GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 03.220.20; 13.040.99

CCS T 09

GB/T 17729-2023

Replacing GB/T 17729-2009, GB/T 28370-2012

Hygienic Standard and Detect Methods for the Air Quality Inside Interurban Bus

长途客车内空气质量要求及检测方法

Issued on: March 17, 2023 **Implemented on: October 1, 2023**

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

Table of Contents

Hygienic Standard and Detect Methods for the Air Quality Inside Interurban Bus

1 Scope

This document specifies the limits and detection methods for volatile organic compounds and carbonyl compound in new interurban buses, and the limits and detection methods for the main components of the air in in-service interurban buses.

This document is applicable to Class B and Class III buses in Category-M_2, Category-M_3. Other types of buses may take this as a reference.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB 7258 Technical Specifications for Safety of Power-driven Vehicles Operating on Roads

GB/T 15089 Classification of Powder-driven Vehicles and Trailers

HJ/T 400-2007 Determination of Volatile Organic Compounds and Carbonyl Compounds in Cabin of Vehicles

3 Terms and Definitions

What is defined in GB 7258 and GB/T 15089, as well as the following terms and definitions are applicable to this document.

3.1 interurban bus

Interurban bus refers to a bus designed and manufactured for transporting passengers between cities (urban and rural areas) and specialized in passenger transport.

[source: GB 7258-2017, 3.2.1.3.1.1, modified]

3.2 new interurban bus

New interurban bus refers to a newly produced interurban bus whose off-line time is within (42 ± 5) d and whose interior has not been changed.

3.3 in-service interurban bus

In-service interurban bus refers to an interurban bus that has completed registration and is used for commercial road passenger transport.

3.4 volatile organic compounds

Volatile organic compounds are a generic term for volatile compounds collected by absorbents like Tenex and separated by a gas chromatographic column with a polarity index less than 10, and whose retention time is between n-hexane and n-hexadecane.

[source: HJ/T 400-2007, 3.2, modified]

3.5 carbonyl compound

Carbonyl compound refers to a compound with carbonyl functional groups, collected by 2,4-dinitrophenylhydrazine (DNPH) and analyzed by high performance liquid chromatography.

[source: ISO 12219-1:2021, 3.4]

3.6 total volatile organic compounds; TVOC

Total volatile organic compounds refer to the sum of the values of volatile organic compounds collected by absorbents like Tenax and separated by a gas chromatographic column with a polarity index less than 10, and whose retention time is between n-hexane and n-hexadecane.

[source: GB/T 18883-2022, 3.4, modified]

3.7 aerobic plate count

Aerobic plate count refers to the number of microorganisms per cubic meter of vehicle interior space after the air in the vehicle is sampled by an air microbial sampler and cultured under certain conditions (such as: culture medium, temperature and time, etc.).

NOTE: colony count is expressed in colony-forming units (CFU).

[source: GB 4789.2-2022, 2.1, modified]

4 Limits of Volatile Organic Compounds and Carbonyl Compound in New Interurban Bus

Table 1 specifies the limits of volatile organic compounds, carbonyl compound and total volatile organic compounds (TVOC) in new interurban bus.

domestic vehicles. Under special circumstances, the test time may be determined in accordance with the time of arrival in the Chinese market.

6.1.2 Sampling environment

The sampling environment where the vehicle under inspection is located shall satisfy the following conditions.

a) Ambient temperature: 25.0 °C ± 1.0 °C.

b) Relative humidity: (50 ± 10) %.

c) Airflow velocity is not greater than 0.3 m/s.

d) Background concentration in the sampling environment chamber: for a single type of volatile organic compound and carbonyl compound, not greater than 0.02 mg/m^3; for total volatile organic compounds (TVOC), not greater than 0.2 mg/m^3.

6.1.3 Setting of sampling points

The number of sampling points in the vehicle is determined by the effective volume of the passenger compartment of the vehicle under inspection and the specific conditions of the vehicle under inspection and shall be able to correctly reflect the air quality in the vehicle. The setting of sampling points shall satisfy the following requirements:

a) For vehicles with a length of 9 m and below, there shall be at least two measurement points, which are evenly arranged along the longitudinal centerline of the compartment;

b) For vehicles with a length of above 9 m, there shall be at least three measurement points, which are evenly arranged along the longitudinal centerline of the compartment;

c) The height of the sampling points is 1.2 m ± 0.1 m from the plane height of the interior floor.

6.1.4 Sampling devices

6.1.4.1 Sampling environment chamber

6.1.4.1.1 The sampling environment chamber is mainly composed of main chamber, air conditioning system and filtration system, etc.

6.1.4.1.2 The inner surface of the sampling environment chamber shall be made of low-release, low-permeability and low-absorption materials. Materials and facilities that may affect the background concentration of environmental pollutants shall not be placed in the chamber. The space in the chamber shall be sufficient to accommodate the vehicle under inspection, so as to facilitate the personnel in the testing and sampling of the vehicle under inspection.

6.1.4.1.3 The sampling environment chamber shall take technical measures to reduce the influence of airflow on the air exchange inside and outside the compartment of the vehicle under inspection.

6.1.4.1.4 The main chamber shall be provided with a main door and an auxiliary door. The main door shall ensure the normal entry and exit of the vehicle under inspection and shall not be opened during the entire sampling process; the auxiliary door is provided for the safe entry and exit of personnel. When the auxiliary door is opened throughout the sampling process, it shall be ensured that the sampling environment conditions at least within a space of 0.5 m from the outer surface of the vehicle under inspection satisfy the requirements of 6.1.2.

6.1.4.2 Sample collection device

6.1.4.2.1 The sample collection device is mainly composed of constant-flow gas sampler, sampling conduit and packed column sampling tube, etc.

6.1.4.2.2 The flow rate of the constant-flow gas sampler shall be adjustable and stable within the range of 50 mL/min ~ 1,000 mL/min. After connecting with the packed column sampling tube, adjust the gas flow rate and use a primary flowmeter (for example, primary soap film flowmeter) to calibrate the flow rate. The flow rate shall satisfy the requirement that the errors before and after sampling are less than 5%.

6.1.4.2.3 The sampling conduit shall use treated stainless steel tubes, polytetrafluoroethylene tubes or silicone rubber tubes. The air inlet shall be fixed at the specified sampling point in the passenger compartment of the vehicle under inspection, then, lead the sampling conduit from the passenger compartment, during which, the integrity and airtightness of the vehicle shall not be damaged; the air outlet shall be connected to the packed column sampling tube outside the passenger compartment. The end of the packed column sampling tube shall be connected to a constant-flow gas sampler.

6.1.4.2.4 The airtightness of the entire sample collection device shall be guaranteed, and there shall be no air leakage.

6.1.4.2.5 The packed column sampling tube shall comply with the relevant stipulations of Appendix B and Appendix C in HJ/T 400-2007.

6.1.5 Sample collection procedures

6.1.5.1 Pre-treatment stage of vehicle under inspection

Put the vehicle under inspection into the sampling environment chamber, remove the surface coverings used to temporarily protect the internal components of the vehicle, such as: the protective film of seats and interior trim parts, etc. Completely open the doors and windows of the vehicle under inspection, so that the vehicle can thoroughly communicate with the outside air. In accordance with the requirements of 6.1.3, arrange the sampling points in the vehicle and monitor the temperature of the sampling points inside the vehicle under inspection. After the temperature reaches 25.0 °C ± 1.0 °C, the vehicle under inspection shall be put into the closed

6.1.9 Sample transportation and storage

The sampling tube shall be sealed with a sealing cap and tightly wrapped with tinfoil or aluminum foil, stored and transported at low temperature (less than 4 °C); the storage time shall not exceed 30 d.

6.1.10 Determination and analysis

6.1.10.1 Determination of volatile organic compounds

The determination of volatile organic compounds shall be conducted in accordance with the determination method specified in Appendix B of HJ/T 400-2007.

6.1.10.2 Determination of carbonyl compound

The determination of carbonyl compound shall be conducted in accordance with the determination method specified in Appendix C of HJ/T 400-2007.

6.1.10.3 Calculation of concentration of total volatile organic compounds (TVOC)

TVOC includes the values of all compounds from n-hexane to n-hexadecane in the total ion chromatogram (TIC). Calculate the concentration (S_{id}) of identified and quantified volatile organic compounds in the standard curve; use the response coefficient of toluene to calculate the concentration (S_{un}) of the first 25 maximum peaks of unidentified volatile organic compounds; the sum of S_{id} and S_{un} is the concentration of TVOC.

6.1.11 Quality assurance and control

6.1.11.1 Instrument requirements

The instrument shall be timely calibrated and demarcated, pass the metrological verification and be within the validity period.

6.1.11.2 Airtightness inspection

Before sampling, the airtightness of the sampling system shall be inspected, and there shall be no air leakage.

6.1.11.3 Flow calibration

Before and after each sampling, a primary flowmeter (for example, primary soap film flowmeter) shall be used to calibrate the sampling flow rate of the sampling system under sampling load conditions.

6.1.11.4 On-site blank inspection

During each sampling, at least 2 blank sampling tubes shall be reserved as on-site blank during the sampling process and sent to the laboratory together with other sampling tubes after sampling. During sample analysis, determine the on-site blank value.

6.3.1.2 The impact-type air microbial sampler shall satisfy the following requirements:

a) The capture rate of bacteria in the air shall not be less than 95% (the pore size of the sixth stage sieve shall not be greater than 0.3 mm);

b) It shall be easy to operate, easy to carry, stable in performance and convenient for sterilization.

6.3.2 Nutrient agar medium

6.3.2.1 The ingredients include 20 g of peptone, 3 g of beef extract, 5 g of sodium chloride, 15 g ~ 20 g of agar and 1,000 mL of distilled water.

6.3.2.2 The preparation method is as follows:

a) Mix the ingredients in 6.3.2.1;

b) Heat to dissolve it;

c) Adjust pH to 7.4, filter and divide it;

d) At 121 °C, perform autoclaving for 20 min.

6.3.3 Detection method

6.3.3.1 The setting of sampling points in the vehicle shall comply with the requirements of 6.1.3.

6.3.3.2 Before sampling, the doors and windows of the vehicle under inspection shall be closed. Start the engine, tune the air conditioner to the maximum wind speed mode and turn on the air purification device (if any). The vehicle under inspection is in the state of no-load and idle speed. When the temperature inside the vehicle under inspection reaches the range of 20 °C ~ 30 °C, start sampling.

6.3.3.3 Disinfect the sampler and arrange the sampling points, then, in accordance with the instructions of the instrument, conduct sampling. The sampling volume is 30 L ~ 150 L. In accordance with the performance of the instrument used and the degree of microbial contamination of the air in the vehicle, the sampling volume of air shall be increased or decreased as appropriate.

6.3.3.4 After sampling is completed, put the bacteria-carrying nutrient agar plate into a constant-temperature incubator at 36 °C ± 1 °C, incubate for 48 h, count the aerobic plate count, then, in accordance with the flow rate and sampling time of the sampler, convert it into the number of colonies per cubic meter of air (CFU/m^3).

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------