be furnished, (if specified by the purchaser).

Substantiation: The large majority of purchasers who buy aerials without prepiped waterways are large cities who buy equipment off of separate vendor contracts and do not always want this equipment supplied with the truck. This is causing confusion at delivery time about what is in the bid and included with the truck.

Committee Meeting Action: Accept in Principle

Move 20.6.2 through 20.6.2.3 and the associated annex material to Chapter 8 as 8.8.4 through 8.8.4.3 and revise the opening statement of the new 8.8.4 to read: "If the aerial fire apparatus does not have a prepiped waterway provided, the following equipment shall be furnished:"

Committee Statement: The ladder pipe is equipment furnished with an aerial without a waterway and the requirement should be in Chapter 8.

1901-147 Log #108 Final Action: Accept
(20.6.2)

Submitter: Steffen Kohleisen, METZ Aerials USA
Recommendation: Revise text to read as follows:
(1) Manual ladder pipe with 1 1/4 in. (32 mm), 1 3/8 in. (35 mm), and 1 1/2 in. (38 mm) tips or electric ladder pipe with automatic nozzle that can be attached to the aerial ladder.
(4) Halyards to control the ladder pipe from the ground (for manual ladder pipe only).
Substantiation: Electric ladder pipes with automatic nozzles are getting more and more popular.
Committee Meeting Action: Accept

1901-148 Log #CP5 Final Action: Accept in Principle
(20.17.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Clarify the text that was the subject of the following Formal Interpretation.
Question: Is the intent of this paragraph to provide an interlock to prevent rotation over the "shortjacked" side of an aerial apparatus?
Answer: Yes
Substantiation: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued.
Committee Meeting Action: Accept in Principle
In 3.3.143, revise the definition of Rated Capacity (Aerial Device) to read as follows:
The total amount of weight of all personnel and equipment that can be supported at the outermost rung of an aerial ladder or on the platform of an elevating platform with the aerial device placed in the horizontal position at its maximum horizontal extension when the stabilizers are fully deployed. ~~waterway uncharged.~~
Add an annex to 20.2.3 to read as follows
The rated horizontal reach of the aerial ladder could be less than the extended length of the aerial that is used to determine the rated vertical height. This may be necessary to maintain the defined stability requirements as outlined in Section 20.21.
Revise 20.2.4 to read as follows:
Height and reach dimensions shall be taken with the aerial ladder mounted on a chassis meeting the aerial manufacturer's minimum recommended fire apparatus specifications, with the fire apparatus on level ground, and with the stabilizers fully deployed ~~in accordance with the manufacturer's instructions~~.
Revise 20.3.1 to read as follows:
The rated capacity of the aerial ladder shall be a minimum load of 250 lb (114 kg) carried on the outermost rung of the outermost fly section with the aerial ladder placed in the horizontal position at maximum extension and with the stabilizers fully deployed.
Add a new 20.3.1.1 to read as follows:
The rated capacity shall remain constant throughout the entire operating envelope of the aerial ladder.
Renumber existing 20.3.1.1 and 20.3.1.2 as 20.3.1.2 and 20.3.1.3 respectively.
Add an annex to 20.7.3 to read as follows:
The rated horizontal reach of the aerial platform may be less than the extended length of the aerial that is used to determine the vertical height. This may be necessary to maintain the defined stability requirements as outlined in Section 20.21.
Revise 20.7.4 to read as follows:
Height and reach dimensions shall be measured with the elevating platforms mounted on a chassis meeting the elevating platform manufacturer's minimum recommended fire apparatus specifications, with the fire apparatus on level ground, and with the stabilizers fully deployed ~~in accordance with the manufacturer's instructions~~.
Revise 20.8.1 to read as follows:
The rated capacity of the elevating platform shall be a minimum of 750 lb (340 kg), with no water in the water delivery system, ~~in any position of operation.~~ with the elevating platform placed in the horizontal position at maximum extension, with the stabilizers fully deployed.
Revise 20.8.2 to read as follows:
The rated capacity of the elevating platform shall be a minimum of 500 lb (227 Kg) with the water delivery system full of water but not discharging, ~~in any position of operation~~ with the elevating platform placed in the horizontal position at maximum extension and with the stabilizers fully deployed.
Add a new 20.8.3 to read as follows:
The rated capacity as determined in 20.8.1 and 20.8.2 shall remain constant throughout the entire operating envelope of the elevating platform."
Add an annex to 20.13.3 to read as follows:
The rated horizontal reach of the water tower could be less than the extended length of the water tower that is used to determine the vertical height. This may be necessary to maintain the defined stability requirements as outlined in Section 20.21.
Delete A.20.17.5.
Add text as 20.17.5(3) to reads as follows:

Operation of the aerial device into an unstable position when the aerial device can be operated with the stabilizers not fully deployed on at least one side of the vehicle

Add new text as 20.17.6.5 to read as follows:

For aerial devices that can be operated with the stabilizers not fully deployed, an indicator shall be located at the operators position to allow the operator to determine the maximum extension in relation to the angle of elevation and the extended length of the stabilizers.

Add new text as 20.24.2.4 to read as follows:

Systems that allow the aerial device to be operated when the stabilizers are not fully deployed shall be tested in three positions:

(1) Stabilizers at the minimum extension as defined by the manufacturer.
(2) Stabilizers extended to midpoint of the minimum extension and full extension.
(3) Stabilizers fully deployed.

Renumber 20.24.2.4 through 20.24.2.8 as 20.24.2.5 through 20.24.2.9

Add new text as 20.24.2.8.3 to read as follows:

Systems that allow the aerial device to be operated when the stabilizers are not fully deployed shall be tested in three positions:

(1) Stabilizers at the minimum extension as defined by the manufacturer.
(2) Stabilizers extended to midpoint of the minimum extension and full extension.
(3) Stabilizers fully deployed.

Renumber 20.24.2.8.3 through 20.24.2.8.5 as 20.24.2.8.4 through 20.24.2.8.6

Committee Statement: The change in the requirements will allow a system which limits the operation of an aerial device to within a safe range based on the actual amount of stabilizer extension. The changes and additions provide the following:

1. The use of aerial devices which have rated vertical heights at maximum ladder extension and have rated horizontal reach limited by envelope control systems.
2. Rated capacities of the aerial device are maintained in any position that the aerial can be positioned,
3. The ability to operate aerial devices when the outriggers are not fully deployed on one or both sides. This allows aerial operation when in tight areas.
4. Additional test requirements are prescribed to verify the stability of the device with the outriggers in three different extended positions.
5. These changes enable products using envelope control technology commonly found in other countries to meet NFPA 1901.

The committee is also removing the text in A.20.17.5 as it describes a system which allows for manual override of interlocks to allow for aerial operations outside the regular operations envelope. The interlock system is present to provides a safe operating environment for the user and allowing them to be overridden can lead to safety issues.

1901-149 Log #70 Final Action: Accept in Principle
(20.18.6)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
20.18.6 A spotlight of not less than 75,000 cp (~~950,000 lumens~~ 75,000 lumens per steradian) ~~or a floodlight of not less than 850 cp (10,500 lumens)~~ shall be provided on the apparatus by which the operator shall be able to observe the effect of the stream from the ladder pipe or monitor nozzle.
Substantiation: A 950,000 lumen spotlight would require about 40,000 watts for a halogen light, or about a 48" diameter aircraft searchlight. This is probably not what is intended to be required. The mistake probably came from the confusion about the term "candle power". There are two uses of the word "candle power". It is used elsewhere in this document as "mean spherical candle power" as a measure of total light output of a light source. This can be converted to lumens by multiplying by 12.566. The second use is "beam candle power" which is a measure of the brightness of light projected in a specific direction. This is equivalent (1:1) to lumens per steradian. All these units are actually SI (metric) units; neither is related to inch-pounds.
An 850 beam candle power floodlight at 100 feet would produce an illumination of less than 0.1 fc. Turning this light on would probably actually reduce the visibility of the end of a stream from a ladder pipe. For this purpose a spotlight is needed. A floodlight is not a reasonable substitute for a spotlight in this application. Several lights typically used for this application can be switched from spot to flood. These work for the specified application as a spot and can provide floodlighting on objects close to the lamp.
Committee Meeting Action: Accept in Principle
Revise 20.18.6 to read as follows:
A spotlight of not less than 75,000 beam cp (~~950,000 lumens~~ 75,000 lumens per steradian) or a floodlight of not less than ~~850 cp (~~ 10,500 lumens~~)~~ shall be provided on the apparatus by which the operator shall be able to observe the effect of the stream from the ladder pipe or monitor nozzle.
Committee Statement: This wording was placed in standard to allow for 110/220 volt flood lighting in place of the 12 volt spot tip lights. The accepted changes were made to produce the right the correct technical data for the light intensity.

1901-150 Log #CP42 Final Action: Accept
(20.22.5.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 20.22.5.4
Delete ASTM E1032 from 2.3.4.
Substantiation: Radiographic Inspection of aerial devices was deleted from NFPA 1911 as it is a cost prohibitive procedure and references to this procedure should be deleted in NFPA 1901 as well.
Committee Meeting Action: Accept

1901-151 Log #71 Final Action: Accept in Principle
(20.24.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
20.24.1 The aerial device shall be inspected and tested in accordance with the requirements of ~~NFPA 1914, *Standard for Testing Fire Department Aerial Devices*~~ NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus,* 2007 edition, including all nondestructive testing, prior to being subjected to the tests defined in 20.24.2 through 20.24.4.
Substantiation: NFPA 1914 has been merged into NFPA 1911.
Committee Meeting Action: Accept in Principle
Revise 20.24.1 to read as follows:
20.24.1 The aerial device shall be inspected and tested in accordance with the requirements of Chapter 19, Performance Testing of Aerial Devices, of NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus*, including all nondestructive testing, prior to being subjected to the tests defined in 20.24.2 through 20.24.4.
Committee Statement: The committee is defining the specific Chapter in NFPA 1911 that the testing needs to be done in accordance with.

1901-152 Log #CP58 Final Action: Accept
(21.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 21.1 to read as follows:
21.1* Application.
21.1.1 If the fire apparatus is equipped with a ~~foam~~ proportioning system for foam or other water additives, it shall comply with the applicable sections of this chapter.
21.1.2 References in this chapter to foam proportion systems shall include systems to proportion all water additives.
Substantiation: Foam proportioning system can be used to meter other firefighting additives such as wetting agents, emulsifiers, gels etc.
Committee Meeting Action: Accept

1901-153 Log #CP62 Final Action: Accept
(21.4.3, 21.7.2, 21.7.3 and 21.9.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: In 21.4.3, 21.7.2, 21.7.3 and 21.9.3, replace the word “plate” with “label.”
Revise the title of 21.9 to read as follows:
Labels~~, Plates,~~ and Instruction~~s~~ Plates.
Substantiation: By definition, these are labels as they display information useful to the operator rather than instructions. The change to 21.9 is editorial for consistency with a change in the term from “plate” to “Instruction plate.”
Committee Meeting Action: Accept

1901-154 Log #72 Final Action: Accept
(21.7.5)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
21.7.5* Foam concentrate pumps that are intended to be supplied from an external source of foam concentrate shall be provided with an external valved intake ~~and discharge~~ connection.
Substantiation: When supplied from an external source, there is an intake that needs to be valved. There is no discharge related to this external supply capability. In NFPA 1906 the entire paragraph was deleted.
Committee Meeting Action: Accept

1901-155 Log #CP63 Final Action: Accept
(21.9.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 21.9.3 to read as follows:
21.9.3* A plate, located at the operator's position, shall provide the following information pertaining to the performance operating specifications of the foam proportioning system:
(1) Foam classification type ~~(Class A, Class B, or Class A and B)~~
~~(2)*~~ ~~Types of foam concentrate(s) compatible with system design~~ *~~(See operating manual.)~~*
(2) Maximum/minimum proportioning rate (percent~~age~~)
(3) Maximum/minimum water flow ~~flows~~ (gpm)
(4) Maximum/minimum operating pressure ~~s~~
(5)* The statement "Only use concentrates that are compatible with this foam proportioning system. Refer to the foam proportioning system manufacturer's operating manual."
Renumber A.23.9(2) as A.23.9(5).
Substantiation: The requirement is being clarified as to the committee's intent particularly regarding 21.9.3(2) which is 21.9.3(5) in the recommendation.
Committee Meeting Action: Accept

1901-156 Log #CP64 Final Action: Accept
(21.9.3.1 and 21.9.3.2 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add text to read as follows:
21.9.3.1 If an in-line eductor system is provided on the apparatus, the following information shall also be provided on the plate:
(1) Maximum hose length using 11/2 in., 13/4 in., and 2 in. (38 mm, 44 mm, and 51 mm) hose
(2) Allowable elevation changes
(3) The statement: "The flow rate of the nozzle must match the flow rate of the system."
21.9.3.2 If an around-the-pump system is provided on the apparatus, the following information shall also be provided on the plate:
(1) Maximum intake pressure or required intake to discharge pressure differential
(2) A table to indicate flow rate and the corresponding metering valve setting
Delete A.21.9.3.
Substantiation: The suggestions in the annex are being moved to be requirements in the standard as it is important for the operator to have the information to properly provide foam for firefighting purposes.

Committee Meeting Action: Accept

1901-157 Log #CP65 Final Action: Accept
(21.10 and 21.11)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Replace 21.10 and 21.11 with text that reads as follows:
21.10* Foam Proportioning System Accuracy.
21.10.1* The foam proportioning system shall be type tested and certified by the foam proportioning system manufacturer to be accurate throughout the foam proportioning system's declared range of water flow, water pressure, foam percentage (or foam proportioning system capacity) and concentrate viscosity.
21.10.1.1 At a minimum, this declaration shall include the test points listed in Table 21.10.1.1.

*** Insert 1901 Log CP65 Rec Table 21.10.1.1

21.10.1.2* Calibration at mid range shall be established by the foam proportioning system manufacturer.
21.10.1.3 When testing to the maximum for water flow and foam percentage or foam proportioning system capacity, the test shall be at the limits of the foam proportioning system or the water pump, whichever is more restrictive.
21.10.2 Systems designed to produce foam solution at ratios of less than 1 percent shall proportion foam concentrate to an accuracy of minus 0 plus 40 percent
21.10.3 Systems designed to produce foam solution at ratios of 1 percent or greater shall proportion foam concentrate to an accuracy of minus 0 plus 30 percent or 1 percentage point, whichever is less.
21.10.4 The foam proportioning system manufacturer shall provide the certification required by Section 21.10 to the final-stage apparatus manufacturer.
21.10.4.1 The certification shall include the foam proportioning system manufacturer's viscosity performance specifications.
21.10.4.2 The final-stage apparatus manufacturer shall provide a copy of the certification to the final user.
21.11 Testing and Documentation.
21.11.1 The final installer shall test and certify the following:
(1) The foam proportioning system, as installed, complies with the foam equipment manufacturer's installation recommendations.
(2)* The foam proportioning system has been calibrated and tested to meet the foam equipment manufacturer's and the purchaser's performance specifications.
(3)* At a minimum, the foam proportioning system has been tested at the points defined in Table 21.11.1 for each foam system injection point.

Insert 1901 Log CP65 Rec Table 21.11.1

21.11.2 The final installer shall furnish documentation declaring the foam proportioning system as installed meets the requirements of 21.10.2 or 21.10.3 across the foam proportioning system manufacturer's declared range of water flow, water pressure, foam percentage (or foam proportioning system capacity) and concentrate viscosity at the test points defined in Table 21.11.1.
Add new annex material to A.21.10.1.2 to read as follows:
A.21.10.1.2 Depending on the foam proportioner technology, the manufacturer could require the system to be calibrated at the low end, high end or somewhere midrange, to ensure the system meets the accuracy requirements in the standard. For example, if the system runs richer as percentages increase, the manufacturer could anchor the low percentage during calibration. Therefore the manufacturer needs to have the flexibility to pick this point, knowing how his technology reacts over the full operating range.
Add new annex material to A.21.11.1(2) to read as follows:
A 21.11.1(2) The user may wish to specify additional test points and viscosities to ensure that user's full range of operational requirements are satisfied.
Add new annex material to A.21.11.1(3) to read as follows:
A.21.11.1(3). See A.21.10.1.
Substantiation: The revised text allows the manufacturer to type test the foam proportioning system, limits the testing required by the installer, and provides protection to the end user to ensure that an operational foam proportioning system is delivered.

Insert Tables 21.10.1 and 21.11.1 for proposal 1901-157 Log #CP65

Table 21.10.1.1 Test Points for Certification of Foam Proportioning System Performance

Water Flow	Water Pressure	Foam Percentage (Or Foam proportioning System Capacity)
Minimum	Minimum	Minimum
Maximum	Maximum	Maximum*
Minimum Maximum	Maximum Minimum	Minimum Maximum
Midrange	Midrange	Midrange†

* See 21.10.1.3.
† See 21.10.1.2.

Table 21.11.1 Test Points for Installation Testing of Foam Proportioning System Performance

Water Flow	Water Pressure	Foam Percentage (or Foam Proportioning System Capacity)
Minimum	Minimum	Minimum
Maximum	Maximum	Maximum*
Mid Range	Mid Range	Mid Range†

* See 21.10.1.3.
† See 21.10.1.2.

Committee Meeting Action: Accept

1901-158 Log #CP67 Final Action: Accept
(22.2.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 22.2.1 to read as follows:
22.2.1 An automatic regulating ~~A~~ foam proportioning system shall be used and shall comply with the applicable requirements of Chapter 21.
Delete A.22.2.1
Substantiation: Automatic proportioners prevent slug flow in CAFS and therefore are required for proper and safe operation.
Committee Meeting Action: Accept

1901-159 Log #CP68 Final Action: Accept
(22.2.2.1, 22.7.5.1, 22.9.1.1.1, 22.9.1.3.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 22.2.2.1 to read as follows:
22.2.2.1 The airflow shall be expressed in standard cubic feet per minute (SCFM) (L/min at standard temperature and pressure) ~~standard cubic meters per minute (SCMM)]~~ and shall be based on the continuous flow capacity of the compressed air source(s) at a minimum gauge pressure of 125 psi (862 kPa).
Revise 22.7.5.1 to read as follows:
22.7.5.1 Flowmeter displays shall be located at the pump operator's panel and shall indicate the airflow in standard cubic feet per minute (SCFM) (L/min at standard temperature and pressure) ~~standard cubic meters per minute (SCMM)]~~ and indicate the water flow in gallons per minute (gpm) [liters per minute (L/min)].
Revise 22.9.1.1.1 to read as follows:
The compressed air source shall be operated at its flow capacity at a minimum gauge pressure of 125 psi (862 kPa), and the water pump shall discharge a minimum of 2 gpm (7.6 L/min) of water at 125 psi (862 kPa) net pump pressure for every 1 SCFM (SCFM) (28.3 L/min at standard temperature and pressure) ~~(0.028 SCMM)~~ of compressed air discharge.
Revise 22.9.1.3.1 to read as follows:
The airflow shall be measured in SCFM (SCFM) (L/min at standard temperature and pressure) ~~(SCMM)~~ at a minimum gauge pressure of 125 psi (862 kPa).
Substantiation: The correct metric conversion for quantity of air in a CAFS system is liters per minute.
Committee Meeting Action: Accept

1901-160 Log #CP69 Final Action: Accept
(22.2.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 22.2.4 to read as follows:
22.2.4* On a CAFS, the air pressures shall be automatically balanced to the water pressure to within -0, +10 percent throughout the operational range of the CAFS.
Revise A.22.2.4 to read as follows:
A.22.2.4 It is recommended that compressed air not be injected into the discharge piping until the flow of foam solution has been established. The nozzle reaction at the end of a hose can be quite high if air and water are flowing in the discharge line. The nozzle reaction could be a safety issue with an operator that is not expecting or not properly braced to withstand this reaction force. The reaction force is substantially reduced when a foam solution is flowing in the discharge hose. Also a charged CAFS line should be opened slowly to lower the nozzle reaction force that can be very high if opened rapidly.
Substantiation: On a CAFS, it is important for the water pressure and the air pressure to be balanced as closely as possible and the ± 5 percent is easily achievable. The changes to the annex material are to cleanup terminology and to strengthen the advice to users of CAFS.
Committee Meeting Action: Accept

1901-161 Log #CP70 Final Action: Accept
(22.6.1, 22.8)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: In 22.6.1, add the word “instruction” before “plates.”
Revise 22.8 to read “Labels, ~~Plates,~~ and Instruction Plates.”
In 22.8.1, add the word “instruction” before “plates.”
Substantiation: The change is for consistency with a change in the term from “plate” to “Instruction plate.”
Committee Meeting Action: Accept

1901-162 Log #CP71 Final Action: Accept
(22.9)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 22.9 to read as follows:
22.9* Manufacturer’s Predelivery Tests. The manufacturer shall conduct the following tests prior to delivery of the fire apparatus and provide documentation of the test results to the purchaser at delivery of the fire apparatus.
Substantiation: It is important not only that the manufacturer conduct tests to ensure the system is working properly but that the documentation of those test be delivered to the purchaser so they can be used for future reference if necessary.

Committee Meeting Action: Accept

1901-163 Log #CP73 Final Action: Accept
(23.2.1.2 and 23.16.5.3.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Change the voltage tolerance in 23.2.1.2 and 23.16.5.3.6 from ±10 percent to ±5 percent.
Substantiation: The current Standard in section 23.2.1.2 requires that "Any fixed line voltage power source shall produce electric power at the rated voltage ±10 percent".
At the upper end of the range, this allows a 120 volt system to generate power at 132 volts at the generator. Many line voltage loads on fire apparatus, thus with short wire distances and minimum line voltage drops, are lighting loads. At 132 volts the life of a light bulb is reduced somewhere from 50% to 75% from its life at 120 volts. This causes the costs for bulbs, and the frequency of loss of lighting due to burned out bulbs, to be 2 to 4 times what they would be at 120 volts.

At the bottom end of the range this allows a 120 volt system to generate power at 108 volts at the generator. If a motor load such as a smoke fan is connected at the end of a cord reel with a 5% voltage drop, the voltage at the receptacle could be as low as 102 volts. There would be additional voltage drop in the cord to the fan (which could include an extension cord for greater voltage drop). When starting, the most critical time for a motor, the starting current draw can be as much as 3 times the running current and thus the voltage drops would be 3 times as great. While starting, the voltage could be as low as 90 volts at the motor. As the voltage drops, the current required to start the motor increases, further dropping the voltage. This is very hard on motors, and can cause the motor to burn up before it can start. It can also cause the circuit breaker to trip before the motor can get started. If the motor does start, running on low voltage causes excessive current draw, excessive heating, and accelerated aging of the motor. Reduced voltage also causes internal blackening and shortened life to the halogen bulbs used for most fire department lighting. This reduces the light output and shortens the useful life of these bulbs

In reviewing literature and talking with many power source suppliers, they all have voltage tolerances no more than ±5%, and most are ±1% or ±2%, some even better. The requirement in the standard does not apply to portable generators which are often the least precise voltage control at ±5%. More and more generators are using electronic voltage regulation that provides anywhere from ±0.25% to ±2% voltage regulation. All of the generator manufacturers consulted say they would have no problem with a ±5 percent requirement.
Committee Meeting Action: Accept

1901-164 Log #91 Final Action: Accept in Principle
(23.3, 23.4.9, 23.8)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

INCLUDE 1901_L91.R HERE

Substantiation: An isolated line voltage electrical system greatly reduces the changes for shock since the only way to get shocked is to make some kind of contact with both current carrying conductors. Contact with, or leakage to, the truck, the earth, or the case of a piece of electrical equipment does not contribute to a shock path. There are trucks in the field now that have such a system without problem. Many portable generators, even if mounted in apparatus and connected to the apparatus, do not have a bonded neutral.

The National Electrical Code does not address the issue of neutral bonding for portable generators, unless they are used to power wiring systems in a building or in a recreational vehicle. The application on a fire truck is more like a stand alone portable generator, or a Navy ship electrical system, both of which are typically unbonded between neutral and ground.

Since the publication of NFPA 1901-2003, there have been some questions raised about whether GFCIs are required by the standard. After much analysis and discussion, it was agreed that they are not required, and a formal interpretation was issued. This certainly points out that the committee needs to clarify our position on GFCIs on fire apparatus. This proposal incorporates that clarification.

While the committee is not in favor of forbidding GFCIs if a purchaser specifically wants them, they are against them for the following reasons:

1) So far as the committee knows, there is no history of firefighters being electrocuted from their own equipment. There have been a few anecdotal reports of shocks from improperly grounded equipment mounted on fire apparatus, but GFCI receptacles might not have helped in this case with permanently connected equipment that typically is not on a GFCI even on apparatus with GFCI outlets or GFCI breakers on outlet circuits.

2) There is significant history of GFCIs in the fire service being very susceptible to false trips, which expose firefighters to loss of safety lighting inside buildings.

3) GFCIs may not be compatible with 240/120 volt 1 phase, 4 wire cord reels (which share a common neutral wire for two 120 volt circuits) unless they are located at the end of the cord reel.

4) GFCIs feeding long cord runs seem to be very susceptible to false trips.

5) To avoid problems with GFCIs and cord reels, and dealing with resetting false trips, the best location for the GFCI is at the end of the cord reel. This places it in a very harsh, wet environment which causes more false trips and reliability problems.

6) The typical fire apparatus installation is not grounded to the earth, so the Ground (earth) Fault risk being protected against by a GFCI is not applicable to the fireground, since the ground (earth) is not part of the electrical circuit.

7) The applicable section of NEC is 250.34, Portable and Vehicle-Mounted Generators. There is nothing in this section that requires GFCIs.

8) With an isolated neutral system, it is almost impossible to create a situation where a leakage current can be created that would either create a shock hazard or trip a GFCI if it were present.

In response to inquiries made in 2004, several apparatus and electrical equipment manufacturers reported that their customers reported problems with false trips with GFCIs in the fireground environment. In some cases, customers who had initially required GFCIs on new apparatus eventually removed, or went back to the apparatus manufacturer to have them remove, the GFCI outlets or breakers.

The National Electrical Code section 551.41(C) calls for GFCIs in some specific locations in RVs. Where we are building vehicles from, or similar to, RVs, fire apparatus should do the same in the interior of rescue or command vehicles in the vicinity of lavatories, sinks, or toilets.

Committee Meeting Action: Accept in Principle

Accept the submitter's changes with the following revisions as shown to the submitted changes.

A.23.3.1.1 This refers to the protective ground (green wire), not the "neutral" wire. The ground is the chassis/body of the vehicle, not ~~connected to any~~ a connection to an earth ground.

Change the word "outlet" to "receptacle" throughout the text.

Recommendation for proposal 1901-164 Log #91

23.3 Grounding and Bonding.

23.3.1* Grounding. Grounding shall be in accordance with Section 250.34(A) and 250.34(B), "Portable and Vehicle-Mounted Generators," of NFPA 70, *National Electrical Code*.

~~**A.23.3.1** Because of the non-earth grounded nature of apparatus-mounted line voltage equipment and the wet environment in which it operates, great care should be taken in the use and maintenance of such line voltage circuits and equipment. Ground fault protection for personnel should be furnished through an assured equipment grounding conductor program in accordance with Section 527.6(B), "Use of Other Outlets," of NFPA 70. All cord sets, receptacles, and electrical equipment should be maintained in accordance with NFPA 70B, *Recommended Practice for Electrical Equipment Maintenance*.~~

~~This protection can be supplemented by the use of ground fault circuit interrupters (GFCIs). These GFCIs should be attached to the end of distribution cords and located close enough to the equipment being operated that the GFCIs can be conveniently reset in the event they trip. Locating GFCI devices as close as possible to the end of a cord will reduce tripping caused by stray capacitance and leakage associated with long cord lengths and multiple connections.~~

~~While this arrangement is desirable for fire service operating conditions and does protect fire fighters who are operating tools and lights downstream of the GFCIs, no ground fault protection is provided between the electrical source and the GFCIs.~~

A.23.3.1 It is important that all metal parts of the apparatus and the electrical system be bonded together to the vehicle chassis. If there are any electrical boxes, conduits, or fixtures that are not permanently mounted to the metal body, they should be bonded to the protective ground wire. It is especially important that the metal light fixtures or housings of pole lights, light towers, and portable lights be grounded through the protective ground wire. The National Electrical Code sections 250.34(A)(2) and 250.34(B)(3) require that "The non-current carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles are bonded to the generator frame."

23.3.1.1* Ungrounded systems shall not be used.

A.23.3.1.1 This refers to the protective ground (green wire), not the "neutral" wire. The ground is the chassis/body of the vehicle, not connected to any earth ground.

23.3.1.2 Only stranded or braided copper conductors shall be used for grounding and bonding.

~~**23.3.1.3** If a supplementary grounding electrode (ground rod) is provided, it shall be provided in accordance with Section 250.62, "Grounding Electrode Conductor Material"; Section 250.118, "Types of Equipment Grounding Conductors"; and Section 250.54, "Supplementary Grounding Electrodes," of NFPA 70.~~

~~**23.3.1.4** The grounded current-carrying conductor (neutral) shall be insulated from the equipment grounding conductors and from the equipment enclosures and other grounded parts.~~

~~**23.3.1.5** The neutral conductor shall be colored white or gray in accordance with Section 200.6, "Means of Identifying Grounded Conductors," of NFPA 70.~~

23.3.1.6~~3~~ Any bonding screws, straps, or buses in the distribution panelboard or in other system components between the neutral and equipment-grounding conductor shall be removed and discarded.

23.3.2 Bonding.

~~**23.3.2.1** The neutral conductor of the power source shall be bonded to the vehicle frame.~~

~~**23.3.2.2** The neutral bonding connection shall occur only at the power source.~~

23.3.2.1* No current carrying conductor shall be connected to the generator frame, vehicle frame, or vehicle body.

A.23.3.2.1 The entire electrical system is isolated from the vehicle and the earth, unlike power supplied from a public utility. With an isolated power source, the only way to get a shock path through the body is to get a connection to both current carrying wires in the electrical circuit. Touching any one wire will not create a path for electrical shock, even if the person is touching the vehicle or the earth. This is much like the bird sitting on a high tension electrical cable without getting shocked. This provides a safer electrical system since touching the vehicle,

electrical equipment housings, or the earth does not create a connection to the live electrical circuit as it does with a system with a bonded neutral.

23.3.2.2 If a connection between one of the current carrying conductors (neutral) and the power source frame, case, or the protective ground wire is made within the power source and can not be broken or if the fire apparatus line voltage electrical system is intended to serve as an emergency generator for a building electrical system, a grounded neutral system shall be permitted.

> **A.23.3.2.2** Supplying a building electrical system from a fire truck is not recommended, both because it commits the apparatus to this task but also because it requires significantly different grounding, at least while being used for this application, in accordance with the National Electrical Code section 250.20, "Alternating-Current Circuits and Systems to Be Grounded," and other applicable sections of NFPA 70.

23.3.2.2.1 In this case, the neutral conductor of the power source shall be bonded to the vehicle frame.

23.3.2.2.2 The neutral bonding connection shall occur only at the power source.

23.3.2.2.3 If the neutral must be bonded to the frame, the power source specification label shall include the following warning: **Warning: One current carrying conductor of this line voltage electrical system is connected to the vehicle frame and body**.

23.3.2.3 In addition to the bonding required for the low voltage return current, each body and each driving or crew compartment enclosure shall be bonded to the vehicle frame by a copper conductor.

23.3.2.3.1 The conductor shall have a minimum amperage rating, as defined in Section 310.15, "Ampacities for Conductors Rated 0–2000 Volts," of NFPA 70, of 115 percent of the rated amperage on the power source specification label.

23.3.2.3.2 A single conductor that is sized to meet the low voltage and line voltage requirements shall be permitted to be used.

23.3.3* Ground Fault Circuit Interrupters.

> **A.23.3.3** Ground Fault Circuit Breakers may provide some very limited protection from electrical shock, but experience in the fire service has pointed out several disadvantages with using them.
>
> - They introduce the possibility of unwanted trips that shut off electricity and thus lights or other power being used for emergency operations.
> - The risk of electrical shock due to a fault through a firefighter to ground (earth) is much less in the typical fireground situation with a vehicle mounted generator than it is with utility supplied power because the vehicle mounted generator is not connected to an earth ground, thus the potential shock path through a firefighter to the earth generally does not have the necessary path back to the generator to produce a shock.
> - With an isolated line voltage system as required in section 23.3.2.1, a potential path through a person to either the earth ground or the vehicle body do not create a shock hazard. It is almost impossible to create a condition that will trip a GFCI connected to an isolated line voltage system.
> - Due to the presence of water in the fireground environment, GFCIs are much more prone to trips due to leakage currents that do not involve personnel, and thus do not present a safety risk. In an isolated system this leakage to ground will not occur, through a water leakage path or through a firefighter.
> - GFCIs are also not compatible with 120/240 volt 4 wire cord reels frequently used in the fire service unless the GFCI is located at the end of the cord reel. This location does have the advantage that it puts the reset function closer to the user, but it also exposes the delicate electronics of the GFCI to water and physical damage.
> - Since most outlets in the fire service are twist lock instead of standard household plugs, the inexpensive GFCIs integrated with an outlet cannot be used, requiring much more expensive circuit breaker GFCIs or stand alone GFCIs.
> - The manufacturers of some ventilation fans state that they should not be used on circuits with GFCIs.

23.3.3.1 Ground Fault Circuit Interrupters (GFCIs), either integrated into outlets, integrated into circuit breakers, or as stand alone devices, may be used but are not required.

23.3.3.2 In special service vehicles incorporating a lavatory, sink, toilet, shower, or tub; 120 volt, 15- or 20-ampere receptacle outlets within 6 feet (1.8 meters) of these fixtures shall have ground fault circuit interrupter protection if they can be powered from an external source (shoreline) or if the neutral is bonded to the vehicle frame.

…

23.4.9 If there is permanent wiring on the apparatus that is designed to be connected to the power source, a power source specification label that is permanently attached to the apparatus at the operator's control station shall provide the operator with the information detailed in Figure 23.4.9.

Power Source Specifications

Operational Category	**Continuous Duty Rating**
Rated voltages(s) and type (ac or dc)	
Phase	
Rated frequency	
Rated amperage	
Continuous rated watts	
Power Source engine speed	

This line voltage electrical system is fully isolated. No current carrying conductors are bonded to the vehicle chassis or body.

FIGURE 23.4.9 Power Source Specifications Label.

23.4.9.1 If the line voltage electrical system is isolated from the vehicle, the power source specification label shall include the notice "**This line voltage electrical system is fully isolated. No current carrying conductors are bonded to the vehicle chassis or body**."

23.4.9.2 If the line voltage electrical system is not isolated from the vehicle, the power source specification label shall include the warning "**Warning: One current carrying conductor of this line voltage electrical system is connected to the vehicle frame and body**."

…

23.8 Line Voltage Supplied from an External Source.

A.23.8.1 The purchaser should specify the location on the apparatus for the power inlet. Consideration should be given to placement of the power inlet so that it disconnects if the apparatus is moved forward. The shoreline and circuit breaker in the fire station should be sized for the anticipated electrical load.

23.8.1* If the apparatus is equipped with a fixed power inlet (shoreline inlet), it shall be a permanently mounted inlet (male-recessed type with cover), sized in accordance with the anticipated load, and wired directly to the system or device to be powered or wired to a transfer switch where required by 23.8.2.

23.8.1.1 The protective ground from the shoreline inlet shall be bonded to the vehicle frame.

23.8.1.2 The neutral conductor from the shoreline inlet shall be bonded to the vehicle frame.

23.8.2 Transfer Switch Applications.

23.8.2.1 A transfer switch shall be required to isolate one power source from the other where a circuit(s) is intended to be supplied from more than one power source.

23.8.2.2* Transfer equipment, including transfer switches, shall operate such that all ~~ungrounded~~ conductors of one power source are disconnected before any ~~ungrounded~~ conductors of the second power source are connected.

~~**A.23.8.2.2** This paragraph differs from the requirements in NFPA 70, *National Electrical Code*, in that this standard does not permit two sources to be simultaneously connected together.~~

23.8.2.3 If the power source is isolated from the vehicle frame and body, the neutral conductor must be switched through the transfer switch to maintain the isolation.

Revise the diagram in A.23.1 to reflect this configuration. The diagram needs to show each conductor, not just a single line, through panelboard, transfer switch, receptacles, and other loads. It should show a load connected only to shore power and an optional transfer switch and dual powered load.

A.23.3.3 Ground Fault Circuit ~~Breakers~~ Interrupters are intended to ~~may~~ provide ~~some very limited~~ protection from electrical shock, but experience in the fire service has pointed out several disadvantages with using them.

A.23.3.3 (fifth bullet): GFCIs ~~are also~~ might not be compatible with 120/240 volt

A.23.3.3 (sixth bullet): Since most plugs and receptacles used ~~outlets~~ in the fire service are twist lock instead of standard nonlocking household plugs and receptacles, the inexpensive GFCIs integrated with an outlet cannot be used, requiring much more expensive circuit breaker GFCIs or stand alone GFCIsThe manufacturers of some ventilation fans state that they should not be used on circuits with GFCIs.

23.3.3.1 Ground Fault Circuit Interrupters (GFCIs), either integrated into outlets, integrated into circuit breakers, or as stand alone devices, shall be permitted to be used ~~may be used~~ but are not required other than in the situations described in 23.3.3.2.

Revise Figure 23.4.9 to appear as follows:

*** Insert 1901 Log 91 CA Figure 23.4.9 ***

23.4.9.1 If the line voltage electrical system is isolated from the vehicle, the power source specification label shall include a ~~the~~ notice at the bottom of the label that reads: "This line voltage electrical system is fully isolated. No current carrying conductors are bonded to the vehicle chassis or body."

23.4.9.2 If the line voltage electrical system is not isolated from the vehicle, the power source specification label shall include a ~~the~~ warning at the bottom of the label that reads: "Warning: One current carrying conductor of this line voltage electrical system is connected to the vehicle frame and body."

Revise figure A.23.1 to appear as follows:

*** Insert 1901 Log 91 CA Figure A.23.1 ***

Committee Statement: The revision to A.23.3.1.1 is basically editorial for clarification.

The revision to 23.3.3.1 is to state the requirement per the NFPA Manual of Style and also to recognize that 23.3.3.2 does state a requirement for GFCIs in certain situations.

Changing the word "outlet" to "receptacle" is for consistency of terminology.

The change to A.23.3.3 is editorial and minor revisions to be more positive about GFCIs in the discussion. Other changes are editorial for consistency of terminology.

The change to Figure 23.4.9, and the text of 23.4.9.1 and 23.4.9.2 is to avoid confusion on what wording is to appear on the label.

1901-165 Log #CP3 Final Action: Accept in Principle
(23.3.1, 23.10 and 23.10.2)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Clarify the text that was the subject of the following Formal Interpretation.

Question: Is the intent of paragraph 23.3.1 or paragraphs 23.10 and 23.10.2 to require the use of ground fault circuit interrupter devices on branch circuits with overcurrent protection?

Answer: No

Substantiation: The Regulations Governing Committee Projects require that a proposal be processed to clarify the text of a document on which a Formal Interpretation has been issued.

Committee Meeting Action: Accept in Principle

See committee action on Proposal 1901-164 (Log #91).

Committee Statement: The committee believes its action on Proposal 1901-164 (Log #91) has clarified its intent on this subject.

Insert figure 23.4.9 for committee action on proposal 1901-164 Log #91

Power Source Specifications	
Operational Category	**Continuous Duty Rating**
Rated voltages(s) and type (ac or dc)	
Phase	
Rated frequency	
Rated amperage	
Continuous rated watts	
Power Source engine speed	
(Proper notice per 23.4.9.1 or 23.4.9.2)	

Insert figure A.23.1 for committee action on proposal 1901-164 Log #91

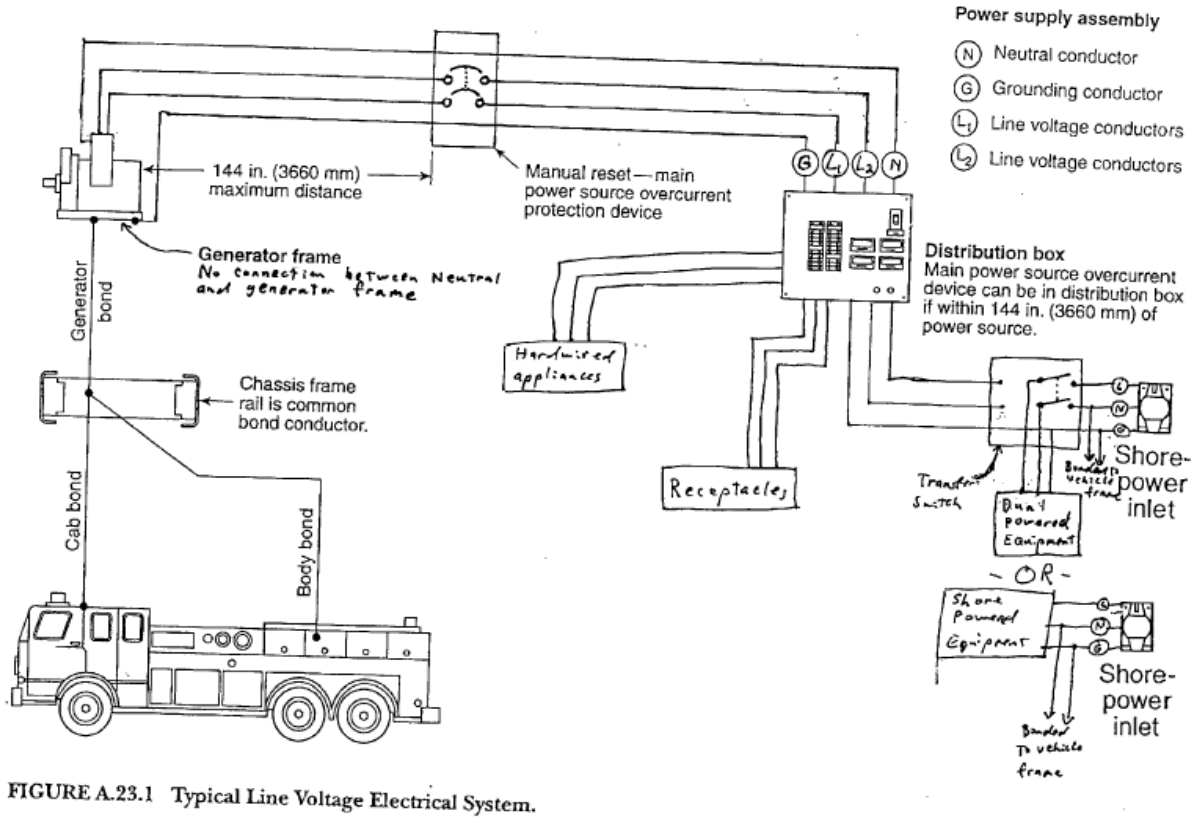


FIGURE A.23.1 Typical Line Voltage Electrical System.

1901-166 Log #CP75 Final Action: Accept
(23.5 and 23.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation:

*** Include 1901 CP75 Rec***
Substantiation: There are now several line voltage power sources available, or under development, that provide fixed frequency power output with a variable speed drive, without hydraulics between the drive and the generator. These are both belt driven and PTO driven power sources. Section 12.6 assumes certain characteristics of various specific types of generators that may not always be true. These changes move each requirement to be conditioned by an "if" clause in cases where it may, but is not always, a requirement. For example:
23.6.1.2 assumes need for fixed engine speed.
23.6.1.3 assumes need for parking brake (vehicle not being driven, i.e. fixed or elevated engine speed).
23.6.1.4 assumes need for fixed engine speed.
23.6.1.6 assumes need for a specific transmission gear.
A.23.6.4 assumes output frequency varies with engine speed.
A question was raised about whether the low oil shutdown in 23.6.3.2 was low oil level or low oil pressure. This has been clarified.
In 23.6.4.1, the question has been raised if the disengaging means must be a clutch or mechanical disconnect, or if a switch that just disables the output such as by shutting of the field current was permissible. The new 23.6.4.1 clarifies this.
Committee Meeting Action: Accept

1901-167 Log #1 Final Action: Accept in Principle
(23.6.4.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Add text to read as follows:
23.6.4.1 A means shall be provided to engage and disengage the generator or alternator. <u>The means may be mechanical to stop the generator or alternator rotation, or electronic to disable the production of electricity from the generator or alternator.</u>
Substantiation: Questions have been raised about the meaning of the existing wording. This proposal clarifies the meaning to explicitly allow the generator/alternator to spin constantly and be disabled by switching off the field current, as is allowed and sometimes done with hydraulic generators. Sections 23.5.1 and 23.5.2 specifically refer to this situation.
Committee Meeting Action: Accept in Principle
Revise 23.6.4.1 to read as follows:
A means shall be provided to <u>mechanically</u> engage and disengage the generator or alternator <u>rotation, or to electronically stop the production of electricity from the generator or alternator.</u>
Committee Statement: The committee agrees with the submitter but is editorially revising the requirement into a single sentence.

Recommendation for proposal 1901-166 Log #CP75

Add definition before existing 3.3.79:

3.3.79 Generator. An electromechanical device for the production of electricity.

Rearrange the specific requirements for generator types in 23.5 and 23.6 based on actual requirements as follows:

~~**23.5 Chassis Engine–Driven Generators.**~~

~~Where the generator is driven by the chassis engine, the requirements in 23.5.1 through 23.5.3 shall apply.~~ *[moved to 23.6.9]*

~~**23.5.1*** Unless the generator is always engaged, a "Generator Engaged" indicator shall be provided in the driving compartment to indicate that the generator shift has been successfully completed.~~ *[moved to 23.6.9]*

~~**A.23.5.1** Completion of the generator shift might require that the chassis transmission be shifted into the proper gear (split shaft PTOs only).~~

~~**23.5.2** Unless the generator is always engaged and operating, an "OK to Operate Generator" indicator shall be provided in the driving compartment to indicate that the generator is engaged, transmission is in the proper gear (automatic transmissions only), and the parking brake is engaged (if applicable).~~ *[moved to 23.6.9]*

~~**23.5.3** An interlock system shall be provided to prevent advancement of the engine speed in the driving compartment or at any operator's panel unless the transmission is in neutral and the parking brake is engaged, or the apparatus is in the "OK to Pump" or "OK to Operate Generator" mode.~~ *[moved to 23.6.9]*

23.6 ~~Additional~~ Power Source Type Specific Requirements.

23.6.1* Direct Drive (PTO) Generators. If the Generator is driven by the any type of PTO, it shall meet the requirements of section 23.6.1.1 through 23.6.1.x.

~~**23.6.1.1*** The generator shall comply with Article 445, "Generators," of NFPA 70, National Electrical Code.~~ *[moved to 23.6.8]*

A.23.6.1.~~1~~ A PTO generator system typically consists of a propulsion engine, a controller to regulate the propulsion engine's speed (if required), an appropriate PTO arrangement, drivetrain components, a generator, and other miscellaneous parts.

When a generator and fire pump are both direct driven by the same engine and are both operated at the same time and the generator requires a fixed engine speed, fire pump performance is limited to the generator set speed, and pump pressure is controlled by a pressure relief valve.

Due to variable engine speeds causing uncontrolled voltage and frequency variation with most direct drive generators, most direct drive generators are not acceptable for fire apparatus where "generate and roll" capability is required. Hydraulically driven or separate engine driven generators are suited for these applications.

~~**23.6.1.2*** The main propulsion engine shall have a governor capable of maintaining the engine speed within the limits required by the generator to meet the frequency control specifications.~~ *[moved to 23.6.6]*

A.23.6.1.~~2~~ Where possible, the generator PTO system should be prevented from engaging if engine speed is above idle.

PTO gear ratios and engine governor components should be selected and matched to provide an engine speed high enough to maintain rated performance of the alternator and air conditioning system (if provided). Engine speed should be high enough to maintain rated performance of the low voltage electrical system. Continuous excessive engine speed will result in premature generator drivetrain component failure and unnecessary fuel consumption.

The purchaser should consider ~~the specification of~~ specifying a means to automatically disconnect the generator or reduce engine speed to idle in the event of engine overspeed.

~~**23.6.1.3** An interlock shall prevent engagement of the generator unless the parking brake is engaged.~~ *[moved to 23.6.6]*

~~**23.6.1.4*** Where the chassis engine drives the generator and electronic engine throttle controls are provided, an interlock shall prevent engine speed control from any other source while the generator is operating.~~ *[moved to 23.6.6]*

~~**A.23.6.1.4** Operations in conjunction with a fire pump, aerial device, or other component driven off the fire apparatus's engine could require special or alternate interlock systems.~~ *[moved to 23.6.6]*

23.6.1.5 The transmission's PTO port and PTO, or the split shaft PTO, and all associated drive shaft components shall be rated to support the continuous duty torque requirements of the generator's continuous duty rating as stated on the power source nameplate.

~~**23.6.1.6** A label indicating the chassis transmission shift selector position to be used for generator operation shall be provided in the driving compartment and located so that it can be read from the driver's position.~~ *[moved to 23.6.7]*

23.6.1.7 Where the generator is driven by the chassis engine and transmission through a split shaft PTO, the driving compartment speedometer shall register when the generator drive system is engaged.

23.6.1.8 Where the generator is driven by the chassis engine and transmission through a split shaft PTO and a chassis transmission retarder is ~~are~~ furnished, it ~~they~~ shall be automatically disengaged for generator operations.

23.6.1.9 The direct drive generator shall be mounted so that it does not change the ramp breakover angle, angle of departure, or angle of approach as defined by other components, and shall not extend into the ground clearance area.

23.6.1.10 The direct drive generator shall be mounted away from exhaust and muffler areas or provided with a heat shield to reduce operating temperatures in the generator area.

23.6.2* Hydraulically Driven Generators. If the generator is driven using hydraulic components, it shall meet the requirements of sections 23.6.2.1 through 23.6.2.x.

~~**23.6.2.1*** The generator shall comply with Article 445, "Generators," of NFPA 70, National Electrical Code.~~ *[moved to 23.6.8]*

A.23.6.2.~~1~~ A hydraulic generator system generally consists of a variable displacement hydraulic pump deriving its power from the propulsion engine, a controller to regulate the hydraulic fluid flow rate, a hydraulic motor driving the generator, hydraulic fluid cooler, reservoir, and other miscellaneous parts.

All hydraulic generator systems have a window of operation (speed range). When selecting the power output of the hydraulic generator system, its speed range should be compared to the operating window of the fire apparatus's engine and the PTO ratios available. By selecting the hydraulic generator system and PTO ratio to match the application, electrical power can be provided over a wide operating range.

The selected PTO should have a gear ratio that will allow the widest possible range of engine speeds without overspeeding the hydraulic pump.

Where possible, engagement of the generator PTO system should be prevented if engine speed is above idle.

23.6.2.2* A means shall be provided to activate the hydraulic generator system.

A.23.6.2.2 This means can be either a mechanical, ~~or~~ hydraulic, or electronic device.

23.6.2.3 If the ~~A~~ hydraulic generator system ~~shall operate at all engine speeds, or~~ is not capable of output as stated on the power source specification label at all engine speeds, an automatic engine speed control system shall be provided.

23.6.2.4 If the apparatus is equipped with a fire pump driven by the chassis engine, the generator shall be capable of output ~~at idle~~ as stated on the power source specification label with the engine at idle.

23.6.2.5 Hydraulic Components.

23.6.2.5.1 A hydraulic system filter and strainer shall be provided and shall be located in a readily accessible area.

23.6.2.5.2 Hydraulic hose shall meet the hydraulic pump manufacturer's recommendations for pressure, size, vacuum, and abrasion resistance.

23.6.2.5.3* Hydraulic fittings shall meet the hydraulic pump manufacturer's recommendations for pressure, size, and the type of hose used.

A.23.6.2.5.3 The use of 90-degree fittings should be avoided.

23.6.2.5.4* Where the hydraulic hose comes into contact with other surfaces, the hose shall be protected from chafing.

A.23.6.2.5.4 Hose runs should not include "S" turns that would allow air to be trapped.

23.6.3* Fixed Auxiliary Engine-Driven Generators. If the generator is driven by a fixed auxiliary engine, it shall meet the requirements of sections 23.6.3.1 through 23.6.3.x.

A.23.6.3 Engine-driven generator systems use an internal combustion engine close coupled to a generator. Some installations are capable of producing power while the apparatus is in motion. Generators used in these applications should be specifically designed for mobile applications. Remote generator controls in the driving compartment should be considered and specified if desired.

~~**23.6.3.1** The generator shall comply with Article 445, "Generators," of NFPA 70, National Electrical Code.~~ *[moved to 23.6.8]*

23.6.3.2* Generators powered by a nonchassis engine shall include the following equipment or shall be installed as follows:

(1) Generators shall be installed so that fumes, vapors, heat, and vibrations do not enter the interior passenger compartment.

~~(2) Generators shall have the exhaust outlet piped to the exterior and located so that exhaust is directed away from any operator's position.~~

(3) Generators 8 kW and over shall be equipped with a high temperature automatic shutdown system and low oil (pressure or level) automatic shutdown.

4) The generator ~~s~~ shall be installed in accordance with the generator manufacturer's ~~installation~~ requirements for ventilation and service accessibility.

(5) If the generator is installed in a compartment ~~s~~ and ~~requiring~~ the compartment doors must ~~to~~ be open during its operation, the generator shall be equipped with ~~a compartment door~~ an interlock system to prevent its operation if the doors are not open, or the compartment shall be equipped with a high temperature alarm.

(6) If the generator is installed in a compartment ~~s~~ on a slide tray ~~s~~ and ~~designed for operation in~~ the slide tray must be in the ~~"~~extended or ~~slide~~ out~~"~~ position during operation, an ~~shall have~~ interlock shall be provided to prevent ~~ensure such~~ operation unless the tray is in the correct position, or the compartment shall be equipped with a high temperature alarm.

(7) Permanently installed generators shall have ~~easily~~ readily accessible engine oil drain provisions or piping to a remote location for oil changing.

(8)* ~~Generators located away from or remote from the main operator's area (top of apparatus, over pump, hidden in body, etc.) shall have a remote operating panel with required instrumentation, start and stop controls, and other controls necessary for safe operation.~~

If the generator is located in a position on the apparatus where the operator cannot see the instrumentation and operate the controls while standing at ground level or positioned at a specifically designated operator station, an operating panel with the required instrumentation, start and stop controls, and other controls necessary for safe operation shall be provided at a remote operator's panel.

A.23.6.3.2 The purchaser should consider the following additional remote instruments where a prime mover, other than the propulsion engine, is used to drive a generator:

(1) Oil pressure gauge and low pressure indicator light and audible alarm

(2) Engine temperature gauge and high temperature indicator light and audible alarm

The purchaser might want to specify a high temperature indicator to help troubleshoot automatic shutdowns.

A.23.6.3.2(8) Generators are often positioned away from or remote from the main operator's area (top of apparatus, over pump, hidden in body, etc.). In these cases, the operator needs to bee able to control the generator and monitor the instrumentation without having to climb to these remote locations.

23.6.3.3 Fuel System.

23.6.3.3.1 Fuel lines shall be protected from chafing at all wear points.

23.6.3.3.2 If the fuel source is shared with the apparatus engine, a separate fuel pickup system shall be provided that is arranged to ensure that the generator cannot utilize more than 75 percent of the fuel tank's capacity.

23.6.3.4 Exhaust System.

23.6.3.4.1* The exhaust piping and discharge shall be located or shielded to prevent thermal damage to the apparatus or equipment.

A.23.6.3.4.1 Emissions from exhaust discharge pipes should be directed away from any fire-fighting tools, because such emissions contain an oily substance that could make the tools difficult to handle and possibly dangerous to use.

23.5.3. 4.2 The exhaust shall be piped to the exterior of the vehicle and discharged at a location away from any operator's position.

23.6.3.4.2 Where parts of the exhaust system are exposed so that they can cause injury to operating personnel, protective guards shall be provided.

23.6.3.4.3 Silencing devices shall be provided and shall not create exhaust backpressure that exceeds the limits specified by the engine manufacturer.

23.6.4* Belt Driven ~~Generators or Dedicated Alternators Driving an Inverter~~ Power Sources. If the power source is belt driven, it shall meet the requirements of sections 23.6.4.1 through 23.6.4.x.

A.23.6.4 Belt-driven generator systems use a voltage regulator and a generator driven off the propulsion engine. The complexity of modern engine drive belt configurations limits power output to about 6000 watts. This system will generally maintain acceptable voltage, but in most units the frequency will vary with engine speed. Motor loads should not be powered by this type of power ~~supply~~ source unless the frequency is regulated.

An alternative system uses a separately driven alternator to supply electrical energy to an inverter, which in turn produces line voltage electrical power. These systems are separate from, and do not affect, the performance of the low voltage electrical system. These systems are voltage regulated and provide ample power for scene lighting. Due to the belt-driven configuration, the system is still subject to low voltage at idle conditions, which could damage motors.

23.6.4.1 A means shall be provided to mechanically engage and disengage the generator or alternator rotation, or to electronically stop the production of electricity from the generator or alternator.

23.6.4.2 A voltmeter shall be provided at an ~~the~~ operator's panel for any ~~all sizes of~~ system ~~s~~ of this type.

23.6.4.3 The belt drive system shall be rated to drive the generator or alternator at the nameplate rating.

23.6.5* Line Voltage Systems Derived from Apparatus Low Voltage Power Supply Systems. If the power source derives its input energy from the apparatus low voltage electrical system, it shall meet the requirements of sections 23.6.5.1 through 23.6.5.x.

23.6.5.1* Where a line voltage power source derives its input energy from the apparatus low voltage electrical system, the system shall be installed in strict compliance with the requirements of Chapter 13.

A.23.6.5 .1 Brief descriptions of several different types of systems follow. All of these systems can overload the low voltage electrical system and cause the load management system to terminate the generation of line voltage. As a result, the amount of line voltage power that can be supplied at any given time is totally dependent on the other, higher priority demands placed on the low voltage system.

Dynamic Power Inverter. A dynamic power inverter converts alternator output power to 120 volts ac (or 120/240 volts ac). Power is electronically inverted to ac. Usually the largest system of this type is 7500 watts. Voltage and frequency control are typically very good.

Static Power Inverter. A static power inverter converts 12 volt to 14 volt dc power to 120 volt ac (or 120/240 volts ac) power. Power is electronically inverted to ac. Usually the largest system of this type is 2000 watts. Voltage and frequency control are typically very good.

Motor-Driven Generators. A motor-driven generator system converts 12 volt dc power to 120 volt ac (or 120/240 volts ac) power. The 12 volt dc motor drives an ac generator. Typical power ratings are less than 1600 watts. Voltage and frequency control are less precise than some of the other systems available. These types of systems are suited to providing electric power while the apparatus is in motion.

Transformers. Transformer systems convert energy from the alternator, which is then rectified to 120 volt dc power. Typical installations provide 1000 watts. Output voltage is directly dependent on input voltage. Input voltage is dependent on engine and alternator speed.

In most cases other power sources that do not draw power from the low voltage system are preferable.

23.6.5.2 The alternator and/or battery system shall be adequate to provide power to the power source for continuous operation for a minimum of 2 hours at full output.

A.23.6.5.2 In order to provide adequate power, it may be necessary to provide a means to advance engine speed as described in 23.6.6.

~~**23.6.5.3** A means that works in coordination with other engine speed controls and interlocks required by this standard shall be provided to advance engine speed to obtain the continuous duty ratings stated on the power source specification label.~~

23.6.6 Power Sources Requiring Elevated Engine Speed. If the power source requires the chassis engine to be operating at a specific fixed speed or a specific speed range, it shall meet the requirements of sections 23.6.6.1 through 23.6.6.3.

23.6.6.1 The main propulsion engine shall have a governor capable of maintaining the engine speed within the limits required by the power source to meet the frequency control, voltage control, or power output specifications.

23.6.6.2 An interlock shall prevent engagement of the generator unless the parking brake is engaged and the transmission is in neutral or not connected to the drive wheels.

23.6.6.3* Where the chassis engine drives the generator and electronic engine throttle controls are provided, an interlock shall prevent engine speed control from any other source that would interfere with the generator while the generator is operating.

A.23.6.6.3 Operations in conjunction with a fire pump, aerial device, or other component driven off the fire apparatus's engine could require special or alternate interlock systems.

23.6.7 Power Sources Requiring the Chassis Transmission to be in a Specific Gear. If the power source requires the chassis transmission be in a specific gear when producing line voltage power, it shall meet the requirements of sections 23.6.7.1 through 23.6.7.2.

23.6.7.1 A label indicating the chassis transmission shift selector position to be used for generator operation shall be provided in the driving compartment and located so that it can be read from the driver's position.

23.6.7.2 Interlocks shall be provided that prevent advancement of the engine throttle for generator operation unless the transmission is in the correct gear.

23.6.8 Generators. If the power source is mechanically driven, it shall comply with Article 445, "Generators" of NFPA 70, National Electrical Code.

23.6.9 Chassis Engine-Driven Generators. Where the generator is driven by the chassis engine, the requirements in 23.6.9.1 through 23.6.9.3 shall apply.

23.6.9.1* Unless the generator is always engaged, a "Generator Engaged" indicator shall be provided in the driving compartment to indicate that the generator shift has been successfully completed.

A.23.6.9.1 When a split shaft PTO is used, completion of the generator shift might require that the chassis transmission be shifted into the proper gear ~~(split shaft PTOs only)~~.

23.6.9.2 Unless the generator is always engaged and operating, an "OK to Operate Generator" indicator shall be provided in the driving compartment to indicate that the generator is engaged (if not always engaged), the transmission is in the proper gear (if required, automatic transmissions only), and the parking brake is engaged (if applicable).

23.6.9.3 An interlock system shall be provided to prevent advancement of the engine speed in the driving compartment or at any operator's panel unless the parking brake is engaged, and the transmission is in neutral or the output of the transmission is correctly connected to a pump or generator instead of the drive wheels.

23.6.10* Waveform Created Electronically. If the power output waveform is electronically created, the purchaser shall specify whether modified sine wave or pure sine wave output is required.

A.23.6.10 Devices that produce modified sine waves may be less expensive than devices that produce pure sine waves. Power from electric utilities, and most traditional mechanical generators, are close to a pure sine wave. A modified sine wave output is satisfactory for many types of equipment, but may cause problems with some types of equipment including:

- Some computer and electronic equipment
- Some fluorescent lights with electronic ballasts
- Some tools with variable speed motor controls
- Some battery chargers
- Some medical equipment
- Some other equipment

The purchaser should identify what equipment they intend to power from the power source and verify with the equipment manufacturers that the equipment is compatible with modified sine wave power sources before specifying such a power source.

1901-168 Log #CP76 Final Action: Accept
(23.10.3.4 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add the following new requirement:
23.10.3.4* Where the power source is 120/240 volts and 120 volt loads are connected, the apparatus manufacturer or line voltage system installer shall consider load balancing to the extent that it is possible.
Add an annex to the new 23.10.3.4 to read:
A.23.10.3.4 Similar fixed loads should be paired on opposite legs of the power source where practical. If pairs of receptacles are provided on the same side of the apparatus or on the front or rear of the apparatus, they should be connected to opposite legs of the power source. If two 120 volt cord reels are provided, they should be connected to opposite legs of the power source. 120/240 volt cord reels should always be connected to both legs of the power source.
Substantiation: Ideally, 120 volt loads on a 120/240 volt power source should be balanced as closely as possible on the 2 power legs. It is not always possible to exactly balance the fixed loads, and plug connected equipment connected to non-dedicated receptacles are mostly beyond the control of the designer. This addition gives guidance or at least suggests that balancing be considered.
Committee Meeting Action: Accept

1901-169 Log #22 Final Action: Reject
(23.12.5)

Submitter: David McClure, Midway Fire Company No.
Recommendation: Add text to 23.12.5 to read:
All auxiliary power (110V-220V) provided by onboard generation shall utilize watertight receptacles and shall not be located within three feet of any fire hose connection.
Substantiation: The fire ground incident is prone to water spray and weather conditions. The use of watertight plugs and receptacles would decrease the hazard of electrical shock. Examples, see Woodhead Co. Products.
Committee Meeting Action: Reject
Committee Statement: These are options that can be specified by any purchaser. Outlets are often placed in the pump panel area and there does not seem to be a significant problem with this location. 23.12.5.1.1 already requires a wet location cover. While watertight plugs and receptacles are available, they are hard to use, hard to maintain, and in almost every case plugs and cord end receptacles are not supplied by the apparatus manufacturer and thus not within the scope of this standard. In general, the waterproof covers for plugs and cord end receptacles of one manufacturer are not compatible with the covers from another manufacturer. Watertight connectors are very expensive and not interoperable with non watertight connectors and watertight connectors of other vendors.

1901-170 Log #19 Final Action: Accept in Principle
(23.12.5.1.1)

Submitter: Mike Lemieux, Rosenbauer America
Recommendation: Add new text to read:
Branch circuit overcurrent protection shall be provided as stated in 23.10.2, however, GFCI protection shall not be required on automotive fire apparatus.
Substantiation: The NEC 551.41(c)(4) states that GFCI protection for personnel is required for receptacles located on the exterior of the vehicle. This addresses recreational vehicles but does not specifically address requirements for fire trucks.
Committee Meeting Action: Accept in Principle
See committee action on proposal 1901-164 (Log #91).
Committee Statement: The committee believes the actions taken on proposal 1901-164 (Log #91) and particularly the changes to 23.3.3 address the concerns of the submitter.

1901-171 Log #CP77 Final Action: Accept
(23.13, 23.13.5 and 23.13.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 23.13 to read as follows:

23.13 All permanently mounted cord reels shall be rated for continuous duty and installed to be accessible for removal, cord access, maintenance, and servicing.

Revise 23.13.5 to read as follows:

23.13.5* The wire size shall be in accordance with NFPA 70, "*National Electrical Code*", Table 400.5(A), but in no case shall it be smaller than 12 AWG.

Revise A.23.13.5 to read as follows:

A.23.13.5 Table A.23.13.5 lists the suggested cord size for cord reels based on the desired circuit ampacity and the cord length. ~~The ratings for 5 amps, 7.5 amps, and 10 amps should be used only where an appropriate load is permanently connected. Any~~ All cord reel with one or more outlets should be rated at 15 amps or greater.

For heavy loads such as large smoke fans and hydraulic rescue tool power plants, the purchaser should consider 240 volt units instead of 120 volt units. This will allow the use of smaller cords and reels. For example, a ~~150~~ 200 ft reel to supply a hydraulic rescue tool (HRT) power plant that draws 15 amps at 240 volts would require 12 gauge wire. The same power unit in a version to run on 120 volts would draw 30 amps and would require 8 gauge wire.

Cord reels for three-phase power or other specialized applications should be designed with the assistance of a qualified electrical engineer.

***Insert 1901 Log CP77 Rec Table A.23.13.5 ***

Revise A.23.13.5 to read as follows:

A.23.13.6 The purchaser may want to specify that the ~~The~~ cord on the reel ~~should~~ be provided with a disconnect means within 18 in. (457 mm) from the reel for cord removal if the cord is 8 AWG or smaller. A disconnect makes it easier to replace the wire if damaged, or to use the wire to extend another cord reel, but reduces the capacity of the reel and makes it harder to coil the wire on the reel.

Substantiation: Table A.23.13.5 "Wire Size for Various Electrical Cord Lengths" is based on a series of calculations that were not conservative enough. The net result is that the table allows a voltage drop of up to 5% in the cord reel wire alone. The National Electrical Code section 210.19(A)(1) FPN No. 4 calls for the conductors to be sized to prevent a voltage drop exceeding 3% in the branch circuit and 5% in the feeder and branch circuit together. The annex item and table should be revised as follows based on 3% voltage drop at 120 Volts in the cord reel plus 30 feet, allowing for 30 feet of wire in the branch circuit up to the cord reel, and the 2% drop in the feeder circuit from the power source to the main circuit breaker panel. By far the most typical cord reel in the fire service today is 20 amps at 200' to 250'. These cord reels are almost all being done with 10 AWG wire by reputable manufacturers, rather than the 12 AWG recommended by the existing table. No changes would be needed from this wire size in these cord reels. This voltage drop becomes most critical when starting inductive (motor) loads with smaller generators. The lines for 5, 7.5, and 10 amps were dropped as not relevant. The cord disconnect wording in the annex was changed to make it more informative.

Committee Meeting Action: Accept

Insert for proposal 1901-171 Log #CP77

Table A.23.13.5 Wire Size for Various Electrical Cord Lengths

Circuit Ampacity	Wire Size (AWG) for Cord Length of					
	50 ft (15 m)	100 ft (30 m)	150 ft (45 m)	200 ft (60 m)	250 ft (75 m)	300 ft (90 m)
~~5~~	~~16~~	~~16~~	~~16~~	~~16~~	~~16~~	~~14~~
~~7.5~~	~~16~~	~~16~~	~~16~~	~~16~~	~~16~~	~~14~~
~~10~~	~~16~~	~~16~~	~~16~~	~~16~~	~~14~~	~~14~~
15	~~14~~ 12	~~14~~ 12	~~14~~ 12	~~14~~ 12	~~12~~ 10	~~12~~ 10
20	12	12	12	~~12~~ 10	~~12~~ 10	~~10~~ 8
25	12	12	~~12~~ 10	~~12~~ 10	~~10~~ 8	~~10~~ 8
30	10	10	10	~~10~~ 8	~~10~~ 8	~~10~~ 6
35	8	8	8	8	~~8~~ 6	~~8~~ 6
40	8	8	8	8	~~8~~ 6	~~8~~ 6
50	6	6	6	6	6	~~6~~ 4

1901-172 Log #127 Final Action: Accept in Principle
(23.14.3)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
The manufacturer of the device shall ~~type~~ certify that the scene light has ~~been tested and complies with the vibration testing requirements of SAE J575, *Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less Than 2032 mm in Overall Width.*~~ passed a vibration test conducted in accordance with industry standards.
Substantiation: Vibration testing should be required for scene lighting. However, the SAE test methodology is expensive and can only be conducted at a few laboratories. The SAE-required test equipment is prohibitively expensive to purchase, and the test method has not been demonstrated to be more effective than any other standardized vibration test at identifying construction problems in scene lighting. As long as the fixture is vibration tested at its natural frequencies (i.e. brought to resonance) for a suitable length of time, the test will be worst case, and any construction problems will be identified. There are numerous tests methods able to accomplish this on commercially-available vibration-testing equipment, and any such test should be equivalent for the purpose of installation on fire apparatus.
Committee Meeting Action: Accept in Principle
Revise 23.14.3 to read as follows:
The manufacturer of the device shall have the scene light tested by a nationally recognized testing laboratory and listed to UL 153 *Standard for Portable Electric Luminaires* or UL 1598, *Luminaires.* ~~type certify that the scene light has been tested and complies with the vibration testing requirements of SAE J575, Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less Than 2032 mm in Overall Width.~~
Committee Statement: The committee agreed with the submitter but felt that "industry standards" was too vague. The specific standards referenced are the standards being used today for testing by UL and ETL for scene lights for the fire service. Most scene lights manufactured today are listed based on these two standards.

1901-173 Log #CP78 Final Action: Accept
(23.16.2.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 23.16.2.2.
Substantiation: The requirement is unnecessary and is not in the similar sections on dielectric withstand testing in the National Electrical Code. It apparently came from a UL document and was misquoted from that source.
Committee Meeting Action: Accept

1901-174 Log #130 Final Action: Accept in Principle
(23.16.5)

Submitter: Gary McCann, AMPS
Recommendation: Add new text to read:
After hydraulic generator has reached operating temperature the apparatus engine speed will be reduced to it's lowest RPM while the generator is loaded to it's maximum kW. Any frequency droop below 59.5 hertz for 60 hertz system shall be deemed a failure.
Substantiation: Quite often to low of a PTO ratio or a wrong hydraulic pump will be used and the generator will run at a low frequency/voltage when the apparatus's engine is reduced to idle. The low frequency/voltage damages the equipment that is being ran by the generator and can damage the hydraulic generator system itself. A non electronic system would be K with a 1 hertz droop but with electronic system a .5 hertz droop is all that should be allowed or the generator could temporarily over speed if the engine speed is suddenly increased.
Committee Meeting Action: Accept in Principle
Add new text as 23.16.5.3.5 to read:
If the generator is driven by the chassis engine and the generator allows for operation at variable speeds, the chassis engine speed shall be reduced to the lowest RPM allowed for generator operation and the voltage and frequency shall be recorded.
Renumber existing 23.16.5.3.5 and following sections going forward.
Committee Statement: Adding this specific section puts the test point desired into the test sequence as defined. It maintains the normal frequency requirement.

1901-175 Log #CP81 Final Action: Accept
(23.16.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 23.16.5 after the text added by proposal 1901- (Log #CP79) to read:
23.16.5 If the apparatus is equipped with a transfer switch, it shall be tested to verify operation and that all non-grounded conductors are switched.
Renumber existing text going forward.
Substantiation: Some apparatus' line voltage systems include a transfer switch to allow powering on-board air conditioners, battery chargers, or other equipment from a shore line and an on-board power source. Section 23.8.2 covers the requirements but there is no testing section.
Committee Meeting Action: Accept

1901-176 Log #CP79 Final Action: Accept
(23.16.5 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 23.16.5 to read:
23.16.5 Electrical continuity shall be verified from the chassis or body to all line voltage electrical enclosures, light housings, motor housings, light poles, switch boxes, and receptacle ground connections that are accessible to the firefighter in normal operations.
Renumber existing text going forward.
Substantiation: There have been reports of firefighters getting shocked off of lighting fixtures on apparatus. Since these should always be grounded to the chassis and body, this seems to indicate that in some cases the ground wire is not getting wired through to the appliance. This test verifies that all points are bonded to the body when the apparatus is built.
Committee Meeting Action: Accept

1901-177 Log #CP80 Final Action: Accept
(23.16.5, 23.16.5.1, 23.16.5.2, 23.16.5.3.9)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 23.16.5 through 23.16.5.2 to read as follows:

23.16.5* ~~Operational~~ Certification Test of ~~Fixed~~ Power Source

23.16.5.1 ~~If the apparatus is equipped with a fixed power source, the~~ The apparatus manufacturer or installer of the power source shall perform ~~an operational~~ a certification test on the power source.

23.16.5.2 The testing of the ~~fixed~~ power source shall be witnessed, and the results of the tests of the ~~fixed~~ power source shall be certified by an independent third-party certification organization.

Revise 23.16.5.3.9 to read as follows:

23.16.5.3.9 Concurrent Pumping.

23.16.5.3.9.1* If the apparatus is equipped with a fire pump, the 2 hour ~~operational~~ certification test of the fixed power source shall be completed with the fire pump pumping at 100 percent capacity at 150 psi (1000 kPa) net pump pressure.

23.16.5.3.9.2 The test shall be permitted to be run concurrently with the pump certification test required in 16.13.1.

23.16.5.3.9.3 Running the pump when testing portable generators connected to fixed wiring on the apparatus shall not be required unless the generator is mounted in an area subjected to a rise in ambient temperature greater than 30° F (17°C) from the vehicle engine, pump or other heat source.

Add an annex to 23.16.5.3.9.1 to read:

A.23.16.5.3.9.1 For fire pumps rated at less than 750 gpm, the generator test of 2 hours is longer than the pump test portion at 100 percent of capacity at 150 psi (1000 kPa) net pump pressure. The generator test is still required to be 2 hours with the pump running at 100 percent of capacity, the last 30 minutes of which could be the start of the pump test.

Substantiation: Section 23.16.5 Operational Test of Fixed Power Source uses the term “Operational Test”. With the development of NFPA 1911, a very specific distinction was made between an Operational Test (does it operate?) and a Performance Test (does it perform to certain measurable specifications?). The test specified in this section is a test against the specifications listed on the Power Source Specification Label to be certified by an independent third party certification organization, hence the term has been changed to a "Certification Test". This is the same term used for the pump test under similar circumstances.

As currently written, all requirements of chapter 23 apply to a portable generator attached to fixed wiring on the apparatus, and thus being used as a fixed generator, except the operational (certification) testing. These generators are probably the least likely to perform as expected. This change now requires the testing of these generators to the specifications on the power source specification label like other power sources. In this way, the purchaser knows what they are getting works as stated on the power source specification label and certified by an independent third party. The committee felt that it was not necessary to run the pump in these cases if the generator is mounted away from the pump and engine since the heat from each would not affect the other significantly.

Committee Meeting Action: Accept

1901-178 Log #93 Final Action: Accept
(24.2.2)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Delete the following text:

~~The size of the command center located in a body shall be a minimum of 25 ft^2 (2.3 m^2) of floor space.~~

Substantiation: The area that a “command center” occupies does not in any way dictate whether or not it is a command center. Therefore, this paragraph should be deleted.

Committee Meeting Action: Accept

1901-179 Log #94 Final Action: Accept in Principle
(24.4)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Revise text to read as follows:
When the fire apparatus is stopped with all command center equipment ~~major operational components~~ in operation, the noise levels in the command area shall not exceed 80 dBA.
Substantiation: The term “major operational components” is vague. Those items required for command and communications must all be functioning.
Committee Meeting Action: Accept in Principle
Revise text to read as follows:
When the fire apparatus is stopped with all components on the apparatus required for continuous operation at an incident ~~major operational componenents~~ in operation, the noise levels in the command area shall not exceed 80 dBA.
Committee Statement: The committee has revised the suggested wording for further clarification.

1901-180 Log #95 Final Action: Reject
(24.5.2)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Delete text as follows:
~~Lighting levels during command operations shall provide a continuous 100 fc (1000 1x) in the command area.~~
Substantiation: Not all command operations require or even desire to have light at a certain level. Customers specify what lights they want in their vehicles based on the intended use. With many computer or LCD monitors in operation, the level required and desired may be much less than that currently being specified.
Committee Meeting Action: Reject
Committee Statement: The capability to provide that level of lighting is necessary in a command area. See committee proposal 1901-241 (Log #CP124) which adds annex material that suggests the purchaser may want to specify additional lighting or switching that will allow other lighting conditions during specific operations.

1901-181 Log #128 Final Action: Reject
(24.5.2)

Submitter: Joseph Bernert, Havis-Shields Equipment Corp.
Recommendation: Revise text to read as follows:
Lighting levels during command operations shall provide a continuous illumination level of 100 fc (~~1000~~1076 lx) in the command area, computed as shown in Section 13.10. The Lumen Method may be used with the Effective Surface Area (ESA) measured as the planar area at seat level inside the cab. If no seats are in the interior space, then the ESA is to be measured at the floor of the compartment. Alternatively, IES photometry may be used.
Substantiation: Correct conversion for fc and lx; 1 fc = 10.76 lx. Use lighting design method proposed for 13.10.
Committee Meeting Action: Reject
Committee Statement: The method of calculation that was proposed for 13.10 was not added to the standard. Also see committee statement at proposal 1901-21 (Log #121) regarding the use of SI units.

1901-182 Log #96 Final Action: Accept
(24.9.1)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Delete text as follows:
~~The interior surfaces of command areas shall be designed to sustain the usage expected in a command area.~~
Substantiation: Command centers are a very customer-specific requirement. Customers specify the type of material required. It is the manufacturer's responsibility to properly install the material.
Committee Meeting Action: Accept

1901-183 Log #CP82 Final Action: Accept
(25.2.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.2.2 to read as follows:
Cascade and bulk air systems shall be capable of storage and operation in any ambient temperature between 0°F and 110°F (–18°C and 43°C).
Substantiation: This change reflects the addition of bulk systems to the requirements.

Committee Meeting Action: Accept

1901-184 Log #CP83 Final Action: Accept
(25.2.7.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.2.7.4 to read as follows:
Plugs shall be bar stock type with Allen head or hex heads.
Substantiation: Text changed to reflect use of new type plugs.

Committee Meeting Action: Accept

1901-185 Log #CP84 Final Action: Accept
(25.2.7.7.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete 25.2.7.7.2.
Substantiation: These caps are usually vented and do not need a safety factor.
Committee Meeting Action: Accept

1901-186 Log #CP85 Final Action: Accept
(25.2.9.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.2.9.6 to read as follows:
Any gauge shall be capable of reading at least 110 percent but not greater than 200 percent of maximum working air pressure. ~~50 percent higher than any safety relief valve settings on lines supplying those gauges.~~
Substantiation: This better reflects the measuring range of the gauge as it related to the pressure it will see.
Committee Meeting Action: Accept

1901-187 Log #CP86 Final Action: Accept
(25.2.10.1(2))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.2.10.1(2) to read as follows:
Electrical panels, junction boxes, circuit breakers and fuses ~~(if used),~~ shall be readily accessible.
Substantiation: Additional electrical equipment needs to be accessible for maintenance.
Committee Meeting Action: Accept

1901-188 Log #98 Final Action: Accept in Principle
(25.2.13.1)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Revise text to read as follows:
If a breathing air system without a compressor/purification system is provided, the ~~contractor~~ apparatus manufacturer or manufacturer's representative shall provide training to fire department personnel.
Substantiation: The term "contractor" can be misleading. "Apparatus manufacturer or manufacturer's representative" clearly identifies who will provide the initial fire department training.
Committee Meeting Action: Accept in Principle
Revise 25.2.13.1 to read as follows:
If a breathing air system without a compressor/purification system is provided, the ~~contractor~~ final installer of the air system shall ~~provide~~ supply a qualified person to provide operational training to fire department personnel.
Revise A.25.2.13.1 to read as follows:
~~If the apparatus is equipped with a breathing air system such as an air cascade system or air booster system, the purchaser might still wish to require the system manufacturer rather than just the contractor to provide on-site training on those systems.~~ Expectations for training should be carefully defined in the purchaser's specification.
Committee Statement: The committee is replacing "contractor" with "final installer" as neither the apparatus manufacturer not the contractor may be the installer of the breathing air system. The committee is also requiring a "qualified person" as defined in 3.3.140 provide the training. This does not require the breathing air equipment manufacturer to supply this training, but would still require the final installer to be responsible and not leave it to the sales representative who may not be qualified. With these changes the first sentence in the annex is no longer necessary.

1901-189 Log #97 Final Action: Accept in Principle
(25.2.13.1.2)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Revise text to read as follows:
The trainer shall be certified by the ~~air compressor system assembler~~ apparatus manufacturer or manufacturer's representative as qualified to perform such training.
Substantiation: The term "air compressor system assembler" can be misleading. "Apparatus manufacturer or manufacturer's representative" clearly identifies who will provide the initial fire department training. In addition, this paragraph is still part of the standard that refers to breathing air systems without a compressor/purification system. Therefore any reference to a compressor should be removed. The apparatus manufacturer is responsible for the overall breathing air system installation. Therefore any reference to a compressor should be removed. The apparatus manufacturer is responsible for the overall breathing air system installation. Therefore, the apparatus manufacturer should be responsible for the training.
Committee Meeting Action: Accept in Principle
Delete 25.2.13.1.2
Committee Statement: With the changes made to 25.2.13.1, it is not necessary to require the apparatus manufacturer to certify the person doing the training.

1901-190 Log #99 Final Action: Accept in Principle
(25.2.13.2)

Submitter: William Proft, Pierce Manufacturing Inc.
Recommendation: Revise text to read as follows:
If a breathing air system that includes a compressor/purification system is provided, ~~a representative of the breathing air system manufacturer~~ the apparatus manufacturer or manufacturer's representative shall provide training to fire department personnel.
Substantiation: The term "breathing air system manufacturer" can be misleading. "Apparatus manufacturer or manufacturer's representative" clearly identifies who will provide the initial fire department training. In many instances, the fire apparatus manufacturer installs the breathing air compressor along with the rest of the necessary equipment. In addition, the compressor may be purchased from one manufacturer while the fill enclosure, air control panel, and storage vessels may all be supplied by other manufacturers. Therefore, since the fire apparatus manufacturer is responsible for the correct installation of all of the necessary components, the same manufacturer should also be qualified and able to perform the fire department training.
Committee Meeting Action: Accept in Principle
Revise 25.2.13.2 to read as follows:
If a breathing air system that includes a compressor/purification system is provided, a person certified by the breathing air compressor manufacturer in the operation of the specified air compressor system shall provide training to fire department personnel.
Committee Statement: This would allow the final installer to have their personnel certified in the operation of specific systems so they could do training on the air system, in lieu of only the breathing air system manufacturer. It also ensures the training is done by persons who are knowledgeable in the specific system.

1901-191 Log #CP88 Final Action: Accept
(25.3.3.4 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new 25.3.3.4 to read as follows:
The air compressor compartment shall be equipped with a temperature sensing device that will actuate an audible and visual alarm at the fill station operator's panel, when ambient temperature at this location exceeds 140 degrees.
Substantiation: It is essential that there be adequate cooling of the air compressor and purification system for it to function properly. All compartment doors at the air compressor location should be fully open for sufficient air flow and cooling of the compressor. However, a requirement for a high temperature alarm is being added to warn the operator that the air in the compartment is getting too hot allowing the operator to take action before damage is done.
Committee Meeting Action: Accept

1901-192 Log #CP89 Final Action: Accept
(25.3.3.5 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new 25.3.3.5 to read as follows:
The final stage installer shall provide a warning label(s) cautioning: "Do not obstruct air flow path with equipment mounting"
Add an annex to the new 25.3.3.5 to read as follows:
The purchaser should be extremely careful when mounting or storing equipment in compartment areas to not obstruct open air flow paths to a breathing air compressor required for cooling purposes.
Substantiation: Certain areas on the apparatus must remain free of equipment storage to provide adequate air flow around the compressor, even though large areas in compartments could be left open when mounting the air compressor. As the final installer can not control the equipment mounting after the delivery of the apparatus, wording in the annex is cautioning the purchaser to assure free air flow when mounting equipment.
Committee Meeting Action: Accept

1901-193 Log #CP90 Final Action: Accept
(25.3.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.3.5 to read as follows:
If interstage condensate traps are provided by the compressor manufacturer, they shall be plumbed with ~~to~~ the final separator and to an automatic condensate drain system, which shall be plumbed to a reservoir to collect the discharged liquids.
Substantiation: This is a minor change for clarification of the plumbing.
Committee Meeting Action: Accept

1901-194 Log #CP91 Final Action: Accept
(25.3.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.3.6 to read as follows:
25.3.6 Compressor Drive System, Controls, and Air Quality Monitoring.
Substantiation: This subsection deals with air quality monitoring as well and that should be reflected in the subsection title.
Committee Meeting Action: Accept

1901-195 Log #CP92 Final Action: Accept
(25.3.6.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.3.6.2 to read as follows:
25.3.6.2* All compressors shall be equipped with the following:
(1) An air pressure switch that controls the maximum operating pressure
(2) Interstage pressure gauges after each compression stage
(3) Final stage pressure gauge
(4) Oil pressure gauge on pressure lubricated compressors or an oil level indicator or device on nonpressure oil-type compressors
(5) Electric, nonresettable hourmeter(s)
(6) Air quality monitoring system
Substantiation: There are high quantities of carbon monoxide, water moisture and other gases in the air at a fire scene. It is critical that the air being purified and compressed to refill breathing air cylinders be uncontaminated. Therefore it is critical to have an air quality monitor as part of the compressor system.
Committee Meeting Action: Accept

1901-196 Log #CP93 Final Action: Accept
(25.3.6.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.3.6.3 to read as follows:
25.3.6.3* Compressors with electric motors shall be equipped with the following:
(1) Magnetic motor starter with motor overload protection
(2) Protective control to prevent automatic restart after power loss has been restored
(3) A shorepower connection to permit external electric power to supply the air compressor's electric motor when the vehicle is in a fire station.
Revise A.25.3.6.3 to read as follows:
A.25.3.6.3 ~~The purchaser should consider a shorepower connection to permit external electric power supply to the electric motor. If a shorepower connection is provided, it is important to have a transfer switch to allow the user to power the air compressor independently from either the onboard generator or shorepower.~~ It is important to have a transfer switch or other means to isolate the generator power from the shorepower connection.
Three-phase ~~240 volt~~ electric motors with "soft starting" provisions are the most practical electric motors for air compressors. The fire station electrical supply should be checked for capacity and compatibility with the breathing air compressor. The generator should be sized to provide additional capacity for floodlight, emergency power applications, and other utility usage. A general guideline would be to specify a generator output with twice the capacity as required for the breathing air compressor.
The fire apparatus should be provided with a compatible shorepower cord and plugs, sized to match electric motor requirements. The shorepower cord shall also be sized to reflect distance from fire station service entrance to the fire apparatus shorepower receptacle.
Substantiation: A requirement for a shore power connection is being made a part of the requirements when the air compressor is driven by an electric motor as most systems are designed to provide that capability.
The annex material is being changed to reflect that the shore power connection is now required but to advise that in doing so, it is important to have a means of isolating the shore power from the onboard generator.
The 240 volts reference in the annex is being deleted as it could be other voltages.
Committee Meeting Action: Accept

1901-197 Log #CP94 Final Action: Accept
(25.4.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.4.6 to read as follows:
A ~~n upstream valve and~~ pressure gauge shall be installed ahead of the purifier to ~~control and~~ monitor depressurization before service, maintenance, or repairs of the compressor or purifier.
Substantiation: There may be a check valve upstream of the purifier but a shutoff valve could allow high pressure air to get trapped, a dangerous condition during servicing of the air compressor/purification system.
Committee Meeting Action: Accept

1901-198 Log #CP95 Final Action: Accept
(25.4.7.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.4.7.1 to read as follows:
A piping connection shall be provided downstream of the pressure regulator valve to provide an air sample for the air quality testing ~~monitors~~.
Substantiation: The purpose of the piping connection is to allow air to be drawn for testing, this is not an air monitoring connection.
Committee Meeting Action: Accept

1901-199 Log #CP96 Final Action: Accept
(25.4.7.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.4.7.2 to read as follows:
A line valve shall be installed on the purifier outlet to allow ~~isolate~~ the purifier to be isolated from the downstream air ~~remainder of the~~ system during inspection, maintenance, and repairs.
Substantiation: The revised wording is for clarification of the purpose of the valve.
Committee Meeting Action: Accept

1901-200 Log #CP97 Final Action: Accept
(25.4.8 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new 25.4.8 to read as follows:
25.4.8 A warning label shall be installed at the purifier chambers as follows:
WARNING: Prior to changing purifier cartridges, or performing service or maintenance on the purifier system, release all air pressure in the air compressor system.
Substantiation: Numerous accidents have occurred when an operator tries to remove or service a purifier without properly releasing air pressure from the system prior to working on the system. Providing a label will remind the person servicing the purifier.
Committee Meeting Action: Accept

1901-201 Log #CP121 Final Action: Accept
(25.5.1.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 25.5.1.2 to read as follows:
25.5.1.2 The air tank manufacturer shall provide a copy of either the DOT "Report of Inspection of Gas Cylinders" or the ASME "Manufacturers Data Report for Pressure Vessels" and these certificates shall be delivered to the purchaser with the vehicle.
Renumber 25.5.1.2 as 25.5.1.3.
Substantiation: These certificates are the customers only certified documents that prove the air storage cylinders were tested to their particular code requirements prior to shipment from the original cylinder manufacturers facility.
Committee Meeting Action: Accept

1901-202 Log #CP99 Final Action: Accept
(25.9 and 25.9.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.9 to read as follows:
25.9 SCBA or SCUBA Air Cylinder Fill Station.
Revise 25.9.1 to read as follows:
25.9.1 If SCBA and/or SCUBA air cylinders are to be ~~re~~filled from a fire apparatus–mounted air system, the fill station shall meet the requirements of 25.9.1.1 through 25.9.1.6.
Substantiation: The change to 25.9 is to recognize that the requirements apply to fill stations for SCUBA Cylinders as well as SCBA cylinders.
The change to 25.9.1 is to recognize that some fill stations accommodate he filling of both SCBA and SCUBA cylinders.
Committee Meeting Action: Accept

1901-203 Log #CP100 Final Action: Accept
(25.9.4 and 25.9.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.9.4 to read as follows:
A separate ~~bleeder and~~ flow restriction device shall be provided on each SCBA fill hose.
Add a new requirement as 25.9.5 to read as follows:
A method of bleeding each air cylinder fill hose shall be provided.
Renumber going forward.
Substantiation: The revised wording allows the final assembler to provide any type of manual or automatic air bleed system from the charged SCBA fill line.
Committee Meeting Action: Accept

1901-204 Log #CP101 Final Action: Accept
(25.9.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement as 25.9.5 to read as follows:
25.9.5 The SCBA or SCUBA fill enclosure shall be installed in accordance with requirements of the fill enclosure manufacturer.
Renumber going forward.
Substantiation: It is critical to the proper performance of the fill station that it be installed on the apparatus in accordance with the manufacturer's requirements.
Committee Meeting Action: Accept

1901-205 Log #CP102 Final Action: Accept
(25.9.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.9.5 through 25.9.5.3 to read as follows:
25.9.5 Testing and Certification.
25.9.5.1 The manufacturer of the enclosed air refill station shall type test a standard production model to validate the design.
25.9.5.1.1 If the enclosed air fill station is for SCBA cylinders, the test shall include pressurizing an SCBA cylinder that is capable of holding at least 88 ft3 (2492 L) of air at 4500 psi to failure. The failure shall occur when the pressure in the cylinder is no less than 4500 PSI (31,025 kPa)
25.9.5.1.2 If the enclosed air fill station is for SCUBA cylinders, the test shall include pressurizing an SCUBA cylinder that is capable of holding 80 ft3 (2265 L) of air at 3000 psi to failure. The failure shall occur when the pressure in the cylinder is no less than 3000 psi (20,685 kPa)
25.9.5.1.3 If the enclosed air fill station is designed for both SCBA and SCUBA cylinders, the refill station shall be tested in accordance with 25.9.5.1.1.
25.9.5.1.4 If the system provides for simultaneously refilling of multiple cylinders, the other chambers shall contain air cylinders equal in capacity and pressure to the cylinder in the chamber being tested.
25.9.5.1.5 The test pressure shall be measured at the SCBA or SCUBA fill enclosure.
25.9.5.1.6 The SCBA or SCUBA fill station shall be tested in a configuration that meets the fill station manufacturers standard installation requirements
25.9.5.2 The testing shall prove that:
(1) The air refill station is capable of containing all fragments of a failed cylinder
(2) The cylinders in adjacent chambers do not rupture
(3) The venting provisions direct the air-concussive release away from the operator.
25.9.5.3 All test shall be witnessed and the test results certified by an independent third-party certification organization.
Substantiation: The committee has rewritten the testing and certification requirement to better define the testing procedure, to provide for testing fill stations that are for SCUBA air cylinders only, and to be sure the testing is being witnessed and the test results certified by an independent third-party certification organization.
Committee Meeting Action: Accept

1901-206 Log #CP103 Final Action: Accept
(25.10.4.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.10.4.2 to read as follows:
The air hose reel shall have fluid path sized for its intended flow and working pressure.
Substantiation: As currently written, the requirement may result in air hose sizing that is inadequate to meet the air flow requirements of the equipment it is supplying.
Committee Meeting Action: Accept

1901-207 Log #CP104 Final Action: Accept
(25.10.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.10.5 to read as follows:
The reel shall be marked with a label ~~plate~~ to indicate its intended use and the following:
Substantiation: The correct term is label as this is providing information useful to the operator.
Committee Meeting Action: Accept

1901-208 Log #CP105 Final Action: Accept
(25.11.1 and 25.11.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.11.1 to read as follows:
All low pressure [gauge pressure not over 300 psi (2000 kPa)] air hose and couplings supplied shall comply with their intended application and shall have a pressure rating equal to or greater than the highest pressure expected to be encountered as input to the hose with a test safety factor of at least 3:1.
Add a new paragraph as 25.11.2 to read as follows:
All high pressure [gauge pressure over 300 psi (2000 kPa)] air hose and couplings supplied shall comply with their intended application and shall have a pressure rating equal to or greater than the highest pressure expected to be encountered as input to the hose with a test safety factor of at least 4:1.
Renumber 25.11.2 through 25.11.8 as 25.11.3 trough 25.11.9.
Substantiation: Air hose and couplings for high pressure applications should have a higher safety factor.
Committee Meeting Action: Accept

1901-209 Log #CP106 Final Action: Accept
(25.11.5)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.11.5 to read as follows:
Low pressure breathing air hose shall be a minimum 3/8 in. (10 mm) ~~½ in. (13 mm)~~ ID with a maximum hose length of not more than 300 ft (90 m).
Substantiation: The change reflects the availability of a common size hose that meets the need.
Committee Meeting Action: Accept

1901-210 Log #CP108 Final Action: Accept
(25.14)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise 25.14 to read as follows:

25.14* Breathing Air System Testing and Delivery.

25.14.1 The complete air system shall be tested by the final system installer after its installation on the fire apparatus is complete, using the testing procedure prescribed by the system manufacturer.

25.14.2 The following items shall be tested or verified on all air systems:

(1) Pressure test the system to its maximum operational pressure and check all connections made as a part of the installation for leaks with a leak detection device, which could include bubble fluid or electronic means.

(2) Verify that any leaks detected during the testing in 25.14.2(1) are repaired.

(3) Visually verify the relief valve set points and working pressure of the air tank.

(4) Verify the accuracy of all pressure gauges.

(5) Fully test the operational capabilities of the fill station as established by the manufacturer of the fill station.

(6) Seal all fill adapter connections to eliminate the introduction of contaminants prior to shipment.

25.14.3 If the system's air supply includes a compressor/purification system, the following additional items shall be tested or verified:

(1) Confirm that the fluid levels are at the manufacturer's recommended levels, including the lubricant and coolant if the system is liquid cooled.

(2) Verify the expiration date of the purification filters and cartridges and that they have been installed as required by the manufacturer of the system.

(3) Operate the air compressor for a minimum of 2 hours or the period required to completely fill the onboard air tanks, whichever is longer.

(4) Confirm that all compressor interstage pressures are within guidelines as established by the compressor manufacturer.

(5) Confirm the operation of the compressor shutdown switch at the pressure requested by the purchaser.

(6) Confirm the set point of the final pressure safety relief valve and pressure maintaining valve.

(7) Confirm the factory set limits of all electrical shutdown devices, including low oil pressure, automatic condensate drain system, high air temperature, excessive processed air moisture, high carbon monoxide, and motor amperage draw.

(8) Confirm that the breathing air system is installed in accordance with breathing air compressor manufacturer’s requirements and drawings (see 25.2.11.6.3) and confirm that the cooling air flow is adequate.

25.14.4 Breathing Air Quality.

25.14.4.1 Prior to delivery of the apparatus equipped with a breathing air compressor to the end user, the final system installer shall draw an air sample from the breathing air system at each SCBA or SCUBA fill station and at the end of each air hose on an air reel and submit the sample(s) to be tested in accordance with NFPA 1989, Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection.

25.14.4.2 The breathing air shall meet the air quality standards defined in NFPA 1989.

25.14.5 The results of all tests, including the air quality analysis, shall be documented and shall be included in the documentation given to the purchaser upon acceptance of the fire apparatus.

25.14.6 The contractor shall deliver the apparatus with all air tanks, piping, hose, reels, and other fixed equipment charged with breathing air to a gauge pressure of at least 40 psi (275 kPa).

Substantiation: The committee has revised 25.14 to just apply to breathing air systems and is adding a new section on testing utility air systems (see proposals 1901-212 (Log #CP109) The delivery requirements currently in 25.15 are being moved to the breathing air section as the reason for maintaining pressure is to prevent contamination of the tanks and piping, which is not an issue with utility air systems. The delivery pressure has been lowered from 100 psi to a pressure of at least 40 psi as the lower pressure will assist in avoiding DOT transportation problems of high pressure vessels. Other wording changes are to ensure the entire system is pressurized and checked, not just the storage portion.
Committee Meeting Action: Accept

1901-211 Log #21 Final Action: Accept in Principle
(25.14.4.1)

Submitter: Brian Brown, Parker Fire District
Recommendation: Revise text as follows:
Prior to the delivery of the apparatus to the end user, the final system installer shall draw an air sample from the air system user outlet and submit the sample to be tested in accordance with NFPA 1989, Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection.
Substantiation: In addition to a total system performance test this would also positively confirm that there is no possible contamination to the system from petroleum based products, solvents or sealants after final assembly.
Committee Meeting Action: Accept in Principle
Revise 25.14.4.1 to read as follows:
25.14.4.1 Prior to delivery of the apparatus to the end user, the final system installer shall draw an air sample from the breathing air system at each SCBA or SCUBA fill station and at the end of each air hose on an air reel and submit the sample(s) to be tested in accordance with NFPA 1989, *Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection*.
Committee Statement: The committee is clarifying that a sample is drawn from each user outlet. This could be multiple air hoses as well as fill station hoses.

1901-212 Log #CP109 Final Action: Accept
(25.15)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new section as 25.15 to read as follows:
25.15 Utility Air System Testing.
25.15.1 Prior to delivery of an apparatus with a low pressure utility air compressor and piping, the final installer shall test and certify the performance of the system.
25.15.2 The following items shall be tested or verified on all air systems:
(1) Pressure test the system to its maximum operational pressure and check all connections made as a part of the installation for leaks with a leak detection device, which could include bubble fluid or electronic means.
(2) Verify that any leaks detected during the testing in 25.15.2(1) are repaired.
(3) Visually verify the relief valve set points and working pressure of the air tank.
25.15.3 If the system's air supply includes a compressor system, the following additional items shall be tested or verified:
(1) Confirm that the fluid levels are at the manufacturer's recommended levels, including the lubricant and coolant if the system is liquid cooled.
(2) Operate the air compressor for a minimum of 1 hour
(3) Confirm the operation of the compressor shutdown switch at the pressure requested by the purchaser.
(4) Confirm that the utility air system is installed in accordance with air compressor manufacturer’s requirements and confirm that the cooling air flow is adequate.
Substantiation: Current 25.14 is really focused toward breathing air systems. Therefore the committee is adding a new 25.15 to deal with the testing of utility air systems on fire apparatus.
Committee Meeting Action: Accept

1901-213 Log #CP110 Final Action: Accept
(25.15)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete existing 25.15.
Substantiation: This requirement has been moved to the rewritten section 25.14 on breathing air system testing and delivery [see proposal 1901-210 (Log #CP108)].
Committee Meeting Action: Accept

1901-214 Log #CP120 Final Action: Accept
(Chapter 27 (new))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new chapter as chapter 27 to read as follows:

*** include 1901 Log CP120 Rec Chapter 27***

Substantiation: Trailers are being used more in the fire service. Questions have been raised as to whether trailers and the components mounted on them need to meet the standard. The committee has developed a chapter to address trailers and their connection to a tow vehicle. See also committee proposals 1901-2 (Log #CP115), 1901-10 (Log #CP116), 1901-19 (Log #CP117), 1901-63 (Log #CP118), and 1901-67 (Log #CP119) which modify other requirements in the standard to accommodate this change.
Committee Meeting Action: Accept

1901-215 Log #73 Final Action: Accept
(Table A.1.6(a))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise Table A.1.6(a) to read:

INSERT TABLE A.1.6(a) HERE

Substantiation: Improved accuracy.
Committee Meeting Action: Accept

Recommendation for proposal 1901-213 Log #CP110

Chapter 27 Trailers

27.1 General.

27.1.1 Trailers intended to be towed by fire apparatus under emergency response conditions shall meet the requirements of this chapter.

27.1.2 Any component on the trailer designed to support emergency services operations, shall meet the applicable requirements defined in Section 4.5.

27.2 Classification of Trailers. Trailers shall be classified as Type I, Type II, or Type III.

27.2.1* Trailers designed to remain connected to their tow vehicle throughout the response event and which are dependent on each other to provide the required electrical power and conspicuity shall meet the requirements of this chapter for Type I trailers.

27.2.2* Trailers designed to allow separation from their tow vehicle after arrival at the response event and which are not dependent on the tow vehicle to provide the required electrical power and conspicuity shall meet the requirements of this chapter for Type II trailers.

27.2.3* Open trailers designed to transport other vehicles, equipment, or containers that will be removed from the trailer after arrival at the response event and which will not be blocking right-of way during the incident shall meet the requirements of this chapter for Type III trailers.

27.3 Carrying Capacity.

27.3.1 The GVWR of the trailer shall not be greater than the sum of the tongue weight and the GAWR.

27.3.2 The stated load capacity of the trailer shall be the GVWR of the trailer less the empty weight of the trailer and the weight of the permanently mounted equipment.

27.3 Information Labels and Instruction Plates.

27.3.1 In addition to the label required by 49 CFR 567, "Certification," the final stage manufacturer shall permanently affix an information label that includes the following:

(a) The length and width of the completed trailer in feet/inches and meters

(b) The stated load capacity

(c) For Type I and Type II trailers, the height of the completed trailer in feet/inches and meters

(d) The hitch size and type

(e) The tire manufacturer's maximum speed rating

(f) The proper hitch locking procedures to secure the trailer to the tow vehicle

(g) A statement that reads: "It is the vehicle operators responsibility to ensure the towing vehicle and hitch is adequate to pull this trailer."

27.3.2 For trailers requiring the use of safety chains, an instruction plate shall be provided at or near the hitch location on the trailer that indicates the proper method of chain attachment to the tow vehicle.

27.3.3 For trailers with a braking system, an instruction plate shall indicate the proper method of connecting the braking system and the break away cable connections that apply the emergency brakes in the event the hitch fails.

27.4 Fluids and Pressures Specific to the Trailer Chassis. A permanently mounted informational label shall be provided to specify the following information if it applies:

(a) Brake fluid for trailer brake systems

(b) Grease used for the lubrication of axle bearings

(c) Any other special fluids, pressures, or lubricants required by the trailer manufacturer

27.5 Braking System.

27.5.1* All trailers chassis with a GVWR of 3,000 lb (1360 kg) or greater shall be equipped with a braking system on each axle.

27.5.2 All trailers equipped with brakes shall be equipped with a method to use the braking system to limit trailer movement in the event of failure of the hitch mechanism.

27.5.3 All brakes shall be readily accessible for adjustment.

27.5.4 When tow vehicles and trailers are equipped with air brake systems, the service brakes and parking brakes shall be applied by independent means.

27.6 Suspension and Wheels.

27.6.1 Each load-bearing tire and rim shall not carry a weight in excess of the recommended load for the operation of the tires used, as published in the *Tire and Rim Association — Year Book* and as recommended by the tire manufacturer.

27.6.2* Any trailer with an angle of departure of less than 8 degrees shall be equipped with means to prevent damage to the trailer if the rear contacts the ground.

27.7 Trailer Hitch.

27.7.1 The trailer hitch shall be selected to meet or exceed the GVWR of the trailer.

27.7.2 The construction and load supported by the trailer frame shall be distributed to maintain a tongue weight at or below the tongue weight rating.

27.7.3 Safety Chains.

27.7.3.1 The installation and use of two safety chains shall be required for trailer hitches designed to use safety chains.

27.7.3.2 Each safety chain and the method of attachment to the trailer and towing vehicle shall have an ultimate strength of not less than the gross weight of the trailer.

27.7.4 When using a fifth wheel hitch, the fifth wheel hitch and trailer body design shall allow full 90-degree jackknifing of the tow vehicle-trailer combination when all doors and exterior mounted items are in the stowed position.

27.8 Wheel Chocks.

27.8.1 Four wheel chocks shall be mounted in readily accessible locations.

27.8.2 Each wheel chock shall be designed to hold the trailer on a 10 percent grade when the trailer is loaded to its GVWR and parked independently of the tow vehicle.

27.9 Low Voltage Electrical Systems and Warning Devices.

27.9.1 Any low voltage systems, umbilical cables, and warning devices installed on trailers shall be appropriate for the mounting location and intended electrical load and shall meet the specific requirements of Chapter 13.

27.9.2 Audible and Visual Warning System. If the trailer is classified as Type I or Type II it shall meet the requirements of 13.11.

27.9.3 Power Supply.

27.9.3.1 The final stage trailer manufacturer shall state the minimum continuous electrical load required to be provided by the tow vehicle.

27.9.3.2 If the trailer is classified as Type I, the combined tow vehicle and trailer shall meet the electrical requirements in chapter 13.

27.9.3.3* If the trailer is classified as Type II, the combined electrical load for the federally required clearance and marker lighting and the optical warning devices shall not exceed 45 amps.

27.9.3.3.1 An on-board power source shall be provided and sized to power all trailer electrical loads on a continuous basis.

27.9.3.3.2 If a line voltage power source is used, it shall meet the requirements of chapter 23.

27.9.3.4 If the trailer is classified as Type III, the combined electrical load for the federally required clearance and marker lighting and the optical warning devices shall not exceed 45 amps.

27.9.4* Umbilical Cables and Connections.

27.9.4.1 Umbilical cables shall be constructed of cable that complies with the requirements of chapter 13.

27.9.4.2 Umbilical cables shall be installed and supported to prevent abrasion or chaffing damage during normal operation of the trailer.

27.9.4.3 The umbilical cables shall move freely throughout the trailer's operating range of full turn right to full turn left without damage.

27.9.4.4 For trailers using air brakes, the umbilical cable for the federally required clearance and marker lighting and the ABS brake system shall be connected using a green Type F cable meeting SAE J2394, *Seven-Conductor Cable for ABS Power*, and primary connectors meeting SAE J560, *Primary and Auxiliary Seven Conductor Electrical Connector for Truck-Trailer Jumper Cable*. Circuit identification shall conform to SAE J560, Table 4.

27.9.4.5 For trailers using electric or hydraulic brakes, the umbilical cable for the federally required lighting and brake system shall be connected using a seven-wire heavy duty cable and a seven way flat blade recreational vehicle connector.

27.9.4.6 The optical warning device umbilical cable shall be a yellow cable meeting the requirements of SAE J2394 for Type F cable with auxiliary connectors meeting SAE J560.

27.9.4.6.1 The auxiliary connectors shall have inverted ground terminals to prohibit connection to the primary receptacle (male ground terminal in the plug and the female ground terminal in the receptacle).

27.9.4.6.2 Circuit identification shall conform to SAE J560 Table 4, with the unassigned circuits assigned as follows:

12 - Green "Do Not Move Apparatus" signal from trailer (see 13.11.1)

13 - Brown Clearing Right-of-Way warning lights

14 - Blue Blocking Right-of-Way warning lights

27.9.5 Optical Warning Devices

27.9.5.1 If the trailer is a Type I trailer, the optical warning system requirements of section 13.8 shall be met by considering the combined tow vehicle and trailer as a single unit with its overall length.

27.9.5.2 If the trailer is a Type II trailer, the optical warning system shall meet the requirement of Section 13.8 when considering the trailer as a single unit.

27.9.5.2.1 The trailer's Zone A lighting shall only operate when the trailer's on-board power source is operational and the tow vehicle is disconnected from the trailer.

27.9.5.3 If the trailer is a Type III trailer, the optical warning system shall meet the requirement of Section 13.8 for lower zone B, C, and D.

27.9.6 Work Lighting

27.9.6.1 Type I and II trailers shall be equipped with ground lighting that meets the requirements of 13.10.1.2.

27.9.6.2 If the trailer has work surfaces, steps, or walkways, those surfaces shall be equipped with surface lighting that meets the requirements of 13.10.3.

27.9.6.3 If the trailer has interior spaces where a person can walk, the trailer shall be equipped with interior lighting that meets the requirements of 13.10.4

27.9.6.4 If the trailer has compartments, the compartments shall be equipped with compartment lighting that meets the requirements of 13.10.5.

27.9.7 Stop, Tail, and Directional Lighting. The trailer shall be equipped with stop, tail, and directional lighting meeting the requirements of section 13.13.

27.9.8 Electrical System Performance Tests.

27.9.8.1 Low voltage electrical systems shall be tested in accordance with the testing requirements of Chapter 13 as applicable

27.9.8.2 Line voltage electrical systems shall be tested in accordance with the testing requirements of Chapter 23 as applicable.

27.10 Reflective Markings.

27.10.1 Type I trailers shall meet the requirements of 15.9.3 when considering the combined tow vehicle and trailer as a single unit with its overall length.

27.10.2 Type II trailers shall meet the requirements of 15.9.3 when considering the trailer as a single unit.

27.10.3 Reflex reflectors and conspicuity tape shall be installed when required by 49 CFR 571.108, Lamps, reflective devices, and associated equipment.

Add annex material to support requirements in the new Chapter 27 as follows:

A27.1 Trailers intended to respond under emergency response conditions while being towed by non-NFPA 1901 emergency response vehicles should attempt to comply with this standard.

A.27.2.1 Type I trailers include trailers used as fire apparatus such as hazmat or rescue vehicles that are designed as a tow vehicle-trailer combination rather than a straight vehicle.

A.27.2.2 Type II trailers include trailers towed to the scene and then left at the scene while the tow vehicle performs other functions that could include bringing another trailer to the scene.

A.27.2.3 Type III trailers include boat trailer and construction equipment style trailers transporting bulldozers, tractor-plows and other types of motorized equipment.

A.27.5.1 The tow vehicle must be capable of supplying the necessary means to activate the trailer braking system when the tow vehicle brakes are applied. Tow vehicles must not be retrofitted with braking systems that are not compatible.

A.27.6.2 Use of skid plates, roller wheels, or another means will meet this requirement.

A.27.9.3.3.2 If a line voltage power source is used to provide low voltage power, the power source should be sized to accommodate both the line voltage power needs as well as all low voltage power needs. The purchaser must specify any other devices or receptacles that will require electrical power while the trailer is operating separated from its tow vehicle.

A.27.9.4 The importance of standardizing on specific trailer umbilical connectors is to drive the industry toward a goal of interoperability. This is critical on the Type II and Type III trailers that could easily be shared between mutual aid departments, or need to be pulled by multiple vehicles within a department. Initially, these standards may require some modification to the fleet of apparatus that the fire department intends to use for towing. Adapters may be available, but it is preferable to have the towing vehicles re-wired to permanently conform to these requirements. American Trucking Association TMC Recommended Practice RP 107, *Seven Conductor Truck-Trailer/Converter Dolly Jumper Cable and Connector Selection*, provides additional guidance on this subject.

Insert for proposal 1901-215 Log #73

1 imperial gallon per minute (igpm)	=	~~4.542~~ 4.546 liters per minute (L/min)

1901-216 Log #74 Final Action: Accept
(Table A.1.6(b))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise Table A.1.6(b) to read:

INSERT TABLE A.1.6(b) HERE

Substantiation: The first conversion is more useful at 60°F. This change agrees with NFPA 1906.
The other changes are for improved accuracy. The old values had rounding errors. The new values agree with NFPA 1906.

Committee Meeting Action: Accept

1901-217 Log #CP122 Final Action: Accept
(Table A.1.6(d) (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a table as A.1.6(d) to read as follows:

*** Insert 1901 CP122 Table A.1.6(d)***

Substantiation: This table of abbreviations used in the document has been included in the other standards developed by the committee and is useful to the reader.
Committee Meeting Action: Accept

1901-218 Log #75 Final Action: Accept
(A.3.3.130)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
A.3.3.130 Preconnected Hose Line. A preconnected hose line is commonly called a bucket line, cross lay, <u>speed lay,</u> or mattydale.
Substantiation: Additional term now in common usage.
Committee Meeting Action: Accept

1901-219 Log #CP20 Final Action: Accept
(A.5.8.3, A.6.7.3, and A.7.7.3.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new requirement to the list of equipment in A.5.8.3, A.6.7.3, and A.7.7.3.1 to read:
Hose adaptors for water supply connections in neighboring communities.
Substantiation: This new appendix item provides equipment that allows apparatus to connect to the water supply in areas out of their normal district when responding on mutual aid.
Committee Meeting Action: Accept

Insert for proposal 1901-216 Log #74

1 kilopascal (kPa)	=	~~0.2953 inch of mercury (in. Hg) at 32° F (0°C)~~
		0.2962 inch of mercury (in. Hg at 60° F (15.6°C)
1 meter (m)	=	~~3.279~~ 3.281 feet (ft)
1 cubic meter (m^3)	=	~~35.34~~ 35.31 cubic feet (ft^3)
1 kilometer per hour (kmph)	=	~~0.622~~ 0.621 mile per hour (mph)

Insert for proposal 1901-217 Log #CP122

Table A.1.6(d) Abbreviations Used in Standard

Abbreviation	Term	Abbreviation	Term
A	ampere	kPa	kilopascal
C	Centigrade	kW	kilowatts
F	Fahrenheit	L	liters
fc	footcandle	L/min	liters per minute
ft	feet	lx	Lux
gpm	gallons per minute	m	meter
hp	horsepower	mm	millimeter
in.	inch	mph	miles per hour
in. Hg	inches of mercury	psi	pounds per square inch
Kg	kilograms	V	volt
km/hr	kilometers per hour		

1901-220 Log #76 Final Action: Accept in Principle
(A.5.8.3A.6.7.3, A.8.8.2, A.10.5.2)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:

Pumper Fire Apparatus

A.5.8.3(13) Two cord reels ~~with minimum 200 ft (60 m) cord on each~~ or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

Initial Attack Fire Apparatus

A.6.7.3~~(4) One smoke ejector, 5000 ft3/min (140 m3/min) minimum capacity, and, if the ejector is electrically driven, a suitable adapter cord to fit standard house "U" ground outlets and extension cords and outlets on line voltage power sources used in fire departments~~

(13) One ~~3000~~ 1500 W (minimum) portable generator if the apparatus does not have a fixed line voltage power source

(15) ~~Two~~ One cord reel~~s with minimum 200 ft (60 m) cord on each~~ or other means to store and deploy 100 ft (30 m) of electric cord with connectors that are compatible with lights~~,~~ and generator~~, and smoke ejector~~; and sized for the expected loads and distances

Aerial Fire Apparatus

A.8.8.2(3) ~~Two electric cord reels with 200 ft (60 m) of 12 AWG, 3-wire cord with connectors that are compatible with lights, smoke ejectors, and onboard generators~~ Two cord reels or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

(41) One 4000 W (minimum) portable generator if the apparatus does not have a fixed line voltage power source

Special Service Fire Apparatus

A.10.5.2(21) ~~Two cord reels with minimum 125 ft (38 m) of 10 AWG, 3-wire cord on each with connections that are compatible with lights and generator~~ Two cord reels or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

Substantiation: There are other means than reels to store cords. It is important for the cords to be sized for the expected loads and distances, but these will depend on the department's operations.

Initial Attack vehicles have only 22 ft^3 of storage. The electrical equipment alone would fill all that space.

Committee Meeting Action: Accept in Principle

Revise A.5.8.3(13) to read as follows:

Two cord reels ~~with minimum 200 ft (60 m) cord on each~~ or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

Delete A.6.7.3(4)

Revise A.6.7.3(13) to read as follows:

One ~~3000~~ 1500 W (minimum) portable generator if the apparatus does not have a fixed line voltage power source

Revise A.6.7.3(15) to read as follows:

~~Two~~ One cord reel~~s with minimum 200 ft (60 m) cord on each~~ or other means to store and deploy 100 ft (30 m) of electric cord with connectors that are compatible with lights~~,~~ and generator~~, and smoke ejector~~; and sized for the expected loads and distances

Revise A.8.8.2(3) to read as follows:

~~Two electric cord reels with 200 ft (60 m) of 12 AWG, 3-wire cord with connectors that are compatible with lights, smoke ejectors, and onboard generators~~ Two cord reels or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

Add a new A.8.8.2(41) to read as follows:

(41) One 3000 W (minimum) portable generator if the apparatus does not have a fixed line voltage power source

Revise A.10.5.2(21) to read as follows:

~~Two cord reels with minimum 125 ft (38 m) of 10 AWG, 3-wire cord on each with connections that are compatible with lights and generator~~ Two cord reels or other means to store and deploy 400 ft (120 m) of electric cord with connectors that are compatible with lights, generator, and smoke ejector; and sized for the expected loads and distances

Revise A.10.5.2(19) in the list for rescue apparatus to read as follows:

(19) One 3000 ~~4000~~ W (minimum) portable generator if the apparatus does not have a fixed line voltage power source

Committee Statement: The committee is accepting the submitters suggestions except it is standardizing on 3000 W minimum for generator size on pumpers, aerial apparatus, and special service apparatus.

1901-221 Log #77 Final Action: Accept
(A.8.8.2)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
(39) One ~~life~~ line gun with ammunition
Substantiation: I believe this is what is intended here.
Committee Meeting Action: Accept

1901-222 Log #78 Final Action: Accept
(A.12.3.3)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
A.12.3.3 Where automatic transmissions are used, the power takeoff applications could present problems, especially where dual PTO drives are required. In some instances, the PTO drive can be engaged only in torque converter range with resultant chances of overheating with prolonged use. ~~If high engine rpm occurs, there is the possibility, if the vehicle is accidentally left in gear, of the output torque overcoming the parking brake and moving the vehicle.~~ If the vehicle is accidentally left in gear and high engine rpm occurs, there is a possibility of the output torque overcoming the parking brake and moving the vehicle. Proper operational instructions are essential with automatic transmissions.
Substantiation: The sentence structure is very awkward, confusing, and complicated. This entire paragraph may no longer be applicable with modern automatic transmissions and interlocks.
Committee Meeting Action: Accept

1901-223 Log #CP30 Final Action: Accept
(A.13.2.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise A.13.2.1 as follows:
A.13.2.1 The 125 percent requirement for wiring and circuits is intended to provide ~~end users a minimum amount of extra electrical circuit capacity~~ reduced voltage drop over wire rated based on ampacity due to heating. In low voltage wiring, voltage drop becomes a problem before reaching the thermal limit of current carrying capacity of a wire. This requirement also insures that the circuit protection will prevent damage to the wire in the event of a short or overload. It is not the intent of this requirement to have the final-stage manufacturer replace the standard OEM chassis manufacturer's wiring to meet the 125 percent requirement. It is also not the intent of this requirement to have electrical accessories purchased by the apparatus manufacturer rewired to meet the 125 percent requirement. Electrical device manufacturer–supplied wiring can be used to the point where it connects to apparatus manufacturer's installed wiring.
Substantiation: The added wire size does not allow the load to exceed the circuit protection. This explanation is more accurate.
Committee Meeting Action: Accept

1901-224 Log #CP35 Final Action: Accept
(A.13.10.2 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new annex to 13.10.2 to read as follows:
A.13.10.2 The hose bed lighting can be line voltage lighting provided by mounted line voltage lights that can be directed to provide the required light.
Substantiation: In many cases with modern line voltage systems, much better hose bed lighting can be provided with pole lights mounted on the truck, eliminating the need for troublesome and ineffective low voltage lights.
Committee Meeting Action: Accept

1901-225 Log #CP38 Final Action: Accept
(A.14.1.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise A.14.1.3 to read as follows:
The purchaser will need to define how many seating positions are required to carry personnel and might wish to specify the arrangement of the seating positions. ~~Canopy cab extensions with patio door-type closures or separate telephone booth-type personnel enclosures are acceptable means for providing fully enclosed seating positions.~~ Large firefighters with heavy bunker gear may require special accommodation for seat belt length. Seat belt extenders are not recommended by the seat belt manufactures because of the potential that they could be transferred to other apparatus or personal vehicles where, if used on other manufacture's belts, could produce a false latch. This can occur if the latch design is similar but not exact. The length of belt that can be accommodated in the retractor is fixed at 89 inches, so extra long belts will not retract all the way, leaving a portion of the belt hanging free. Purchasers who specify extra long belts must be aware of the potential for the belt to swing into or out of the door.
The ability for a fire fighter to enter the driving or crew riding area, get seated, and properly buckle the seat belt is critical. Studies of fire fighter size have shown that it is not possible to seat four of the largest fire fighters (95th percentile males) wearing their protective clothing side by side across the crew riding area without rubbing shoulders. Purchasers should consider specifying a seating configuration to ensure that all occupants will be able to be buckled into a seating position effectively and efficiently before the apparatus is moving. Alternate seating configurations that can be considered include three or two seats across the width of the riding area and facing seats.
Substantiation: Additional information informs the purchaser that longer belts are available, but warns them of the potential for inconvenience if the longer belts are selected. Reference to canopy cabs is outdated. Four-across seating is probably OK for most departments unless they have an abnormally high percentage of fire fighters who are above 95th percentile in shoulder width. This appendix provides guidance on this subject.
Committee Meeting Action: Accept

1901-226 Log #CP46 Final Action: Accept
(A.16.2.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise the first sentence of A.16.2.2 to read as follows:
If the apparatus is equipped with an automatic transmission, it is acceptable to lightly apply throttle and brakes for short periods of time to maintain this requirement. ~~a maximum speed of 2 mph (3.2 kmph).~~
Substantiation: The requirement is stated in 16.2.2 and as restated in the annex it is causing confusion.
Committee Meeting Action: Accept

1901-227 Log #79 Final Action: Accept
(A.16.13.2.3.1, A.18.13.2.3.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
A.16.13.2.3.1, A.18.13.2.3.1 Annex ~~A~~ C of NFPA 1911, ~~*Standard for Service Tests of Fire Pump Systems on Fire Apparatus*~~ *Standard for the Inspection, Testing, Maintenance, and Retirement of In-Service Automotive Fire Apparatus*, shows a test data form for recording the test readings and other necessary data.
Substantiation: NFPA 1911 has been revised and retitled.
Committee Meeting Action: Accept

1901-228 Log #114 Final Action: Accept in Principle
(A.18.13.5.5)

Submitter: Dan W. McKenzie, US Department of Agriculture
Recommendation: Add text to read as follows:
A.18.13.5.5 If the test is done with intake valves open and intakes capped, the apparatus could have a bad intake valve which would not be detected. By conducting a second test with the intake valves closed and intakes not capped a leaking intake valve would be detected.
Substantiation: Explanation of why the second test with the intake valves closed and the intake caps removed is necessary.
Committee Meeting Action: Accept in Principle
Add a new annex to 16.13.6.5 to read:
When the test is done with intake valves open and intakes capped, the apparatus could have a bad intake valve which would not be detected. By conducting a second test with the intake valves closed and intakes not capped a leaking intake valve would be detected.
Committee Statement: Chapter 18 is being deleted but the committee agrees with this annex material and is adding it to chapter 16 to support the new 16.13.6.5.

1901-229 Log #CP59 Final Action: Accept
(A.21.2.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise the third paragraph of A.21.2.1 to read as follows:
A variable pressure eductor is another modification of the in-line eductor foam proportioning system. This type of eductor is designed to automatically adjust the area of the eductor venturi to compensate for changes in water pressure at the inlet of the device. Better performance (less pressure loss) can be achieved by having the eductor in the straight line position with the main line and the water flow control valve in the off-set position. The reason for this is that the small eductor sets the pressure drop and the water control valve merely matches the pressure losses of the eductor and fittings directing flow to the eductor. If the eductor flow has to flow through 2 branching tees and 2 elbows, the water control valve must match these pressure losses. If the eductor is in the straight line position pressure losses of 2 branching tees and 2 elbows are not present in the eductor branch of the variable flow bypass eductor; and therefore, the total pressure loss across the proportioning system is only that of the eductor. The variable pressure eductor is a manually regulated foam proportioning system.
Substantiation: The added information describes how better performance can be obtained from a variable flow bypass eductor.
Committee Meeting Action: Accept

1901-230 Log #80 Final Action: Accept in Principle
(A.21.2.2)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
A.21.2.2 Self-educting master stream nozzles are mounted on the discharge side of the pump. These devices make up a complete foam proportioning system consisting of a foam proportioner and application device (nozzle). Self-educting master stream nozzles have the following operating characteristics:
(1) Operator-adjustable foam solution rates of ~~3~~ ½ percent ~~or~~ to 6 percent
(2) Minimal pressure drop, approximately 1 percent to 2½ percent of inlet pressure
Substantiation: Master stream foam nozzles are now available with ½ / 1 / 3 / 6 percent and ½ / 1/ 3 percent.
Committee Meeting Action: Accept in Principle
Revise A.21.2.2 to read as follows:
Self-educting master stream nozzles are mounted on the discharge side of the pump. These devices make up a complete foam proportioning system consisting of a foam proportioner and application device (nozzle). Self-educting master stream nozzles have the following operating characteristics:
(1) Automatic or ~~O~~operator-adjustable foam solution rates ~~3 percent to 6 percent~~
(2) Minimal pressure drop, ~~approximately 1 percent to 2½ percent of inlet pressure~~
Committee Statement: Self-educting master stream nozzles are available in a larger range of solution rates than stated in this proposal. The specific pressure drop, while minimal, may not fall within the 1 to 2 ½ percent cited in this appendix section.

1901-231 Log #CP60 Final Action: Accept
(A.21.2.4)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete the fourth paragraph of A.21.2.4 and figure A.21.2.4(c).
Substantiation: This equipment is not found on fire apparatus.
Committee Meeting Action: Accept

1901-232 Log #CP61 Final Action: Accept
(A.21.2.6)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Revise the last sentence of A.21.2.6
A conductivity-sensing direct injection foam system utilizes an electrical conductivity sensor(s) to sample the fire pump discharge water prior to foam concentrate injection and transmits this information to an electronic control. A second electrical conductivity sensor samples the foam solution and transmits this information to the electronic control that controls the foam pump motor speed based on the ratio selected by the operator. Since flow rate affects conductivity readings, a flow meter transmits the flow rate through the process manifold to the electronic control. [See Figure A.21.2.6(c).]
Revise Figure A.21.2.6(c) to show as:

*** Insert 1901 Log CP61 Rec Figure A.21.2.6(c) ***

Substantiation: The revised paragraph more accurately reflects the technology being described.
Committee Meeting Action: Accept

Insert for proposal 1901-232 Log #CP61

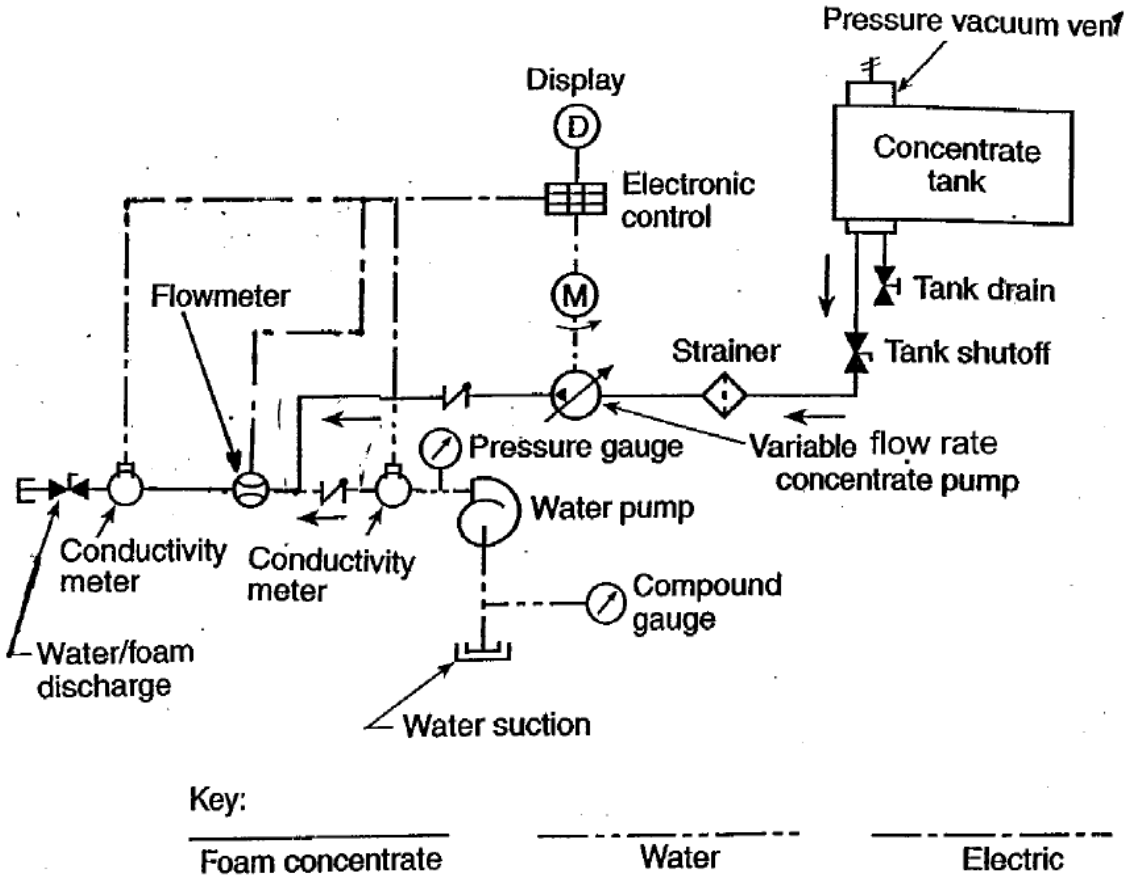


Figure A.21.2.6(c) Conductivity-Sensing Direct Injection Foam Proportioning System

1901-233 Log #81 Final Action: Accept
(A.21.11.1(3), Method 3,4th Paragraph)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
The required amount of water is placed in a 100 ml or larger graduated cylinder, leaving space for the foam concentrate. A 10 ml pipette or 10 cc syringe is used to carefully add the required amount of foam concentrate to the water. Each measured foam solution is then poured from the graduated cylinder into a 100 ml or larger plastic bottle, and the bottle is marked to indicate the percentage solution it contains. ~~A plastic-coated magnetic stirring bar is added to the bottle, and the~~ The bottle is capped and thoroughly shaken to mix the foam solution.
Substantiation: A plastic-coated stirring bar is not needed if the bottle is to be shaken to mix the solution. If a magnetic stirrer is to be used, most plastic bottles will not work, as a smooth, flat bottom is needed such as an Erlenmeyer flask or a beaker.
Committee Meeting Action: Accept

1901-234 Log #CP66 Final Action: Accept
(A.22.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a definition of CAFS Capable to read as follows:
CAFS-Capable. A compressed air foam system (CAFS)-capable fire apparatus is a fire apparatus equipped with the following:
a. Automatic regulating foam proportioning system capable of injecting foam concentrate into the discharge or pressure side of the pump
b. Air compressor with the capacity to supply the required scfm and automatic air pressure controls
c. Controls to mix the air and foam solution
Substantiation: This is adding an additional term to a list of defined terms that are used in relation to CAFS.
Committee Meeting Action: Accept

1901-235 Log #82 Final Action: Accept
(A.22.4)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Change 100 to 1000 in formula.
Substantiation: The formula as written is not correct. At 1:1 expansion (no expansion), the mass of 1000 ml of foam solution would be 1000 grams, not 100 grams.
Committee Meeting Action: Accept

1901-236 Log #83 Final Action: Accept
(A.22.9.1(1))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
~~A.22.9.2 The person conducting the test should check with the manufacturer of the hose being used to ensure the hose has been approved for use with CAFS.~~
*Remove * from 22.9.2.*
Substantiation: Hose manufacturers do not recommend specific hose for use with CAFS. The corresponding section was deleted from NFPA 1906
Committee Meeting Action: Accept

1901-237 Log #84 Final Action: Accept
(A.23.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
~~(3) If an earth grounded system is required, the details of grounding rods, plates, clamps, or other means to establish bonding of the apparatus and the power source to the earth.~~
~~If premises wiring or other fixed wiring systems are to be powered by the generator, the installation should be preplanned and in accordance with NFPA 70, *National Electrical Code*, for that intended purpose. Grounding of the system should comply with Section 250.20, "Alternating-Current Circuits and Systems to Be Grounded," and other applicable sections of NFPA 70.~~
Substantiation: Earth grounding a fire truck increases risk to the firefighter and should not be suggested.
Powering premises wiring (buildings) from fire apparatus is not recommended and should not be suggested.
Committee Meeting Action: Accept

1901-238 Log #85 Final Action: Accept
(A.23.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
Generally, the line voltage electrical system should be sized based on the total amount of fixed and portable equipment that is likely to be operated at the same time. In view of the increasing use of line voltage devices on apparatus, the provision of a line voltage electrical system of sufficient capacity is strongly recommended. ~~Where line voltage equipment use is extensive, a separately driven generator is recommended.~~
Substantiation: This sentence is no longer accurate. Generators driven from the apparatus engine (not separately driven) are not available up to 30kW or larger.
Committee Meeting Action: Accept

1901-239 Log #CP72 Final Action: Accept
(A.23.1)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add text to the end of A.23.1 to read as follows:

The following factors are guidelines for determining the line voltage electrical loads present on an apparatus and determining the size of power source required. Various electrical loads are placed on apparatus for specific purposes yet a number are installed for convenience usage. The purchaser should start by creating a tabulated list of line voltage electrical items (lights, cord reels, receptacles, etc.) and their wattage ratings so a total electrical load can be determined. It is the responsibility of the purchaser to specify the ratings to be used when calculating power source loads.

Loads or Receptacles . For plug connected equipment and receptacles, either work with the loads that can be connected or with the power available from receptacles that could have equipment connected to them. Do not add both in the calculation. If the power source will normally power only equipment carried on that piece of apparatus, use a total of loads carried on the apparatus. If the power source might power equipment carried on other apparatus as well, work with the total capacity represented by the receptacles provided. Fixed loads permanently connected are always included.

Fixed mounted lighting . All lighting that is mounted directly to the apparatus should be itemized with the manufacturer's wattage ratings. This includes light towers, brow lights, scene lights, and interior lights.

Removable lighting . All lights mounted on the apparatus using a plug and receptacle connection scheme should be itemized with the light manufacturer's wattage rating. This includes tripod lights mounted on the top or back of apparatus bodies that can be unplugged, removed from the apparatus, set up on the ground or inside a building, and powered with the use of an extension cord.

Dedicated receptacles . For receptacles located and intended to always power a specific piece of equipment such as a hydraulic rescue tool (HRT) power unit, battery charger, light, or other piece of equipment, use the wattage of the connected equipment.

Cord reels. Rate cord reels to their circuit breaker rated amperage when determining generator loads. Wattage rating should be voltage times circuit breaker amperage. For 120/240 volt cord reels, use 240 times the circuit breaker rating.

"Side of body" receptacles . Rate "side of body" receptacles at half their amperage capacity when determining generator loads. If specific devices will be connected to a "side of body" receptacles most of the time, the higher wattage rating of the specific device should be used.

Interior receptacles . Rate interior duplex receptacles at 180 watts. If specific devices will be connected to specific receptacles, use the higher wattage rating of the specific device connected to the receptacle.

Motor loads. Motor loads put large AC demands on generators. Consult the system manufacturer for wattage ratings for motor driven systems. A general rule is that motors require about 740 watts per horsepower for running. An allowance should be added for the largest motor for starting at about twice the running wattage, or the manufacturer's stated starting wattage. Some variable speed motors for smoke fans have little or no additional starting power draw. If equipment with large motors are to be driven, consult with the manufacturer of the equipment for their experience on what size and types of generators have been successfully used for driving their equipment.

Power Source Sizing .

Once all the line voltage devices and receptacles on the apparatus have been identified and their wattage rating determined, the size of he generator needed can be determined. It is always a good idea to make an allowance for future additions and spare capacity.

Table A.23.1(a) shows an example of a calculation for a rescue unit, intended to power its on-board equipment but not typically power equipment from other apparatus. Note that for the largest motor load, the HRT power unit, the starting load is used. For other motors, the running power is used.

*** Insert 1901 Log CP72 Rec Table A.23.1(a) ***

In this example, a 15,000 watt generator would be the minimum that should be considered. A significant driving factor in requiring this size generator is the starting draw of the HRT power unit. Once the power unit is started, the total draw with all equipment running would drop to about 10,000 watts, giving a comfortable safety margin. Some generators have a peak or intermittent rating that exceeds the continuous power rating. This peak capability can be used for motor starting since these loads last only a few seconds.

Table A.23.1(b) shows an example of an electrical load for the equipment and receptacles that might be on an attack

pumper.

*** Insert 1901 Log CP72 Rec Table A.23.1(b) ***

Again in this example, a 15,000 watt generator would be the minimum that should be considered. This allows little reserve capacity for future use so a larger generator might be considered. Even though the pumper may not carry this much equipment, if this apparatus is at the front of the fire building, lights and fans from other apparatus may be brought to the scene and plugged into the electrical system on this apparatus.

The selection of a smaller generator puts the generator at risk of being overloaded and the user has the potential to damage the generator in those situations.

It is recommended the purchaser review the line voltage components and review the generator size to verify that proper operation of the apparatus can be achieved. If there is more load than power supply, reducing line voltage loads or selecting a larger generator is recommended.

Substantiation: This information provides guidance to the purchaser in determining the size generator to order.

Committee Meeting Action: Accept

1901-240 Log #CP74 Final Action: Accept

(A.23.4.3)

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add text to A.23.4.3 before the existing text to read:

The 120°F (49°C) requirement is for air inlet temperature to the power source. The completed apparatus is required to operate at an ambient temperature of 110°F (43°C). This difference of only 10°F (6°C) is very difficult to achieve due to heat produced by the apparatus engine. The installer should take this temperature into consideration in selecting a location for the power source. If the apparatus is intended to operate at high temperatures, the purchaser may want to specify a larger nameplate rating on the generator and derate it to allow for a higher temperature capability. Consult with the power source manufacturer for more information on extended temperature range operation. In the testing required in 23.16.5 the ambient and air inlet temperature are recorded, giving a measure of the temperature difference in actual operation.

Substantiation: The question was raised of problems with high temperatures at power sources. Some power sources are more influenced by this than others. The standard has a requirement that the power source manufacturer declare the continuous rating at 120°F. Some people have questioned the difference between this number and the 110°F ambient temperature number used elsewhere. The difference is very dependent on the installation, and is not described anywhere. The revised text provides more explanation of these issues.

Committee Meeting Action: Accept

1901-241 Log #CP124 Final Action: Accept

(A.24.5.2 (New))

Submitter: Technical Committee on Fire Department Apparatus,

Recommendation: Add a second sentence to the annex to 24.5.2 to read as follows:

A.24.5.2 The purchaser might want to specify additional lighting and/or switching to allow a reduced lighting level for computer operation or red lighting to preserve night vision.

Substantiation: The lighting requirements are a minimal standard and do not prevent additional lighting modes in the command area. The annex clarifies that the purchaser can specify additional lighting requirements to meet specific needs.

Committee Meeting Action: Accept

Insert for proposal 1901-239 Log #CP72

Table A.23.1(a) Electric Loads for Equipment Carried On Rescue Unit

Device	Notes	Rated Voltage	Rated Amperage	Number Carried	Generator Load Wattage
Brow Light	Permanently Connected	240		1	750
Pole Lights	1000 watt light	240		2	2,000
Portable Lights	500 Watt	120		4	2,000
16” Smoke Fan	800W run, 2000W start	120		1	800
HRT Power Unit	4000 W run, 9000 W start	240		1	9,000
Battery Charger	On transfer switch	120		200	200
Total					14,750

Insert for proposal 1901-239 Log #CP72

Table A.23.1(b) Electric Loads for Equipment Carried on an Attack Pumper

Device	Notes	Rated Voltage	Rated Amperage	Number Carried	Generator Load Wattage
Brow Light	Permanently Connected	240		1	750
Pole Lights	1500 watt light	240		2	3,000
Rear Scene Light	1500 watt light	240		1	1,500
Body Receptacle	20 amp, at 50%	120	20	4	4800
Cord Reel	120/240 V, 20 Amp breaker	240	20	1	4800
Total					14,850

1901-242 Log #CP87 Final Action: Accept
(A.25.3)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Delete the first 2 paragraphs of A.25.3.
Substantiation: The wording in the first paragraph is not in the appropriate place in the document. It deals with utility air systems, not breathing air systems and will be added to the utility air system section.
The second paragraph is being deleted as a shore power connection is going to be required if the compressor is driven by an electric motor.
Committee Meeting Action: Accept

1901-243 Log #CP98 Final Action: Accept
(A.25.5.7.1 (New))

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add a new annex to 25.5.7.1 to read:
A.25.5.7.1 Air tanks should be mounted as low as possible to minimize the adverse effect on the center of gravity of the vehicle.
Substantiation: This added wording will provide guidance to help achieve a more stable fire apparatus.
Committee Meeting Action: Accept

1901-244 Log #CP107 Final Action: Accept
(A.25.12)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add an additional paragraph after the existing annex of 25.12 to read as follows:
Selection of a low pressure utility compressor should be based upon the fire department's air equipment and requirements for CFM capacity and duration of air supply. The compressor drive determines the cost of the compressor, installation requirements, type of operating controls and procedures, and frequency and cost of routine service and maintenance. Air tank storage should be considered to improve air system performance. The following compressor drives are available:
(1) Electric drive
(2) Hydraulic drive
(3) Gasoline or diesel drive
(4) PTO Drives
Substantiation: This material was in the annex of 25.3 but did not belong there as it pertains to utility air systems, not breathing air compressors. It is being moved to the utility air section.
Committee Meeting Action: Accept

1901-245 Log #CP126 Final Action: Accept
(B.2)

Submitter: Technical Committee on Fire Department Apparatus,
Recommendation: Add text after the first paragraph of Annex B.2 to read as follows:
If a trailer is being purchased, the purchaser needs to provide the contractor with sufficient information about how the trailer will be towed, used and equipped so the trailer manufacturer can provide a trailer appropriate for the application. Hitches, axles, frames, and brake systems need to be sized to handle the equipment loads installed inside the trailer. Tow vehicles need to be carefully selected to prevent overloading of the tow vehicle chassis and to ensure the safe stopping distances required by federal regulations. For trailers being designed for use under emergency response conditions, the trailer must include the reflective striping, and emergency lighting required by this standard to provide adequate visibility.
If the Purchaser owns a vehicle that will be the intended tow vehicle for the trailer, the purchaser needs to make that vehicle available for the contractor to inspect to validate compatibility and inter-connectability between the tow vehicle and the trailer before delivery of the trailer.
Substantiation: The committee has added a new chapter on trailers to the standard and is adding material to annex B to make purchasers aware of issues with such vehicles.
Committee Meeting Action: Accept

1901-246 Log #88 Final Action: Accept
(Figure B.2, Chapter 23)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
*~~Amperage~~ Continuous rated wattage of power source: _____
Substantiation: Power sources are typically rated in watts, and sizing based on expected loads is normally done in watts. The relationship between watts and amps can be confusing in a 120/240 volt system with both 120 and 240 volt loads.
Committee Meeting Action: Accept

1901-247 Log #87 Final Action: Accept
(Figure B.2, Chapter 4)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Add the following below "*Specify the maximum road speed required"
*Specify the number of crew riding positions required: _____
Substantiation: This information is required and must be specified by the purchaser. It got missed in Figure B.2.
Committee Meeting Action: Accept

1901-248 Log #86 Final Action: Reject
(B.2 Figure B.2, B.2.12)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Change the Figure Number from B.2 to B.2.12. Change the references in B.2 and B.2.12 to use the new number.
Substantiation: This will move the figure to after the text describing the process. The reader should read through the whole process through B.2.12 before going to the figure.
Committee Meeting Action: Reject
Committee Statement: The NFPA Manual of Style requires that the figure be numbered with the paragraph where it is first referenced. In this case, the figure is first referenced in B.2.

1901-249 Log #89 Final Action: Accept
(B.5.1)

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
(2) In rows (b) through (k), calculate the expected hose load by multiplying the length of hose by the standard values for weight per unit length and enter the result in column ~~8~~ 7. Use the values in Table B.5.1 or obtain specific values for the brand of hose being used.
(3) In row (~~1~~ l), multiply the number of seat belt–equipped seating positions by the NFPA allowance of 200 lb (90 kg) per person and enter the result in column ~~8~~ 7.
(4) In row (m), enter the miscellaneous equipment allowance from Table 12.1 in column ~~8~~ 7. Divide the hose, personnel, and equipment weights in column ~~8~~ 7 between the front and rear axles according to the indicated percentages (or, as appropriate, from a detailed weight analysis).
(5) In row (n), enter the sum of the values from rows (a) through (m) for each of columns ~~8~~ 7 through ~~11~~ 10.
Substantiation: The table was apparently revised and the text did not get changed to match.
Committee Meeting Action: Accept

1901-250 Log #90 Final Action: Accept
(B.5.1(1))

Submitter: Thomas A. Stalnaker, Goshen Fire Company
Recommendation: Revise as follows:
(1) In row (a), fill in the vehicle weights from a certified scale, measured under the following conditions ~~with the following~~:
(a) All manufacturing work completed
(b) Water, fuel, and foam tanks full
(c) Ground ladders stored on the vehicle
Substantiation: This change improves the grammar and clarifies the meaning. The table should be filled in with weights; not with manufacturing, water, ladders, etc.
Committee Meeting Action: Accept

1901-251 Log #17 Final Action: Accept in Principle
(Annex D)

Submitter: Jerry Miller, Mountain Grove Fire Department
Recommendation: To the NFPA 1901 standard. Do you realize the impact this would have on the State of Missouri? There was no grandfather clause therefore if ISO or fire department attempt to adopt this they would spend years of their budget doing this and letting other things like personnel safety go. I don't think this is the intent of NFPA. I felt some of the requirements were good and should be required but I feel they are required today. Item 3 is a safety item that is affordable and cost/benefit return. Item 9 and 10 should already be in place. Item 13 is a good one. Item 16 is required now. The rest of this needs to be recommended for apparatus older than 1991. Who's paying for this? Was a survey accomplished to evaluate the impact? I work with 86 fire departments in southern Missouri, this puts 76 out of service.
Substantiation: The problem solved would be the fact that we keep fire fighters fighting fire. I think ANNEX D should stay as a recommendation but not become the standard for the older apparatus.
Committee Meeting Action: Accept in Principle
Revise Annex D to read as follows:

*** include 1901-Log 17 CA ***

Committee Statement: The submitter has raised questions and offered suggestions without providing revised text. Annex "D" has been rewritten to reflect additional substantiation for upgrading apparatus in a timely manner. The submitter asks that paragraph D-3 refer to apparatus built prior to 1991. This has basically been accomplished by the requirement that apparatus be refurbished no later than 15 years after it was built. The submitter also asks that Annex "D" stay as a recommendation which it will be as an annex item.

Insert for proposal 1901-251 Log #17

Annex D Guidelines for First-Line and Reserve Fire Apparatus

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 General. To maximize fire fighter capabilities and minimize risk of injuries, it is important that fire apparatus be equipped with the latest safety features and operating capabilities. In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus manufactured prior to 1991 usually included only a few of the safety upgrades required by the recent editions of the NFPA fire department apparatus standards or the equivalent Underwriters' Laboratories of Canada (ULC) standards. Because the changes, upgrades, and fine tuning to NFPA 1901, *Standard for Automotive Fire Apparatus*, have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to fire fighters of keeping fire apparatus older than 15 years in first-line service.

It is recommended that apparatus greater than 15 years old, that have been properly maintained, and that are still in serviceable condition, be placed in reserve status and upgraded in accordance with NFPA 1912, *Standard for Fire Apparatus Refurbishing* to incorporate as many features as possible of the current fire apparatus standard *(see Section D.3)*. This will ensure that, while the apparatus might not totally comply with the current edition of the automotive fire apparatus standards, many of the improvements and upgrades required by the recent versions of the standards are available to the fire fighters who use the apparatus.

Apparatus that was not manufactured to the applicable NFPA fire apparatus standards or that is over 25 years old should be replaced.

D.2 How the Standards Have Changed. It is a generally accepted fact that fire apparatus, like all types of mechanical devices, have a finite life. The length of that life depends on many factors, including vehicle mileage and engine hours, quality of the preventative maintenance program, quality of the driver training program, whether the fire apparatus was used within the design parameters, whether the apparatus was manufactured on a custom or commercial chassis, quality of workmanship by the original manufacturer, quality of the components used, and availability of replacement parts, to name a few.

In the fire service, there are fire apparatus with 8 to 10 years of service that are simply worn out. There are also fire apparatus that were manufactured with quality components, that have had excellent maintenance, and that have responded to a minimum number of incidents that are still in serviceable condition after 20 years. Most would agree that the care of fire apparatus while being used and the quality and timeliness of maintenance are perhaps the most significant factors in determining how well a fire apparatus ages.

Prior to 1991, NFPA 1901 was basically a "reactive standard." If something worked well in field use for a few years, it might have been suggested for inclusion in NFPA 1901. It was a very basic standard. In the late 1980s, the Technical Committee on Fire Department Apparatus decided to become proactive and to greatly enhance the value of the standard for the fire service. Task groups were appointed to develop reasonable requirements for the various components that made up a fire apparatus, and a safety task group was charged with looking at issues across the board that would improve the safety of fire fighters who use the apparatus.

The completely revised 1991 editions of NFPA fire department apparatus standards were the result of these efforts and the full committee's strong desire to make the automotive fire apparatus standards not only more safety oriented but also more user friendly.

Contained within the 1991 edition of the fire department apparatus standards were requirements for such items as fully enclosed riding areas with reduced noise (dBA) levels to keep crew members safe and informed, seats and seat belts for all crew members riding on the apparatus, fail-safe door handles so the sleeve of a coat does not inadvertently catch a handle and open a door, and signs requiring everyone to be seated and belted. Also included were increased battery capacity to ensure starting under most conditions, improved warning lights including intersection lights for increased visibility, removal of all roof-mounted audible warning devices to reduce hearing problems, a flashing light in the cab to warn if a cab or body door is open, a backup alarm, an automatic transmission to make it easier to drive (unless the purchaser has a specific reason for a manual transmission), auxiliary braking systems and reflective striping.

The tip load for an aerial ladder was required to have a minimum carrying capacity of 250 lb (114 kg) when the aerial ladder is at zero degrees elevation and maximum extension. Other requirements, such as a minimum rail height, the minimum design strength of the rungs and minimum load-carrying requirement for folding steps was, were added to make the aerial ladder safer for fire fighters to use. Where a water tower is equipped with a ladder, the same requirements that applied to an aerial ladder were required of the ladder on the water tower.

The carrying capacity of elevating platforms at zero degrees elevation and maximum extension was raised to 750 lb (340 kg). Elevating platforms were also required to have handrails, breathing air available in the platform (with low-air warning capability) for at least two fire fighters, and a water curtain cooling system under the platform.

All aerial devices had to be capable of supporting a static load of one and one-half times their rated capacity in any position. A requirement for a stabilizer movement alarm and reflective striping with warning lights was added. Interlocks to prevent inadvertent movement to an unsupported side and to prevent raising the aerial device prior to the stabilizers being deployed were specified. One hundred percent nondestructive tests (NDT) became a requirement. All these requirements were included in the 1991 editions of the NFPA fire department apparatus standards

In the pump area, the standard specified that 3 in. (75 mm) or larger valves be “slow close,” that caps on intakes and discharge outlets be tested to 500 psi (3400 kPa), that an intake relief valve be provided to help manage incoming pressure, that 30-degree sweep elbows be provided on the discharges to eliminate hose kinking, and that all 3 in. (75 mm) and larger discharges be eliminated from the pump panel to reduce the possibility of injuries to the pump operator.

Fire apparatus equipped with electronic or electric engine throttle controls were required to include an interlock system to prevent engine speed advancement, unless the chassis transmission is in neutral with the parking brake engaged or unless the parking brake is engaged, the fire pump is engaged, and the chassis transmission is in the correct pumping gear.

The 1991 editions have been recognized as the benchmark from which improved and safer fire apparatus have evolved.

In 1996, many requirements were added throughout the document to improve the safety for fire fighters using the apparatus. These requirements included limiting the height of controls to 72 in. (2 m) above the standing position of the operator, requiring equipment in driving and crew areas to be securely fastened or in a compartment, increasing work lighting around the apparatus, and better grouping of pump controls to keep the operator away from the intake and discharge outlets. The low voltage electrical chapter was totally rewritten to require load analysis and load management if the total connected load cannot be supplied by the vehicle's alternator. The requirements for warning lights were also rewritten to provide for different lighting when “calling for right-of-way” versus “blocking right-of-way.” Requirements for warning lights were increased to provide more visibility of the fire apparatus.

The 1999 edition of NFPA 1901, added requirements to further increase the safety for the users. In the body area, the minimum step surface size, slip resistance and load-carrying capabilities were increased. Handrails were required to be slip resistant, and reflective striping was required on all four sides of the apparatus. To ensure the capability for continuous operation at fire scenes, a two hour, maximum load, electrical test for line voltage systems was implemented.

The 1999 standard also required more secure mounting of equipment in the driving and crew compartment, minimum performance and pre-delivery testing of foam systems, and also specified that fill stations for breathing air cylinders be designed to totally contain a rupturing cylinder

The 2003 edition continued to refine the requirements in the driving and crew riding areas increasing the head height at seating positions, bright red seat belts, reflective material inside each cab door, automatic door open lights and more secure mounting of SCBAs in seat backs, all aimed at reducing fire fighter injuries. The test protocol for slip resistance of standing and walking surfaces was better defined. Because of the size of emergency vehicles, a plate was required to remind operators of the height, length and weight of the apparatus.

D.3 Upgrading Fire Apparatus. Any apparatus, whether in first-line or reserve service, should be upgraded in accordance with NFPA 1912, as necessary to ensure that the following features are included as a minimum:

(1) Fully enclosed seating is provided for all members riding on the fire apparatus.

(2) Warning lights meet or exceed the current standard.

(3) Reflective striping meets or exceeds the current standard.

(4) Slip resistance of walking surfaces and handrails meets the current standard.

(5) A low-voltage electrical system load manager is installed if the total connected load exceeds the alternator output.

(6) The alternator output is capable of meeting the total continuous load on the low-voltage electrical system.

(7) Where the gross vehicle weight rating (GVWR) is 36,000 lb (16,000 kg) or more, an auxiliary braking system is installed and operating correctly.

(8) Ground and step lighting meets or exceeds the current standard.

(9) Noise levels in the driving and crew compartment(s) meet the current standard, or appropriate hearing protection is provided.

(10) All horns and sirens are relocated to a position as low and as far forward as possible.

(11) Seat belts are available for every seat and are new or in serviceable condition.

(12) Signs are present stating no riding on open areas.

(13) A pump shift indicator system is present and working properly for vehicles equipped with an automatic chassis transmission.

(14) For vehicles equipped with electronic or electric engine throttle controls, an interlock system is present and working properly to prevent engine speed advancement at the operator's panel, unless the chassis transmission is in neutral with the parking brake engaged; or unless the parking brake is engaged, the fire pump is engaged, and the chassis transmission is in pumping gear.

(15) All loose equipment in the driving and crew areas is securely mounted to prevent its movement in case of an accident.

D.4 Proper Maintenance of Fire Apparatus. In addition to needed upgrades to older fire apparatus, it is imperative that all fire apparatus be checked and maintained regularly to ensure that they will be reliable and safe to use. The manufacturer's instructions should always be followed when maintaining the fire apparatus. Special attention should be paid to ensure that the following conditions exist, as they are particularly critical to maintaining a reliable unit:

(1) Engine belts, fuel lines, and filters have been replaced in accordance with the manufacturers' maintenance schedule(s).

(2) Brakes, brake lines, and wheel seals have been replaced or serviced in accordance with the manufacturers' maintenance schedule.

(3) Tires and suspension are in serviceable condition, and tires are not more than 7 years old.

(4) The radiator has been serviced in accordance with the manufacturer's maintenance schedule and all cooling system hose are new or in serviceable condition.

(5) The alternator output meets its rating.

(6) A complete weight analysis shows the fire apparatus is not over individual axle or total gross vehicle weight ratings.

(7) The fire pump meets or exceeds its original pump rating.

(8) The water tank and baffles are not corroded or distorted.

(9) If equipped with an aerial device, a complete test to original specifications has been conducted and certified by a certified testing laboratory.

(10) If so equipped, the generator and line voltage accessories have been tested and meet the current standard.

D.5 Refurbishing or Replacing Fire Apparatus. Fire department administrators and fire chiefs should exercise special care when evaluating the cost of refurbishing or updating an apparatus versus the cost of a new fire apparatus. Apparatus that are refurbished should comply with the requirements of NFPA 1912, *Standard for Fire Apparatus Refurbishing.* A thorough cost-benefit analysis of the value of upgrading or refurbishing a fire apparatus should be

conducted. In many instances, it will be found that refurbishing costs will greatly exceed the current value of similar apparatus.

Some factors to consider and evaluate when considering whether to refurbish or replace a fire apparatus include the following:

(1) What is the true condition of the existing apparatus? Has it been in a major accident or has something else happened to it that would make spending significant money on it ill advised?

(2) Does the current apparatus meet the program needs of the area it is serving? Is it designed for the way the fire department operates today and is expected to operate into the foreseeable future, or is the apparatus functionally obsolete? Can it carry everything that is needed to do the job without being overloaded?

(3) If the apparatus is refurbished, will it provide the level of safety and operational capability of a new fire apparatus? Remember, in many cases, refurbishing does not mean increasing the GVWR, so it is not possible to add a larger water tank or additional foam agent tanks or to carry massive amounts of additional equipment. Enclosing personnel riding areas might add enough weight to the chassis that existing equipment loads need to be reduced to avoid overloading the chassis. An aerial ladder that does not have a 250 lb (114 kg) tip load rating at zero degrees elevation and maximum extension cannot be made stronger.

(4) What is the anticipated cost per year to operate the apparatus if it were refurbished, and what would the cost per year be for a new apparatus? Do not forget insurance costs, downtime costs, maintenance costs, depreciation, reliability, and the safety of the users and the public. At what rate are those costs rising each year? Are parts still readily available for all the components on the apparatus? A refurbished 15-year-old apparatus still has 15-year-old parts in it. How long could the fire department operate without the apparatus if it suddenly needed major repairs?

(5) Is there a current trade-in value that will be gone tomorrow? Most apparatus over 12 years old have little trade-in value. Are there creative financing plans or leasing options that can provide a new fire apparatus for little more than the cost of refurbishing or maintaining an older apparatus?

D.6 Conclusion. A fire apparatus is an emergency vehicle that must be relied on to transport fire fighters safely to and from an incident and to operate reliably and properly to support the mission of the fire department. A piece of fire apparatus that breaks down at any time during an emergency operation not only compromises the success of the operation but might jeopardize the safety of the fire fighters relying on that apparatus to support their role in the operation. An old, worn out, or poorly maintained fire apparatus has no role in providing emergency services to a community.