



## Ensuring the Safety of Wheeled Transport Vehicles When Driving in Fog Conditions

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### ABSTRACT

**Objective.** When driving a car in fog conditions, the driver's vision decreases, which means that driving the car as slowly as possible and being careful is required. Fog causes negative emotions, under its influence, the driver experiences fear and impaired vision.

It is necessary to analyze what factors the features of fog lights in modern cars depend on, what requirements are set for providing light, and the methods of testing them, as well as drawing up appropriate conclusions.

**Methods.** Analysis of what factors are the most convenient anti-fog properties for the driver and what requirements are imposed on cars and roads to ensure safety, and the methods of their testing and the development of relevant conclusions.

**Results.** It is necessary to theoretically justify the impact on visibility and working conditions when driving cars in foggy conditions, to consider the structure and operation of fog lights installed on cars.

**Conclusion.** Nowadays, xenon anti-fog lamps are used in modern cars. The visibility distance of the anti-fog headlight installed on the Damas car was 5-7 meters during the day and 4-5 meters at night. Basics of LED (light-emitting diodes) lighting based on the principle of semiconductor operation. Light-emitting diode lamps inside the lamp work on the principle of a semi-superconductor. This means that energy is generated during the movement of positive and negative charges, and the maximum part is distributed in the form of photons of visible light.

### Keywords:

fog, fog lights, road covered with fog, car, types of fog, international requirements.

**Introduction.** The development of the automobile industry in our country is growing rapidly. At the same time, ensuring traffic safety is becoming an urgent issue. A total of 741 traffic accidents were recorded in Andijan region in 2020. In 2021, this indicator was 848. 37% of road traffic accidents occurred in inconvenient weather conditions.

When driving a car in fog conditions, the driver's visibility decreases, which means that

driving the car as slowly as possible and being careful is required. Fog causes negative emotions, under its influence, the driver experiences fear and impaired vision.

The GOST 41.19-99 standard was considered in the study of international students. According to the requirements of this standard:

Front fog lamps must be designed and constructed in such a way that, under normal

conditions of use and subject to vibration, they are guaranteed to function correctly and maintain the characteristics specified in these regulations. The correct position of the lenses must be clearly defined, and the lens and reflector must be mounted so that rotation does not occur during use. Verification of compliance with the requirements of this clause is carried out by external inspection and, if necessary, a test installation.

Front fog lights must be equipped with a device that allows them to be adjusted in the vehicle to meet the requirements of the relevant standards. Such a device need not be provided for headlamp assemblies in which the reflector and lens cannot be separated, provided that the use of such assemblies is restricted to vehicles with front fog lamps configured by other means. If front fog lamps and other types of headlamps, each equipped with a separate filament lamp, are grouped or combined into one device, the adjustment device must allow each optical system to be adjusted separately.

Fog - liquid dispersed phase aerosols in the form of droplets. It is formed by condensation of supersaturated vapors.

Consisting of a collection of water droplets or ice crystals formed by the saturation of water vapor in the Earth's surface layers in the atmosphere, fog obscures horizontal visibility for less than 1 km. fog occurs as a result of the cooling of the air layer near the Earth or its moistening. The fog that appears as a result of cooling is divided into the following: 1) radiation fog, which is formed as a result of the negative radiation balance of the earth's surface and cools the air layer on the surface of the earth, such fog, as a rule, is a light wind, it can be frosty at night, and in winter it can be during the day; 2) advective fog resulting from the advection of warm air over the cold Earth; it can occur at any time of the day when the clouds are low and the cold wind is blowing; 3) frontal fog, which appears due to the evaporation of raindrops above the atmospheric front, is observed over seas during winter advection of extreme cold, and over water bodies due to the outflow of cooled air from the coast in summer and autumn. Most of the time, fog appears under the combined or sequential influence of the above-mentioned processes.



**Picture 1. Highways in foggy conditions**

Fog lights. Fog lights serve to ensure safe movement of vehicles in fog, heavy snowfall, hail and other severe weather conditions. In these conditions, turning on the high-beam headlights only worsens the visibility of the road, and the low-beam headlights are not effective enough.

In conditions of fog and heavy precipitation, turning on the headlights gives the effect of a "white veil". The reason for this is that the flow of light falling on a fog or raindrop is partially reflected and partially absorbed. The part of the light flux that enters the particle is divided into two parts, one part passes through the particle and exits, the other part is reflected many times at the inner edges of the particle, and then leaves the particle in different directions. The part of the light stream that is reflected from the fog particles greatly reduces the level of illumination of the road, while the absorbed part creates the above-mentioned "dark curtain".

To create an anti-fog light beam, the following requirements must be met:

a) It is necessary to reduce the length of the light rays in order to reduce the reflection and absorption of the light flux in the fog. To meet this requirement, the fog lights must be positioned lower than the main headlights. The distance between the road surface and the extreme point of the fog lamp should not be less than 250 mm.

b) The angle of dispersion of the light flux should be reduced in the vertical plane and increased in the horizontal plane. This is done by installing special diffusers in fog lights. In the fog lights installed on modern cars, the angle of the beam of light on the horizontal plane is 700...900.

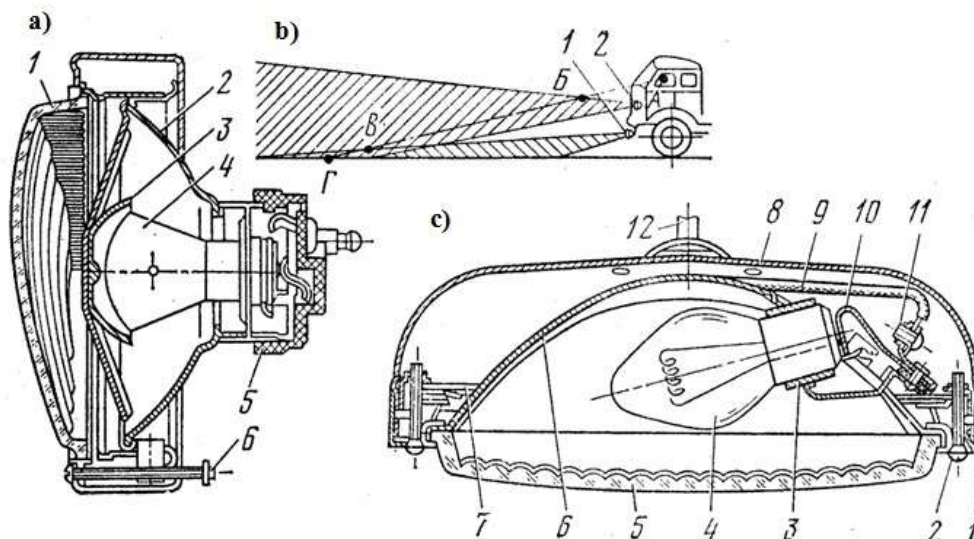
c) All light rays coming directly from the filament of fog lights must be shielded.

A reference lamp of the category specified by the manufacturer, with a voltage of 12 V and a colorless bulb provided by the manufacturer, is used for the test.

In foggy conditions, all the colors on the road will change except for the red ones. For example, yellow is more reddish in fog, and green is more yellowish. The fog layer can be so thick that even with the lights on, you can't see more than 3-5 meters away. At night and in conditions of insufficient visibility, the driver gets tired much faster than during the day, because he drives the car with a high level of attention and tension for a long time.

### **Analysis and results of lamps used in cars The construction of fog lights is shown in the picture.**

According to the structure, these headlights can be rectangular or circular. Reflectors of fog lights have a paraboloid shape, and ordinary A-12-35 and H1, H2, H3 halogen lamps are installed in its focus center. A screen is placed in front of them to block the direct rays coming from the lamp. Cylindrical lenses are placed on the inner surface of the light diffuser, which ensures the distribution of the beam of light along the horizontal plane. Taking into account the small internal volume of the headlight and the use of halogen lamps, the diffusers are made of glass. According to modern standards, diffusers can be made white or yellow, but this does not affect the characteristics of the headlights in fog conditions. Fog lights are fixed in the body or on the bumper using a special bracket.



**Picture 2. Fog lamp:**

a) marked headlight FG119: 1. Distributor, 2. Returner, 3. Screen, 4. Lamp, 5. Cartridge, 6-adjustment bolt.

b) - distribution of light rays: 1.that of the anti-fog headlight, 2.headlight, ABVG- driver's line of sight.

c) headlight FG120-B: 1.flange, 2.bolt, 3.lamp cartridge, 4.lamp, 5.distributor, 6.returner, 7.optical element handle, 8.case, 9.conductor, 10.contact plate, 11.clamp, 12.bracket.

**Xenon lamps.** The principle of operation is similar to the production of light in such lamps, where the main role belongs to the hydrogen wire, which is a beautiful body in halogen lamps and is heated to light under its influence.

**Diode lamps.** Basics of LED lighting based on the principle of semiconductor operation. Light-emitting diode lamps (light-emitting diodes) inside the lamp work on the principle of a semi-superconductor. This means that energy is generated during the movement of positive and negative charges, and the maximum part is distributed in the form of photons of visible light.

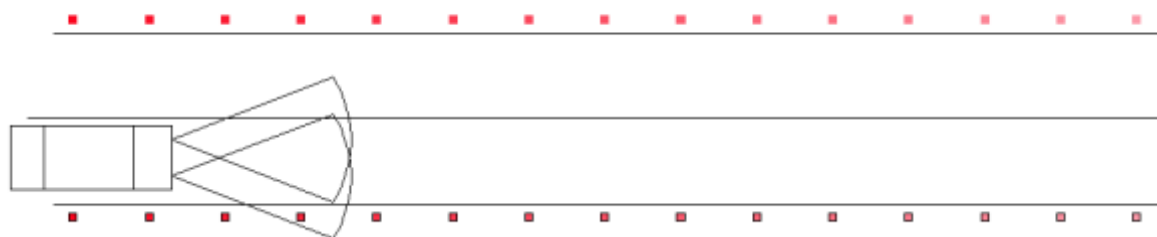
**Advantages:**

- long-term storage service;
- economical energy consumption;
- Improved visibility for the driver.

**Methods.** The following methods are used to organize traffic safety in the district:

- empirical research methods;
- theoretical research methods;
- analysis, synthesis, induction and deduction, abstraction.

**Results.** In fog conditions, the red color is visible unchanged. Visibility distance was determined by installing red reflectors at the edge of the road every 1 meter.



**Picture 3. Determining the visibility distance in fog conditions.**

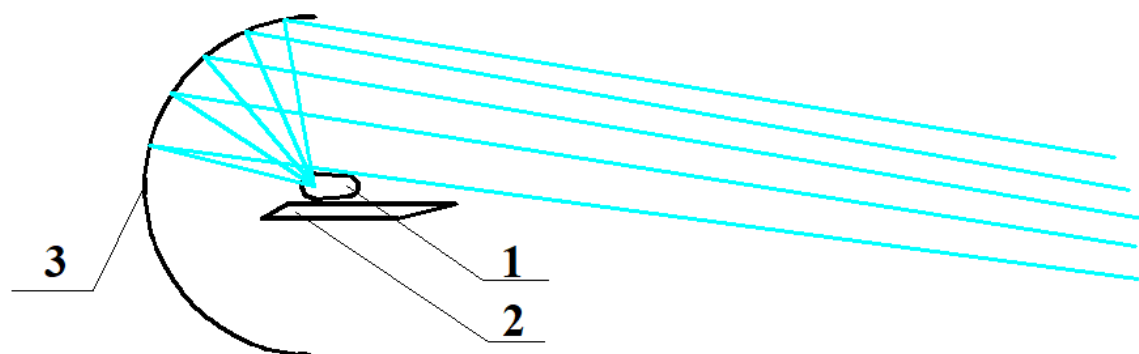
The visibility distance of the anti-fog headlight installed on the Damas car was 5-7 meters during the day and 4-5 meters at night. And in the headlight with a diode lamp, this distance changed from 8-10 meters during the day to 6-8 meters at night. However, it creates inconvenience for the driver of the car coming from the opposite direction.

**Discussions.** In foggy conditions, all the colors on the road will change except for the red ones. For example, yellow is more reddish in fog, and green is more yellowish. The fog layer can be so thick that even with the lights on, you can't see more than 3-5 meters away. At night and in conditions of insufficient visibility, the driver gets tired much faster than during the day, because he drives the car with a high level of attention and tension for a long time. In cars produced in our country, the color of fog lights is yellow. Studies show that using white fog lights increases visibility. The main issues of the work are the theoretical justification of the changes that occur in the process of studying the methods and methods of driving safety in fog conditions, its application, and the practical justification of car anti-fog headlights, as well as creating ease for the car to move in the fog.

**Conclusion.** Statistics show that almost half of road traffic accidents occur in dark and foggy conditions with limited visibility. In foggy conditions, all the colors on the road will change except for the red ones. For example, yellow is more reddish in fog, and green is more yellowish. The fog layer can be so thick that even with the lights on, you can't see more than 3-5 meters away. At night and in conditions of insufficient visibility, the driver gets tired much faster than during the day, because he drives the car with a high level of attention and tension for a long time.

During the research work, the state of safety for drivers in the conditions of the district was studied. It was proposed to replace the current fog lights with diode lights. It was found that the ability to see in the conditions of the fog increases 1.2-1.3 times. A method of determining the driver's visibility in fog conditions was created. The existing standards were studied.

The advantages of diode lamps are justified by their long service life, energy saving and, most importantly, the improvement of the visible distance for the driver.



**Picture 4. Use of diode lamps in fog lights.**

1.LED lamp 2-Light guide 3. Reflector

A beam deflector was installed to regulate the upward beam of the LED lamps, which prevents glare for the oncoming car driver.

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