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ICS 13.220.10

C 84

GB 7956.12-2015

Fire Fighting Vehicles – Part 12: Aerial Fire Fighting Vehicle

消防车 第 12 部分：举高消防车

Issued on: October 09, 2015

Implemented on: January 01, 2016

Issued by: General Administration of Quality Supervision, Inspection and Quarantine of PRC;

Standardization Administration of PRC.

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Fire Fighting Vehicles - Part 12: Aerial Fire Fighting Vehicle

1 Scope

This part of GB 7956 specifies the terms and definitions, technical requirements, test methods, inspection rules as well as marking, packaging, transport and storage of aerial fire fighting vehicles.

This part is applicable to various aerial fire fighting vehicles.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated reference, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 3181	<i>Colour Standard for Paint Film</i>
GB 4351.1-2005	<i>Portable Fire Extinguishers - Part 1: Performance and Construction</i>
GB 6245	<i>Fire Pumps</i>
GB 7956.1-2014	<i>Fire Fighting Vehicles - Part 1: General Technical Specifications</i>
GB 15052-2010	<i>Cranes - Safety Signs and Hazard Pictorials - General Principles</i>
GB 19156	<i>General Specifications for Fire Monitors</i>
GB 19157	<i>General Specification for Remote-controlled Fire Monitor Systems</i>
GA 494-2004	<i>Fire Service Fall Protection Equipment</i>

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in GB 7956.1-2014 and the following apply. For the convenience of application, some terms and definitions specified in GB 7956.1-2014 are listed as follows.

3.1

turntable operating platform and in rescue cage of aerial fire fighting vehicle.

4.2.1.5 Connection and disconnection of hydraulic oil pump of aerial fire fighting vehicle shall be carried out in the cab of fire fighting vehicle; after connection of oil pump, there shall be light indication on operating platform of turntable; and it is the same with water pump connection.

4.2.1.6 Aerial fire fighting vehicles with the maximum operating height not less than 50m and equipped with firefighting sprayers shall be equipped with booster fire pump.

4.2.1.7 Firefighting gloves may be worn to operate stabilizer and boom (ladder) of aerial fire fighting vehicle.

4.2.1.8 As for aerial fire fighting vehicles, control of fire monitor, speed adjustment of fire pump and control of boom (ladder) shall be integrated in one place.

4.2.1.9 All components of aerial fire fighting vehicle shall not cover the front windshield glass.

4.2.1.10 As for the aerial fire fighting vehicle, the maximum operating height shall be greater than 15 m and the revolution angle of boom (ladder) shall be greater than 90°.

4.2.2 Operating instructions and mark

4.2.2.1 Detailed illustration or literal operating instructions and warning specifications shall be arranged at operating platform of stabilizer, rescue cage and turntable of aerial fire fighting vehicle visible for the operation personnel.

4.2.2.2 Operation and warning specifications for different operation places shall be distinguished by using fonts with different color or different size. Warning mark with the color meeting those specified in Clause 9 of GB 15052-2010 and font size legible and readable by operation personnel shall be arranged for operations possibly resulting in serious consequences. Corresponding warning specifications shall be arranged at retractable stabilizer outer end, cat ladder of lower- and upper-vehicles, fire monitor operation place, remote operation place and forced operation place.

4.2.3 Hydraulic system

4.2.3.1 Hydraulic oil tank volume of aerial fire fighting vehicle shall ensure the aerial fire fighting vehicle is able to continuously complete 50 operation cycles, and the temperature of hydraulic oil in the oil tank shall not be greater than 90°C. There shall be no boom (ladder) quiver, creeping or blocking due to overhigh oil temperature, and the hydraulic elements and components shall be free from oil leakage, oil penetration or damage.

4.2.3.2 There shall be indication of hydraulic system working pressure of boom (ladder) on the turntable operating platform; and there shall be indication of hydraulic system working pressure of stabilizer at the place for stabilizer operation.

4.2.3.3 Overflow valve shall be respectively arranged for hydraulic systems for stabilizer, boom (ladder), etc. of aerial fire fighting vehicle.

4.2.3.4 Nameplate indicating hydraulic oil model, operating temperature range, capacity, recommended replacement period and precautions for hydraulic oil replacement shall be arranged nearby the hydraulic oil tank of aerial fire fighting vehicle. Nameplate shall be arranged where is nearby hydraulic oil tank and convenient for reading. Device indicating liquid level and temperature of hydraulic oil in hydraulic oil tank shall be arranged. Replaceable air filter shall be arranged at hydraulic oil tank vent.

4.2.3.5 At least two replaceable hydraulic oil filters shall be arranged for hydraulic system of aerial fire fighting vehicle; the hydraulic oil flow of oil filter shall be able to meet the requirements of aerial fire fighting vehicle on hydraulic oil flow. Nameplate indicating oil filter model and recommended replacement period of oil filter shall be arranged at a visible place nearby the oil filter.

4.2.3.6 Turntable operating platform and rescue cage operating platform shall possess foot switch; when the foot switch is opened and, meanwhile, the hydraulic system operating valve is manipulated, the engine speed shall automatically response and be adjusted to be within the working speed range of hydraulic oil pump, and the hydraulic system shall act correspondingly. If the switch is not opened, the hydraulic system shall not response during hydraulic system operating valve manipulation. When fire pump and hydraulic pump are working simultaneously, the requirements of fire pump on rotation speed shall be met preferentially.

4.2.4 Safety requirements

4.2.4.1 Aerial fire fighting vehicle shall possess the function of interlocking of lower- and upper-vehicles; the boom (ladder) cannot move before the stabilizer is extended and leveled and supported reliably; before boom (ladder) retracts to the support bracket, the stabilizer of lower-vehicle cannot retract. Interlock function of lower- and upper-vehicles shall be realized automatically.

4.2.4.2 During moving process of boom (ladder), in case any stabilizer is not subjected to force, there shall be audible and visual alarm signal, and the boom (ladder) cannot continue moving in the hazardous direction but can move in safe direction.

4.2.4.3 In case the stabilizer of aerial fire fighting vehicle may stretch for working on single side, the boom (ladder) can only move on the side on which stabilizer stretches and the action on the other side shall be automatically prohibited. In case the stabilizers on both sides may partially stretch for working, the safety system shall automatically limit the actions of the boom (ladder) within safety range.

4.2.4.4 Add 1.1 times of rated load in rescue cage of aerial fire fighting vehicle; when the boom (ladder) acts within the safety operating range, one stabilizer is allowed to leave the ground with

the rated load of its rescue cage shall not be less than 270kg.

4.2.5.1.5 If lateral cat ladder is arranged for platform fire fighting vehicle, auxiliary ladder able of ensuring the personnel arrive at ground surface safely shall be arranged; there shall be transitive ladder section connecting rescue cage on the top of crawling ladder.

4.2.5.1.6 If lateral cat ladder is arranged for platform fire fighting vehicle, lighting device shall be arranged for it; the maximum load bearing capacity (number of people) of cat ladder shall be indicated at the turntable operation place; the crawling ladder strength shall be able to ensure it is free from permanent deformation or damage when it bears the maximum load (the maximum quantity of people). As for the ladder step, the length shall be greater than 400mm, the spacing shall be less than 350 mm, and the surface shall be antiskid with the anti-skid surface length greater than 60% the length of the ladder step. There shall be handrail on the side of cat ladder far away from the boom, and the handrail shall be higher than the ladder step by more than 300mm.

4.2.5.1.7 As for platform fire fighting vehicles equipped with fire monitor, its stability shall comply with the requirements of 4.2.4.4 and all its boom shall be extended to the working limit positions with an angle of 45°. If all booms cannot be extended to the working limit positions due to structure, the last section of boom shall be extended to the working limit position with an angle of 45°, and the inextensible boom shall be extended to the working limit position with the maximum angle formed with horizontal plane. Load the rescue cage according to the specified load during spraying, meanwhile, let the fire monitor spray at rated flow within the working range, and the stability of platform fire fighting vehicle shall also meet the requirements of 4.2.4.4.

4.2.5.1.8 As for fire monitor installed on the platform fire fighting vehicle, the depression angle and elevation angle for it winding the horizontal line as well as the left swing angle and right swing angle for it winding the boom parallel line shall be greater than 45°.

4.2.5.1.9 As for fire monitor arranged for platform fire fighting vehicle, the flow rate shall not be less than 30 L/s and the spray range shall not be less than 40 m; valve and pressure gauge shall be arranged at the inlet of the fire monitor; the duration from opening the valve to the maximum opening shall be greater than 5s.

4.2.5.2 Aerial ladder fire fighting vehicle

4.2.5.2.1 For aerial ladder fire fighting vehicles with a maximum operating height not greater than 40 m, the duration for ladder lifting from driving position to the maximum operating height and rotating by 90° shall be less than 120s. For aerial ladder fire fighting vehicle with the maximum operating height greater than 40 m, such duration shall increase by 30 s for each 10 m of the part exceeding 40 m; in case the length of the part exceeding 40m is less than 10m, the value of such length shall be rounded off.

4.2.5.2.2 The duration for stabilizer extending, supporting and being leveled shall not be greater than 40 s.

4.2.5.2.3 As for aerial ladder fire fighting vehicle, the area of its rescue cage shall be greater than 1.0m^2 and that of its lift shall be greater than 0.8m^2 .

4.2.5.2.4 As for aerial ladder fire fighting vehicle with the rescue cage monitor not spraying water, the rated load of its rescue cage shall not be less than 180kg.

4.2.5.2.5 As for aerial ladder fire fighting vehicle, auxiliary ladder, which may directly arrive the ground surface when unfolded, shall be arranged at the lower end of its ladder.

4.2.5.2.6 Lighting device shall be arranged for the ladder of aerial ladder fire fighting vehicle; the maximum load bearing capacity (number of people) of ladder shall be indicated at the turntable operation place; the ladder strength shall be able to ensure it is free from permanent deformation or damage when it bears the maximum load (the maximum quantity of people). As for the ladder step, the length shall be greater than 450mm, the spacing shall be less than 350 mm, and the surface shall be antiskid with the anti-skid surface length greater than 60% the length of the ladder step. There shall be handrail on both sides of ladder, and the handrail shall be higher than the ladder step by more than 300mm.

4.2.5.2.7 If ladder step is round, the diameter of ladder step including anti-skidding layer shall be greater than 32 mm.

4.2.5.2.8 If ladder step is of other shape, the sectional area of ladder step shall not be less than 775 mm^2 ; as for the section including anti-skidding layer, the length of long side is not greater than 80 mm and that of the short side is not less than 19 mm.

4.2.5.2.9 The ladder step installed on ladder of aerial ladder fire fighting vehicle shall be able to withstand a force of 2,300N without fracture or obvious permanent deformation.

4.2.5.2.10 Ladder of aerial ladder fire fighting vehicle shall possess driving locking device which shall ensure the ladder will not stretch when the aerial ladder fire fighting vehicle imminently brakes at 30 km/h and shall be without additional switch.

4.2.5.2.11 As for aerial ladder fire fighting vehicle equipped with manned rescue cage and fire monitor, its stability shall comply with the requirements of 4.2.4.4, the ladder shall be extended to working limit position with an angle of 45° ; load the rescue cage according to the specified load during spraying, meanwhile, let the fire monitor spray at rated flow within the working range; the stability of aerial ladder fire fighting vehicle shall also meet the requirements of 4.2.4.4.

4.2.5.2.12 Fire monitor installed at ladder top shall not influence the motion of ladder or hinder the personnel approaching the ladder top according to operation specifications. The depression angle and elevation angle for fire monitor winding the horizontal line shall be greater than 60° and the left swing angle and right swing angle for it winding the ladder parallel line shall be greater than 45° .

tower fire fighting vehicle with forcible entry device and with the maximum operating height greater than 20 m, such duration shall increase by 40 s for each 10 m of the part exceeding 20m, in case the length of the part exceeding 20m is less than 10m, the value of such length shall be rounded off.

4.2.5.3.9 As for water tower fire fighting vehicles with forcible entry device, its forcible entry device shall be automatically positioned and replaced and manually fixed.

4.2.5.3.10 As for water tower fire fighting vehicle with forcible entry device, it shall be ensured that the forcible entry device is firmly installed during vehicle driving, otherwise, the forcible entry device shall be placed in the storage tank before driving vehicle.

4.2.5.3.11 If water tower fire fighting vehicle is equipped with forcible entry device, boom shall be strong enough so that it is free from permanent deformation or structural damage or will not result in vehicle rollover when the forcible entry device works at the maximum operating height and the maximum forcible entry force.

4.3 Chassis Remanufacture Requirements

4.3.1 Chassis remanufacture of aerial fire fighting vehicle shall comply with the requirements of 5.4 in GB 7956.1-2014.

4.3.2 If chassis tyres serve as supporting points during aerial fire fighting vehicle work, the suspension system of chassis shall be locked when the transverse stabilizer is extended.

4.4 Special Device Requirements

4.4.1 Stabilizer

4.4.1.1 Aerial fire fighting vehicles shall possess at least 4 stabilizers.

4.4.1.2 If automatic leveling is adopted for stabilizer leveling of aerial fire fighting vehicles, there shall be emergency manual leveling mechanism.

4.4.1.3 When the aerial fire fighting vehicle is in driving state, all parts (except warning marking lamp) of stabilizer shall not exceed the widest part of the aerial fire fighting vehicle.

4.4.1.4 Stabilizer operation personnel shall be able to observe the movement condition of stabilizer at operating position.

4.4.1.5 When the stabilizer is moving, there shall be alarm sound not less than 90 dB(A) which lasts until the leveling is completed.

4.4.1.6 There shall be a button at stabilizer operation place which may stop the stabilizer

movement in an emergency way; when the button is pressed down, all the movements of stabilizer shall be stopped immediately.

4.4.1.7 The operating instructions arranged at the stabilizer operation place shall cover the following content:

- The supporting place of stabilizer shall be of flinty ground and with a loading capacity meeting the supporting requirements;
- Before extending the stabilizer, make sure there is no obstacle within the stabilizer extending range;
- Before extending the stabilizer, inspect to make sure the bearing plate has been put in place and the like.

4.4.1.8 Stabilizer oil cylinder shall possess hydraulic locking mechanism which shall ensure the oil cylinder retraction length is not greater than 5 mm in 1 h.

4.4.1.9 Stabilizer of aerial fire fighting vehicle shall be able to extend continuously and support the complete vehicle in leveling process for 100 times; during the test, there shall be free from oil leakage, structural member deformation, movement block, etc.

4.4.1.10 As for steel structural members bearing transverse and longitudinal stabilizer oil cylinders as well as secondary beam junction, their weld seam shall be subjected to non-destructive inspection.

4.4.1.11 As for the aerial fire fighting vehicle, yellow warning marking lamp shall be arranged at outer side of its stabilizer; when the stabilizer is extended, the yellow warning marking lamp shall automatically light and flicker. Yellow warning marking lamp shall possess such a luminance that it can be seen clearly at a place more than 10m away from it, the flicker frequency shall not be less than 1/s; the part of stabilizer extending out of the aerial fire fighting vehicle shall be painted red alternating with white by reflectorized paint.

4.4.1.12 Aerial fire fighting vehicle shall be equipped with bearing plates with the quantity same as that of the stabilizer, and the area of bearing plate shall ensure the pressure borne by support surface is not greater than 800kPa. The mass of each bearing plate shall not be greater than 15kg for aerial fire fighting vehicle with the maximum operating height not greater than 60m and 25 kg for that with the maximum operating height greater than 60m; the bearing plate shall be strong enough to support the complete vehicle without damage or obvious deformation.

4.4.1.13 After the aerial fire fighting vehicle is leveled, there shall be light indication at the leveling operation place; level gauge or equipment that can display transverse and longitudinal level conditions shall be installed along the vehicle body in transverse and longitudinal directions.

4.4.2.3.2 When the boom (ladder) of aerial fire fighting vehicle with rescue cage is moving, the motion trail, extending height, operating range, luffing angle and safety operating range of boom (ladder) shall be displayed in real time at a place visible for the operation personnel.

4.4.2.3.3 Emergency stop button for stopping boom (ladder) in emergency situation shall be arranged on the turntable operating platform.

4.4.2.3.4 The front/rear/left/right positions of control handle of aerial fire fighting vehicle boom (ladder) shall give an obvious hand feeling, and the control handle shall be capable of self-return. If electric control valve is adopted, each control handle may integrate two kinds of operations; the control handle on left side controls the extending and retracting of the boom (ladder) and that on right side controls the rotating of boom (ladder) and luffing of main boom; if hydraulic manual valve is adopted, the valve on left side controls the extending and retracting of boom (ladder), that in the middle controls the rotating of boom (ladder) and that on right side controls the luffing of main beam. The following operation directions should be adopted for control lever of electric control valve:

- Pull backward the handle, the boom (ladder) shall pitch up or retract;
- Push forward the handle, the boom (ladder) shall pitch down or extend;
- Push leftwards the handle, the boom (ladder) shall rotate anticlockwise;
- Push rightwards the handle, the boom (ladder) shall rotate clockwise.

4.4.2.4 Safety requirements of boom (ladder)

4.4.2.4.1 When the boom (ladder) of aerial fire fighting vehicle is started, the safety system shall work automatically.

4.4.2.4.2 Boom (ladder) shall move stably without creeping, quivering or shaking; starting and stopping of boom (ladder) shall not cause obvious shake of vehicle.

4.4.2.4.3 Boom (ladder) of aerial fire fighting vehicle shall act within the safety operating range; when the boom (ladder) is close to the edge of safety operating range or movement limit position, the speed of boom (ladder) actions shall be slow down. When reaching the limit of safety operating range, the boom (ladder) shall automatically stop acting towards hazardous direction with audible and visual alarm sent, the alarm sound shall not be less than 90 dB(A); after stopping moving, the boom (ladder) shall not act towards hazardous direction; the boom (ladder) may act towards safe direction without operating any additional switch.

4.4.2.4.4 As for aerial fire fighting vehicles with rescue cage, its boom (ladder) shall be strong enough to bear 1.5 times the rated load of rescue cage without permanent deformation and structural damage.

4.4.2.4.5 The 1h retraction length of boom (ladder) shall be less than the 0.2% of the maximum operating height.

4.4.2.4.6 As for strength design calculation of boom (ladder), at least the following working loads shall be considered:

- Wind load;
- Self-weight load of boom (ladder);
- Inertial load generated during boom (ladder) movement;
- Working load of boom (ladder);
- Dynamic loads generated by counterforce of monitor spraying, activities of personnel in rescue cage, etc.

4.4.2.4.7 Boom (ladder) shall be subjected to stress test; during the stress test; load according to the maximum load of the tested component in working; as for plastic materials, the maximum stress borne by the components shall be less than 50 % of the yield stress of the used materials. As for fragile materials, the maximum stress borne by components shall be less than 20% of the rupture stress of the used materials.

4.4.2.4.8 Main welds of boom (ladder) and those of supporting axle seats shall be subjected to non-destructive inspection.

4.4.3 Rescue cage

4.4.3.1 Mark

4.4.3.1.1 Contents such as rated load of rescue cage, belt up, and no overcrowding shall be marked at obvious position of rescue cage. Rated load of rescue cage shall be big enough that it is legible and readable for personnel more than 10m away from the rescue cage, and the font color shall be obviously different with the periphery color. The text shall be free from shedding or corrosion due to vibration, high temperature, water and other environments.

4.4.3.1.2 As for the aerial fire fighting vehicle with rescue cage, different safety operating ranges shall be determined according to rescue cage load and spraying condition of fire monitor. Different safety operating ranges shall be displayed at the place visible at aerial fire fighting vehicle turntable rescue cage according to different loads and spraying condition of fire monitor.

4.4.3.2 Structural strength

4.4.3.2.1 Rescue cage door shall be opened inward, its width is not less than 450mm and its

the nozzles are opened, the sight line and visual field necessary for safety operation of operation personnel in rescue cage shall be ensured.

4.4.3.3.4 If air breathing system is configured for aerial fire fighting vehicle with rescue cage, at least two breathing masks shall be arranged in the rescue cage; the duration for using the air breathing system by two persons simultaneously shall be greater than 1h.

4.4.3.3.5 If high-altitude emergency escape system is configured for the aerial fire fighting vehicle with rescue cage, such system shall be reliably connected to rescue cage.

4.4.3.4 Safety requirements of rescue cage

4.4.3.4.1 As for rescue cage of aerial fire fighting vehicle within safety operating range, its floor shall automatically keep level against level surface; the leveling error shall not exceed 3° , and it shall be leveled timely and stably. When the angle formed by rescue cage floor and level surface reaches 10° , the safety device shall automatically stop the boom (ladder) actions; the rescue cage shall possess auxiliary manual leveling mechanism which can work only when two devices are operated simultaneously.

4.4.3.4.2 Aerial fire fighting vehicle with rescue cage shall possess overload alarm; when rescue cage load is larger than the rated load, audible and visual alarm signal shall be sent with the alarm sound not less than 90 dB(A), and the boom (ladder) shall be able to act in safe direction.

4.4.3.4.3 There shall be anti-collision device at forepart and lower part of rescue cage; the device shall automatically stop the boom (ladder) actions and send sound alarm signal with the alarm sound not less than 90 dB(A) when approaching or touching obstacles. If contact-type anti-collision device is adopted, the impact force necessary for stopping boom (ladder) actions shall not be greater than 1,000N.

4.4.3.4.4 As for aerial fire fighting vehicle with the maximum operating height not less than 30m, wind meter shall be arranged on rescue cage fence or boom (ladder) top; if the wind speed exceeds that specified by the production enterprise, audible and visual alarm signal shall be sent with the alarm sound not less than 90dB(A).

4.4.4 Turntable

4.4.4.1 Turntable shall be able to rotate in two directions and possess braking device for stopping the rotation; it shall be convenient for lubricating the support of turntable.

4.4.4.2 Turntable operating platform of aerial fire fighting vehicle shall possess safety fences which shall be convenient for operation personnel access without influencing turntable rotation; turntable fence height shall not be less than 1.0 m; all parts of the fence ought to withstand 1,500N without permanent deformation or structural damage.

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Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

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