

ECONOMIC COMMISSION FOR EUROPE
INLAND TRANSPORT COMMITTEE
World Forum for Harmonization of Vehicle Regulations (WP.29)
Working Party on General Safety Provisions (GRSG)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATIONS No. 36

Transmitted by the Expert from the Russian Federation

Note: The text reproduced below was prepared by the expert from the Russian Federation in accordance with the decision of the 79th session of GRSG (document TRANS/WP.29/GRSG/58, para. 14). It is based on document TRANS/WP.29/GRSG/2000/11 and incorporates the proposals included into both informal documents Nos. 1 and 14. The amendments are deemed in black. The text includes also new proposals made by Czech Republic. They are taken in square brackets. Parties are invited to discuss the amendments done and proposed by Czech Republic.

Insert a new clause 5.16, to read:

“ 5.16. Trolley buses shall comply with the prescriptions of annex 8.

Insert a new annex 8, to read:

Annex 8

SAFETY PRESCRIPTIONS TO TROLLEY BUSES

1. DEFINITIONS

For the purpose of this **Annex**:

1.1. Contact system voltage

Trolley buses can be supplied with contact system voltage of rated value of:

- 600 V (a working range of 400 to 720 V);
- 750 V (a working range of 500 to 900).

1.2. Electrical circuits of trolley bus

- high voltage circuits means circuits supplied with contact system voltage;
- low voltage circuits means circuits supplied with accumulator battery voltage **and with a charger outlet of nominal 24 V voltage.**
- **three phase circuits means circuits supplied with a second convertor outlet of three phase voltage not exceeding 400 V AC.**

1.3. Rated climatic conditions

Trolley buses are intended to provide reliable transit service in the environmental conditions with:

- a temperature range of minus 40 [25]°Ñ to plus 40°Ñ;
- an relative humidity of 98% at temperature of 25°Ñ and lower;
- an atmospheric pressure of 866 to 1066 hPa
- altitude from sea level 1000 m maximum

1.4. Hardly flammable materials means materials able to burn when exposed to the ignition source but not continue burning after the ignition source has been extinguished.

2. POWER COLLECTION

2.1. Electrical power from overhead wires is leaded to trolley bus with power collectors. The power collector is comprised of a pole, a trolley electric current collector and an replaceable collector insertion. Power collectors are hinged to trolley bases, and turning in horizontal and vertical directions.

2.2. Poles shall be made of **insulated material or metal covered with** insulating material resistant to metal shocks

2.3. Power collectors shall be designed to maintain adequate positive contact with the overhead trolley electric supply wires when the wires are located at 4 to 6 metres **above the ground** and trolley bus **axis to axis** deviation distance of at least 4.0 meters to each side with respect to the axis of the overhead wires.

2.4. In case the pole dewires, trolley electric current collector(s) shall not be raised higher than 7.2 **metres above the road** and declined lower than **0.5 metres above the roof of the trolley bus.**

2.5. Each power collector shall be equipped with the device pulling the pole automatically down if the pole dewires.

2.6. The trolley electric current collector, if wrenched out the pole, shall be kept connected to the pole and should not fall down.

2.7. Insulation resistance of the electric current collector to trolley bases shall be at least $10 \text{ M}\Omega$:

2.8. Power collectors **may** be equipped with remote control from the driver's compartment at least for dewiring.

2.9. Certain arrangements at the trolley bus shall provide an opportunity for the driver to replace, if necessary, **power collector** inserts in transit service conditions.

3. TRACTION AND AUXILIARY EQUIPMENT

3.1. Electrical components installed on the trolley bus shall be protected against overvoltage and short-circuit current. The protection shall **preferably be assured by current-breaking apparatus that are reset either automatically, remotely or manually.**

3.2. Electrical components shall be protected against commutation or atmospheric overvoltage.

3.3. Current-breaking apparatus shall provide interruption of particular damaged circuits.

3.4. If any circuit includes single current-breaking apparatus, it shall be installed in the positive wire of the circuit.

3.5. All electrical circuits and circuit branches shall be of dual wiring. The trolley bus body can be used for current return grounds only for low voltage electrical circuits.

3.6. **Battery** cases, **accumulator** covers and **battery compartment** trays shall be made of unflammable or **hardly flammable** materials.

3.7. Electrical components energized by the trolley line voltage shall have additional insulation from the body and transmission.

3.8. Electrical components with exemption of traction resistors shall be protected against **penetration of** moisture and dust inside the body **and** on insulated and **current conducting** parts.

3.9. At rated climate conditions for dry and clean trolley bus insulation resistance of electrical circuits when all rotating machines and apparatus are switched on shall not be less than, $\text{M}\Omega$:

- body to high voltage electrical circuits 5
- high voltage electrical circuits 5
- to low electrical circuits
- body to positive pole of low voltage 1
- electrical circuits

3.10. Wiring, Cabling and Apparatus

3.10.1. Only multi-line wires shall be used for high voltage circuits. All high voltage DC wiring shall have insulation rated for 3000 V DC or AC.

3.10.2. Mounted wiring and cabling should not **be stressed mechanically. Length of each wire shall be sufficient for at least twice replacement of end terminals.**

3.10.3. Wiring insulation shall not propagate burning.

3.10.4. Wiring of different voltages shall be mounted separately.

3.10.5. Cabling conduits shall be made of non flammable material.

3.10.6. Cabling tubes located under the floor shall exclude propagation of water and dust.

3.10.7. Cabling and wiring located under the trolley bus shall be **inserted** into conduit protecting against water and dust.

3.10.8. Fastening and arrangement of wiring and cables shall exclude damage (fraying) of insulation.

Grommets of elastomeric material shall be provided at points where wiring penetrates metal structure to exclude insulation damage.

Radius of bound tubes containing wiring shall be five external diameters of the tube minimum.

3.10.9. Location of wiring in apparatus breaking off electrical current shall exclude skipping the electrical arch onto the wiring.

3.10.10. Precautions shall be taken to avoid damage of wiring and cables from heated resistors and other electrical components. In critical areas thermoresistant wires or cables shall be used.

3.10.11. Wiring holders, connectors and other devices for mounting shall be made of unflammable or **hardly flammable** materials. Electrical components of the hardly flammable materials may be installed outside passenger compartment only.

3.10.12. Test voltage U_{tes} for electrical equipment, wiring and cabling for high voltage circuits shall be of value of:

$$U_{tes} = 2.5 U + 2000 \text{ VAC} \text{ where } U - \text{rated voltage of the contact system}$$

Test voltage for low voltage equipment $U_{tes} = 750 \text{ VAC}$.

The test voltage at frequency of 50 Hz shall be approximately sinusoidal form. The time of application of the test voltage is fixed at 1 min.

3.11. Electrical machines, apparatus, devices, wiring and cables shall withstand mechanical affects, applied to fixations, as follows:

- sine-wave form vibration of 0.5 - 55 Hz frequency and 10 m/s^2 maximum amplitude including resonance if produced;
- discrete shocks of 30 m/s^2 peak shock acceleration lasting 2 -20 μs in vertical direction.

4. ELECTRICAL SAFETY OF PASSENGERS AND SERVICE PERSONAL

4.1. At rated climate conditions for dry and clean trolley bus connected with both power collectors to wire of positive polarity and negative polarity of the contact system to "the ground" leakage current from the body shall not be higher than $0.2 \mu\text{A}$ (Grounded contact system).

4.2. Trolley bus must be equipped with onboard device for permanent monitoring of leakage current **or voltage between chassis and the road surface. The device shall disconnect the high voltage circuits from the contact system in case of leakage current exceeding 3 mA or the voltage of more than 40 V.**

[There shall be a warning system that gives an audible or visible signal to the driver when during operation a difference in voltage of more than 15 V occurs between the chassis and the road surface and that shall additionally disconnect the high voltage circuits in case of a difference of more than 50 V.

Trolley bus must be equipped with onboard insulation test device for insulation resistance periodical inspection between high voltage equipment and chassis and between high voltage equipment and low voltage circuits – Czech Republic proposal].

4.3. Stanshions at doorway shall be made of insulated material or plated with mechanically durable insulation. Insulation resistance shall at least be $1.0 \text{ M}\Omega$ on a contact square of $100 \pm 5 \text{ cm}^2$.

4.4. The first steps shall be made of insulated material or plated with mechanically durable insulation. Insulation resistance shall at least be $1.0 \text{ M}\Omega$ at a square of contact of $300 \pm 5 \text{ cm}^2$.

4.5. Door panels shall be made of insulated material or insulated from the trolley bus body. Insulation resistance shall be $1.0 \text{ M}\Omega$ at least at a contact square on the panel of $300 \pm 5 \text{ cm}^2$.

4.6. Sidewall area adjacent to the door apertures shall be plated with insulation. The insulated area shall extend at least 50 cm wide each side of the door apertures and at least 200 cm high from the roadway. Insulation resistance in respect to the trolley bus body shall not be less than $1.0 \text{ M}\Omega$ at a square of contact of $200 \pm 5 \text{ cm}^2$ [**Czech Republic proposes to exclude this para**].

4.7. If the trolley bus is equipped with a DC/DC converter, paragraph 3.3 to 3.6 shall not be applied [Czech Republic proposes to exclude this para].

5. THE DRIVER'S COMPARTMENT

5.1. In the driver's compartment there should not be high voltage equipment accessible for the driver.

5.2. As a minimum, the instrument panel shall be consistent of:

- indicator of voltage in the contact system;
- indicator of **zero** voltage in the contact system;
- indicator of main automatic switch of contact system voltage state;
- indicator of charge/discharge of the batteries;
- indicator of dangerous potential on the body or leakage current exceeding permissible value.