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agenda item 1.)

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 36
(Public service vehicles)

Transmitted by the Expert from the Russian Federation

Note: The text reproduced below was prepared by the expert from the Russian Federation in order to introduce prescriptions for trolleybuses in the text of the Regulation. It is based on a document distributed without a symbol, (informal document No. 3) during the seventy-eighth session (TRANS/WP.29/GRSG/57, para 14).

Note: This document is distributed to the Experts on General Safety Provisions only.

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Insert a new annex 8, to read:

"Annex 8

SAFETY PRESCRIPTIONS FOR TROLLEYBUSES

1. DEFINITIONS

For the purpose of this annex:

1.1. Contact system voltage

Trolleybuses 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 trolleybus

- "high voltage circuits" means circuits supplied with contact system voltage;
- "low voltage circuits" means circuits supplied with accumulator battery voltage.

1.3. Rated climatic condition:

Trolleybuses are intended to provide a reliable transit service in the environmental conditions with:

- a temperature range of minus 40°C to plus 40°C;
- a relative humidity of 98 per cent at temperature of 25°C and lower;
- an atmospheric pressure of 650 to 800 mm Hg
- altitude from sea level to 1,000 m maximum

2. POWER COLLECTION

2.1. Electrical power from overhead wires is transmitted to trolleybuses with power collectors. The power collector is comprised of a pole, a trolley electric current collector and a replaceable collector insert. Power collectors are hinged to trolleybuses, and turn in horizontal and vertical directions.

2.2. Poles shall be made of insulating material resistant to metal shocks. Insulation shall be repairable.

[The Netherlands proposes to leave "or be covered with insulating material"]

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 meters height and the trolleybus

touring excursion deviation distance is of at least 4.0 meters to each side with respect to the axis of the overhead wires.

- 2.4. In case the pole unwires, the trolley electric current collector shall not reach higher than 7.2 m and decline lower than 2.2 m above the roadway.

[The Netherlands proposes to add "and decline lower than 0.5 m above the roof of the trolleybus; however for the purpose of maintenance this may be reduced to 1.5 m above the road"]

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

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

- 2.7. Insulation resistance of the electric current collector to trolleybuses shall be at least 10 M Ω .

- 2.8. Power collectors can be equipped with a remote control from the driver's compartment at least for unwiring.

- 2.9. Certain arrangements at the trolleybus shall provide an opportunity for the driver to replace, if necessary, carbon inserts in transit service conditions.

3. TRACTION AND AUXILIARY EQUIPMENT

- 3.1. Electrical components installed on the trolleybus shall be protected against over-voltage and short-circuit current. Protection shall be arranged by automatic reset circuit breakers remote or manually controlled.

- 3.2. Electrical components shall be protected against commutation or atmospheric over-voltage.

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

- 3.4. For any circuit only a protective apparatus shall interrupt the positive side of the circuit.

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

- 3.6. Control circuits, light-signalling devices, lighting etc. shall be fed from a DC low voltage source comprising accumulator battery and charger.

- 3.7. Case, cell covers and trays shall be made of inflammable or hardly flammable materials.

- 3.8. The trolleybus should be as tolerant as possible to power the system operational working range limited by the national standard in the country the trolleybus is delivered to.
- 3.9. Electrical components energized by the trolley line voltage shall have additional insulation from the body and transmission.
- 3.10. Electrical components with the exemption of traction resistors shall be protected against moisture and dust inside the body, on insulated and conducted parts.
- 3.11. At rated climate conditions for a dry and clean trolleybus, insulation resistance of electrical circuits when all rotating machines and apparatus are switched on shall not be less than:
- body to high voltage electrical circuits 5 M Ω
 - high voltage electrical circuits to low electrical circuits 5 M Ω
 - body to positive pole of low voltage electrical circuits 1 M Ω
- 3.12. Wiring, Cabling and Apparatus
- 3.12.1. Wiring and cabling must be assumed for operation at ambient temperature range of minus 40°C to plus 40°C.
- 3.12.2. Only multi-line copper wires shall be used for high voltage circuits. All high voltage DC wiring shall have insulation rated for 3,000 v DC or AC.
- 3.12.3. Mounted wiring and cabling should not be tight. Each wire or cable shall withstand twice replacement of end terminals.
- [The Netherlands proposes to read the clause as "Mounted wiring and cabling shall not be stressed mechanically"]*
- 3.12.4. Wiring, cabling and terminals shall be resistant to relative humidity up to 98 per cent at the ambient temperature of 25°C.
- 3.12.5. Wiring insulation shall not propagate burning.
- 2.12.6. Wiring of different voltages shall be mounted separately.
- 3.12.7. Cabling conduits shall be made of non-flammable material.
- 3.12.8. Cabling tubes located under the floor shall exclude propagation of water and dust.
- 3.12.9. Cabling and wiring located under the trolleybus shall be mounted into a conduit protecting against water and dust.
- 3.12.10. 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.

- 3.12.11. Location of wiring in apparatus breaking off electrical current shall exclude skipping the electrical arch onto the wiring.
- 3.12.12. Precautions shall be taken to avoid damage of wiring and cables from heated resistors and other electrical components. In critical areas thermo-resistant wires or cables shall be used.
- 3.12.13. Wiring holders, connectors and other devices for mounting shall be made of no flammable or hardly flammable materials.

Electrical components of the hardly flammable materials may be installed outside the passenger compartment only.

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

$$U_{tes} = 2.5 U + 2000 \text{ v,}$$

where U - rated voltage of the contact system

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

- 3.13. 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/s² maximum amplitude including resonance if produced;
 - descrest shocks of 30 m/s² peak shock acceleration lasting 2 - 20 μ s in vertical direction.

4. ELECTRICAL SAFETY OF PASSENGERS AND SERVICE PERSONNEL

- 4.1. At rated climate conditions for dry and clean trolleybus 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 μ A (Grounded contact system).

[The Netherlands proposes to leave paragraph 4.2. of document TRANS/WP.29/GRSG/1999/25 in wording as follows "At any operation conditions leakage current shall not be higher than 3 milliampers [ma] at voltage of 600 V DC

Voltage limits between chassis and the road surface during operation:

$U < 15 \text{ V}$	<i>no alarm</i>
$15 \text{ V} < U_{max} < 50 \text{ V}$	<i>alarm</i>
$U > 50 \text{ V}$	<i>alarm and disconnection"</i>

- 4.2. Trolleybus must be equipped with onboard indicator or another device for permanent monitoring of leakage current or protection of people at the appearance of leakage current.

The installation of leakage current control device does not exclude periodical inspection high voltage equipment insulation in transit service conditions.

- 4.3. Stanchions 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 trolleybus 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 of the trolleybus body shall not be less than $1.0 \text{ M}\Omega$ at a square of contact of $200 \pm 5 \text{ cm}^2$.

5. THE DRIVER'S COMPARTMENT

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

- 5.2. The instrument panel shall be equipped with:

- gauge indicating presence of a voltage in the contact system;
- indicator of disappearance voltage in the contact system;
- indicator of main automatic switch of the contact system voltage state;
- indicator of charge/discharge of the batteries;
- indicator of dangerous potential on the body or of a leakage current exceeding permissible value."
