Informal document No. 3
(78th GRSG 10-14 April 2000
agenda item 1.)

Transmitted by the expert from the Russian Federation

REPORT OF THE MEETING OF GRSG INFORMAL GROUP ON TROLLEY BUS
(February 7-11, 2000)

The meeting of the informal group was held from 7 February to 11 February 2000 under the chairmanship of Mr. J.Martin (Luxemburg), vice-chairman Mr. O. Ghirutsky (the Russian Federation).

Experts from the following countries participated in the work: Czech Republic, Russian Federation, Spain. The participants are listed in annex 1.

Working documents:
TRANS/WP.29/GRSG/55, paras 13-21;
TRANS/WP.29/GRSG/1998/13;
TRANS/WP.29/GRSG/1999/1;
TRANS/WP.29/GRSG/1999/2;
TRANS/WP.29/GRSG/1999/25;
Informal document No. 13 on 76th session of GRSG;
Informal document, submitted to the informal group by the Russian Federation.
Informal document, submitted to the informal group by Czech Republic

1. In accordance with the decision made at 76th session of GRSG the informal group should elaborate new annex to Regulation No.36 related to safety prescriptions for eltctrical components of trolley bus.

2. Constitution of the group was authorised by WP 29 at its 119th session.

3. Before the meeting the Russian Federation analized the all comments to the official documents TRANS/WP.29/GRSG/1998/13 and TRANS/WP.29/GRSG/1999/25 including informal document submitted by Czech Republic. That work resulted to new draft proposals made on the basis of the official document TRANS/WP.29/GRSG/1999/25.

4. The participants of the meeting discussed the new draft and certain amendments were done.

5. The Netherlands did not participate in the meeting. However the informal group took into consideration the Dutch proposals to the document TRANS/WP.29/GRSG/1999/25 sent by fax.

6. Mostly the Dutch proposals were accepted. Items the Netherlands has different attitude to were put into final document in square brackets. These items due to general opinion of the group shall be considered at 77th session of GRSG.

7. The final document worked out by the informal group is annexed to the report. The group proposes to put into agenda of 77th session of GRSG the consideration of the new draft proposals for safety requirements of trolley bus electrical components.

Vice-chairman
of the informal groupmeeting
Dr. O.Ghirutsky

Annex 1

Restricted
February 7-11, 2000

Informal Group on Trolley Bus

State Scientific Centre NAMI
Moscow, the Russian Federation

LIST OF PARTICIPANTS

Chairman: Mr.J.Martin (Luxemburg)
Vice-chairman: Mr.O.Ghirutsky (the Russian Federation)

CZECH REPUBLIC

Mr. V.KUNZL	Motor Vehicle Research Institute Ltd. 18068, PRAHA 8
Mr. S.KOUCKY	SCODA OSTROV 36329, OSTROV

The RUSSIAN FEDERATION

Mr.L.GARONINE	State Scientific Centre NAMI 125438, Moscow
Mr. V.GOLOUBEV	NIIGET 125212, Moscow
Mr. V.KOMAROV	NIIAT 123480, Moscow
Mr. A.MAXIMOV	NIIGET 125212, Moscow
Mr. V.MISHCENKOV	NICIAMT 141800, Dmitrov 7
Mr. E.ZHITINSKY	NICIAMT 141800, Dmitrov 7

SPAIN

Mr.J.BORROS	IDIADA L'Arbornar, 43700 Santa Oliva (Tarragona)
Mr.J.Nogues	IDIADA L'Arbornar, 43700 Santa Oliva (Tarragona)

Annex 2

PROPOSAL FOR DRAFT AMENDMENTS TO REGULATION No. 36

Insert a new annex 8, to read:

Annex 8

SAFETY PRESCRIPTIONS TO TROLLEYBUSES

DEFINITIONS

For the purpose of this annex:

i) 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).

ii) 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.

iii) Rated climatic conditions

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

- a temperature range of minus 40°Ñ to plus 40°Ñ;
- an relative humidity of 98 per cent at temperature of 25°Ñ and lower;
- an atmospheric pressure of 650 to 800 mm Hg
- altitude from sea level 1000 m maximum

1. POWER COLLECTION

1.1. Electrical power from overhead wires is transmitted 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.

1.2. 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"*]

1.3. 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

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

1.4. In case the pole dewires, trolley electric current collector shall not be arised higher than 7.2 meters and declined lower than 2.2 meters above the roadway.

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

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

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

1.7. Insulation resistance of the electric current collector to trolley bases shall be at least 10 ÌΩ:

1.8. Power collectors can be equipped with remote control from the driver's compartment at least for dewiring.

1.9. Certain arrangements at the trolley bus shall provide an opportunity for the driver to replace, if necessary, carbon inserts in transit service conditions.

2. TRACTION AND AUXILIARY EQUIPMENT

2.1. Electrical components installed on the trolley bus shall be protected against overvoltage and short-circuit current. Protection shall be arranged by automatic reset circuit breakers remote or manually controlled.

2.2. Electrical components shall be protected against commutator or atmospheric overvoltage.

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

2.4. For any circuit only protective apparatus shall interrupt the positive side of the circuit.

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

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

2.7. Case, cell covers and trays shall be made of unflammable or hardly flammable materials.

2.8. Trolley bus should be as tolerant as possible to power system operational working range limited by national standard in country trolley bus delivered to.

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

2.10. Electrical components with exemption of traction resistors shall be protected against moisture and dust inside the body, on insulated and conducted parts.

2.11. 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, MΩ:

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

2.12. Wiring, Cabling and Apparatus

2.12.1. Wiring and cabling must be assumed for operation at ambient temperature range of minus 40°Ñ to plus 40°Ñ.

2.12.2. Only polyline copper wires shall be used for high voltage circuits. All high voltage DC wiring shall have insulation rated for 3000 V DC or AC.

2.12.3. Mounted wiring and cabling should not be tightened. Each wire or cable shall withstand twice replacement of end terminals. [*The Netherlands proposes to read the clouse as “Mounted wiring and cabling shall not be stressed mechanically”*]

2.12.4. Wiring , cabling and terminals shall be resistant to relative humidity up to 98% at the ambient temperature of 25°Ñ.

2.12.5. Wiring insulation shall not propogate burning.

2.12.6. Wiring of different voltages shall be mounted separately.

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

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

2.12.9. Cabling and wiring located under the trolley bus shall be monted into conduit protecting against water and dust.

2.12.10. 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 binded tubes containing wiring shall be five external diameters of the tube minimum.

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

2.12.12. 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.

2.12.13. 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.

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

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

where U - rated voltage of the contact system

Test voltage for low voltage equipment $U_{tes} = 750$ V.

2.13. 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 friequency and 10 m/s^2 maximum amplitude including resonance if produced;
- descrete shocks of 30 m/s^2 peak shock acceleration lasting 2 -20 μs in vertical direction.

3. ELECTRICAL SAFETY OF PASSENGERS AND SERVICE PERSONAL

3.1. 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 μA (Grounded contact system).

[*The Netherlands proposes to leave clouse 4.2 of official 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 V	*no alarm*
15 V < U_{max} < 50 V	*alarm*
U > 50 V	*alarm and disconnection*]

3.2. Trolley bus 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.

3.3. Stanshions at doorway shall be made of insulated material or plated with mechanically durable insulation. Insulation resistance shall at least be 1.0 MΩ on a contact square of 100 +/- 5 cm^2.

3.4. The first steps shall be made of insulated material or plated with mechanically durable insulation. Insulation resistance shall at least be 1.0 MΩ at a square of contact of 300 +/- 5 cm^2.

3.5. Door panels shall be made of insulated material or insulated from the trolley bus body. Insulation resistance shall be 1.0 MΩ at least at a contact square on the panel of 300 +/- 5 cm^2.

3.6. 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 resistanse in respect to the trolley bus body shall not be less than 1.0 MΩ at a square of contact of 200 +/- 5 cm^2.

4. THE DRIVER'S COMPARTMENT

4.1. In the driver’s compartment there should not be high voltage equipment accessible for the driver.

5.2. The instrument panel shall be consistent of:

- gauge indicating existance of voltage in contact system;
- indicator of disappearance voltage in 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.

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