国标委工交函〔2003〕68号

关于批准《室内空气质量标准》国家标准第1号修改单的函

卫生部:

你部报批的GB/T18883-2002《室内空气质量标准》国家标准第1号修改通知单，业经国家标准化管理委员会批准，于2003年10月1日起实施，并在《中国标准化》杂志2003年第9期上公布。

修改单见附件。

二〇〇三年七月二十五日

附件:

GB/T18883-2002《室内空气质量标准》国家标准

第1号修改单

本修改单经国家标准化管理委员会于2003年7月25日批准，自2003年10月1日起实施。

标准名称: GB/T18883-2002《室内空气质量标准》

1、第6页，表A.1(续)18 氡 ^{222}Rn 来源:

原文为: “(1)GB/T 14582 (2)GB/T 16147”

修改为: “(1)GB/T 16147 (2)GB/T 14582”

2、 第7页，B.3.3 椰子壳活性炭:

原文为: “20～40目”

修改为: “0.90～0.45mm(20～40目/英寸)”

3、第10页，C.3.3 吸附剂:

原文为 “使用的吸附剂粒径为 0.18～0.25mm(60～80目)”

修改为 “使用的吸附剂粒径为0.28～0.18mm(60～80目

/英寸)”

4、第 11 页，C.6.2 色谱分析条件:

原文为:“固定相可以是二甲基硅氧烷或 70%的氰基丙烷、70%的苯基、86%的甲基硅氧烷”

修改为:“固定相可以是二甲基硅氧烷或 7%的氰基丙烷、7%的苯基、86%的甲基硅氧烷”

ICS 13. 040. 01
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中华人民共和国国家标准

GB/T 18883—2002

室内空气质量标准

Indoor air quality standard

2002-11-19 发布　　2003-03-01 实施

国家质量监督检验检疫总局
卫生部　发布
国家环境保护总局

目　　次

前　言

为保护人体健康，预防和控制室内空气污染，制定本标准。

本标准的附录A、附录B、附录C、附录D为规范性附录。

本标准为首次发布。

本标准由卫生部、国家环境保护总局《室内空气质量标准》联合起草小组起草。

本标准主要起草单位：中国疾病预防控制中心环境与健康相关产品安全所，中国环境科学研究院环境标准研究所，中国疾病预防控制中心辐射防护安全所，北京大学环境学院，南开大学环境科学与工程学院，北京市劳动保护研究所，清华大学建筑学院，中国科学院生态环境研究中心，中国建筑材料科学研究院环境工程所。

本标准于2002年11月19日由国家质量监督检验检疫总局、卫生部、国家环境保护总局批准。

本标准由国家质量监督检验检疫总局提出。

本标准由国家环境保护总局和卫生部负责解释。

室内空气质量标准

1 范围

本标准规定了室内空气质量参数及检验方法。

本标准适用于住宅和办公建筑物，其它室内环境可参照本标准执行。

2 规范性引用文件

下列文件中的条款通过本标准的引用而成为本标准的条款。凡是注日期的引用文件，其随后所有的修改（不包括勘误内容）或修订版均不适用于本标准，然而，鼓励根据本标准达成协议的各方研究是否可使用这些文件的最新版本。凡是不注日期的引用文件，其最新版本适用于本标准。

GB/T 9801	空气质量　一氧化碳的测定　非分散红外法
GB/T 11737	居住区大气中苯、甲苯和二甲苯卫生检验标准方法　气相色谱法
GB/T 12372	居住区大气中二氧化氮检验标准方法　改进的 Saltzman 法
GB/T 14582	环境空气中氡的标准测量方法
GB/T 14668	空气质量　氨的测定　纳氏试剂比色法
GB/T 14669	空气质量　氨的测定　离子选择电极法
GB 14677	空气质量　甲苯、二甲苯、苯乙烯的测定　气相色谱法
GB/T 14679	空气质量　氨的测定　次氯酸钠-水杨酸分光光度法
GB/T 15262	环境空气　二氧化硫的测定　甲醛吸收-副玫瑰苯胺分光光度法
GB/T 15435	环境空气　二氧化氮的测定　Saltzman 法
GB/T 15437	环境空气　臭氧的测定　靛蓝二磺酸钠分光光度法
GB/T 15438	环境空气　臭氧的测定　紫外光度法
GB/T 15439	环境空气　苯并［a］芘测定　高效液相色谱法
GB/T 15516	空气质量　甲醛的测定　乙酰丙酮分光光度法
GB/T 16128	居住区大气中二氧化硫卫生检验标准方法　甲醛溶液吸收－盐酸副玫瑰苯胺分光光度法
GB/T 16129	居住区大气中甲醛卫生检验标准方法　分光光度法
GB/T 16147	空气中氡浓度的闪烁瓶测量方法
GB/T 17095	室内空气中可吸入颗粒物卫生标准
GB/T 18204.13	公共场所室内温度测定方法
GB/T 18204.14	公共场所室内相对湿度测定方法
GB/T 18204.15	公共场所室内空气流速测定方法
GB/T 18204.18	公共场所室内新风量测定方法　示踪气体法
GB/T 18204.23	公共场所空气中一氧化碳检验方法
GB/T 18204.24	公共场所空气中二氧化碳检验方法
GB/T 18204.25	公共场所空气中氨检验方法
GB/T 18204.26	公共场所空气中甲醛测定方法
GB/T 18204.27	公共场所空气中臭氧检验方法

3 术语和定义

3.1 室内空气质量参数（indoor air quality parameter）

指室内空气中与人体健康有关的物理、化学、生物和放射性参数。

3.2 可吸入颗粒物（particles with diameters of 10μm or less，PM_{10}）

指悬浮在空气中，空气动力学当量直径小于等于 10 μm 的颗粒物。

3.3 总挥发性有机化合物（Total Volatile Organic Compounds TVOC）

利用 Tenax GC 或 Tenax TA 采样，非极性色谱柱（极性指数小于 10）进行分析，保留时间在正己烷和正十六烷之间的挥发性有机化合物。

3.4 标准状态（normal state）

指温度为 273 K，压力为 101.325 kPa 时的干物质状态。

4 室内空气质量

4.1 室内空气应无毒、无害、无异常嗅味。

4.2 室内空气质量标准见表 1。

表 1 室内空气质量标准

Table 1 Indoor Air Quality Standard

序号	参数类别	参数	单位	标准值	备注
1	物理性	温度	℃	22～28	夏季空调
				16～24	冬季采暖
2		相对湿度	%	40～80	夏季空调
				30～60	冬季采暖
3		空气流速	m/s	0.3	夏季空调
				0.2	冬季采暖
4		新风量	$m^3/(h\cdot人)$	30[a]	
5	化学性	二氧化硫 SO_2	mg/m^3	0.50	1 小时均值
6		二氧化氮 NO_2	mg/m^3	0.24	1 小时均值
7		一氧化碳 CO	mg/m^3	10	1 小时均值
8		二氧化碳 CO_2	%	0.10	日平均值
9		氨 NH_3	mg/m^3	0.20	1 小时均值
10		臭氧 O_3	mg/m^3	0.16	1 小时均值
11		甲醛 HCHO	mg/m^3	0.10	1 小时均值
12		苯 C_6H_6	mg/m^3	0.11	1 小时均值
13		甲苯 C_7H_8	mg/m^3	0.20	1 小时均值
14		二甲苯 C_8H_{10}	mg/m^3	0.20	1 小时均值
15		苯并［a］芘 B(a)P	ng/m^3	1.0	日平均值
16		可吸入颗粒物 PM_{10}	mg/m^3	0.15	日平均值
17		总挥发性有机物 TVOC	mg/m^3	0.60	8 小时均值
18	生物性	菌落总数	cfu/m^3	2 500	依据仪器定[b]
19	放射性	氡 ^{222}Rn	Bq/m^3	400	年平均值（行动水平[c]）

a 新风量要求≥标准值，除温度、相对湿度外的其它参数要求≤标准值；

b 见附录 D；

c 达到此水平建议采取干预行动以降低室内氡浓度。

5 室内空气质量检验

5.1 室内空气中各种参数的监测技术见附录 A。

5.2 室内空气中苯的检验方法见附录 B。

5.3 室内空气中总挥发性有机物（TVOC）的检验方法见附录 C。

5.4 室内空气中菌落总数检验方法见附录 D。

附 录 A
（规范性附录）
室内空气监测技术导则

A.1 范围

本导则规定了室内空气监测时的选点要求、采样时间和频率、采样方法和仪器、室内空气中各种参数的检验方法、质量保证措施、测试结果和评价。

A.2 选点要求

A.2.1 采样点的数量：采样点的数量根据监测室内面积大小和现场情况而确定，以期能正确反映室内空气污染物的水平。原则上小于 50 m^2 的房间应设 1～3 个点；50～100 m^2 设 3～5 个点；100 m^2 以上至少设 5 个点。在对角线上或梅花式均匀分布。

A.2.2 采样点应避开通风口，离墙壁距离应大于 0.5 m。

A.2.3 采样点的高度：原则上与人的呼吸带高度相一致。相对高度0.5 m～1.5 m 之间

A.3 采样时间和频率

年平均浓度至少采样 3 个月，日平均浓度至少采样 18 h，8 h 平均浓度至少采样 6 h、1 h 平均浓度至少采样 45 min，采样时间应函盖通风最差的时间段。

A.4 采样方法和采样仪器

根据污染物在室内空气中存在状态，选用合适的采样方法和仪器，用于室内的采样器的噪声应小于 50 dB（A）。具体采样方法应按各个污染物检验方法中规定的方法和操作步骤进行。

A.4.1 筛选法采样：采样前关闭门窗 12 h，采样时关闭门窗，至少采样 45 min。

A.4.2 累积法采样：当采用筛选法采样达不到本标准要求时，必须采用累积法（按年平均、日平均、8 h 平均值）的要求采样。

A.5 质量保证措施

A.5.1 气密性检查：有动力采样器在采样前应对采样系统气密性进行检查，不得漏气。

A.5.2 流量校准：采样系统流量要能保持恒定，采样前和采样后要用一级皂膜计校准采样系统进气流量，误差不超过 5%。

采样器流量校准：在采样器正常使用状态下，用一级皂膜计校准采样器流量计的刻度，校准 5 个点，绘制流量标准曲线。记录校准时的大气压力和温度。

A.5.3 空白检验：在一批现场采样中，应留有两个采样管不采样，并按其他样品管一样对待，作为采样过程中空白检验，若空白检验超过控制范围，则这批样品作废。

A.5.4 仪器使用前，应按仪器说明书对仪器进行检验和标定。

A.5.5 在计算浓度时应用下式将采样体积换算成标准状态下的体积：

$$V_0 = V \frac{T_0}{T} \cdot \frac{P}{P_0}$$

式中 V_0——换算成标准状态下的采样体积，L；

V——采样体积，L；

T_0——标准状态的绝对温度，273 K；

T——采样时采样点现场的温度（t）与标准状态的绝对温度之和，（$t+273$）K；

P_0——标准状态下的大气压力，101.3 kPa；

P——采样时采样点的大气压力，kPa。

A.5.6 每次平行采样，测定之差与平均值比较的相对偏差不超过20%。

A.6 检验方法

室内空气中各种参数的检验方法见表A.1。

表A.1 室内空气中各种参数的检验方法

序号	参数	检验方法	来源
1	二氧化硫 SO_2	（1）甲醛溶液吸收——盐酸副玫瑰苯胺分光光度法	（1）GB/T 16128 GB/T 15262
2	二氧化氮 NO_2	（1）改进的 Saltzman 法	（1）GB 12372 GB/T 15435
3	一氧化碳 CO	（1）非分散红外法 （2）不分光红外线气体分析法　气相色谱法　采置换法	（1）GB 9801 （2）GB/T 18204.23
4	二氧化碳 CO_2	（1）不分光红外线气体分析法 （2）气相色谱法 （3）容量滴定法	GB/T 18204.24
5	氨 NH_3	（1）靛酚蓝分光光度法　纳氏试剂分光光度法 （2）离子选择电极法 （3）次氯酸钠—水杨酸分光光度法	（1）GB/T 18204.25　GB/T 14668 （2）GB/T 14669 （3）GB/T 14679
6	臭氧 O_3	（1）紫外光度法 （2）靛蓝二磺酸钠分光光度法	（1）GB/T 15438 （2）GB/T 18204.27　GB/T 15437
7	甲醛 HCHO	（1）AHMT 分光光度法 （2）酚试剂分光光度法　气相色谱法 （3）乙酰丙酮分光光度法	（1）GB/T 16129 （2）GB/T 18204.26 （3）GB/T 15516
8	苯 C_6H_6	气相色谱法	（1）附录B （2）GB 11737
9	甲苯 C_7H_8 二甲苯 C_8H_{10}	气相色谱法	（1）GB 11737 （2）GB 14677
10	苯并［a］芘 B(a)P	高效液相色谱法	GB/T 15439
11	可吸入颗粒物 PM_{10}	撞击式——称重法	GB/T 17095
12	总挥发性有机化合物 TVOC	气相色谱法	附录C
13	菌落总数	撞击法	附录D
14	温度	（1）玻璃液体温度计法 （2）数显式温度计法	GB/T 18204.13
15	相对湿度	（1）通风干湿表法 （2）氯化锂湿度计法 （3）电容式数字湿度计法	GB/T 18204.14

（续）

序号	参数	检验方法	来源
16	空气流速	（1）热球式电风速计法 （2）数字式风速表法	GB/T 18204.15
17	新风量	示踪气体法	GB/T 18204.18
18	氡^{222}Rn	（1）空气中氡浓度的闪烁瓶测量方法 （2）径迹蚀刻法 （3）双滤膜法 （4）活性炭盒法	（1）GB/T 16147 （2）GB/T 14582

A.7 记录

采样时要对现场情况、各种污染源、采样日期、时间、地点、数量、布点方式、大气压力、气温、相对湿度、空气流速以及采样者签字等做出详细记录，随样品一同报到实验室。

检验时应对检验日期、实验室、仪器和编号、分析方法、检验依据、实验条件、原始数据、测试人、校核人等做出详细记录。

A.8 测试结果和评价

测试结果以平均值表示，化学性、生物性和放射性指标平均值符合标准值要求时，为符合本标准。如有一项检验结果未达到本标准要求时，为不符合本标准。

要求年平均、日平均、8 h平均值的参数，可以先做筛选采样检验。若检验结果符合标准值要求，为符合本标准。若筛选采样检验结果不符合标准值要求，必须按年平均、日平均、8 h平均值的要求，用累积采样检验结果评价。

附 录 B
（规范性附录）
室内空气中苯的检验方法
（毛细管气相色谱法）

B.1 方法提要

B.1.1 相关标准和依据

本方法主要依据 GB 11737—89 居住区大气中苯、甲苯和二甲苯卫生检验标准方法——气相色谱法。

B.1.2 原理：空气中苯用活性炭管采集，然后用二硫化碳提取出来。用氢火焰离子化检测器的气相色谱仪分析，以保留时间定性，峰高定量。

B.1.3 干扰和排除：当空气中水蒸气或水雾量太大，以至在碳管中凝结时，将严重影响活性炭的穿透容量和采样效率。空气湿度在 90％以下，活性炭管的采样效率符合要求。空气中其他污染物的干扰，由于采用了气相色谱分离技术，选择合适的色谱分离条件可以消除。

B.2 适用范围

B.2.1 测定范围：采样量为 20 L 时，用 1 ml 二硫化碳提取，进样 1 μl，测定范围为 0.05～10 mg/m^3。

B.2.2 适用场所：本法适用于室内空气和居住区大气中苯浓度的测定。

B.3 试剂和材料

B.3.1 苯：色谱纯。

B.3.2 二硫化碳：分析纯，需经纯化处理，保证色谱分析无杂峰。

B.3.3 椰子壳活性炭：20～40 目，用于装活性炭采样管。

B.3.4 高纯氮：99.999％。

B.4 仪器和设备

B.4.1 活性炭采样管：用长 150 mm，内径 3.5～4.0 mm，外径 6 mm 的玻璃管，装入 100 mg 椰子壳活性炭，两端用少量玻璃棉固定。装好管后再用纯氮气于 300～350℃温度条件下吹 5～10 min，然后套上塑料帽封紧管的两端。此管放于干燥器中可保存 5 d。若将玻璃管熔封，此管可稳定三个月。

B.4.2 空气采样器：流量范围 0.2～1 L/min，流量稳定。使用时用皂膜流量计校准采样系统在采样前和采样后的流量。流量误差应小于 5％。

B.4.3 注射器：1 ml。体积刻度误差应校正。

B.4.4 微量注射器：1 μl，10 μl。体积刻度误差应校正。

B.4.5 具塞刻度试管：2 ml。

B.4.6 气相色谱仪：附氢火焰离子化检测器。

B.4.7 色谱柱：0.53 mm×30 m 大口径非极性石英毛细管柱。

B.5 采样和样品保存

在采样地点打开活性炭管，两端孔径至少 2 mm，与空气采样器入气口垂直连接，以 0.5 L/min 的速度，抽取 20 L 空气。采样后，将管的两端套上塑料帽，并记录采样时的温度和大气压力。样品可保存 5 d。

B.6 分析步骤

B.6.1 色谱分析条件：由于色谱分析条件常因实验条件不同而有差异，所以应根据所用气相色谱仪的型号和性能，制定能分析苯的最佳的色谱分析条件。

B.6.2 绘制标准曲线和测定计算因子：在与样品分析的相同条件下，绘制标准曲线和测定计算因子。

用标准溶液绘制标准曲线：于 5.0 ml 容量瓶中，先加入少量二硫化碳，用 1 μl 微量注射器准确取一定量的苯（20℃时，1 μl 苯重 0.8787 mg）注入容量瓶中，加二硫化碳至刻度，配成一定浓度的储备液。临用前取一定量的储备液用二硫化碳逐级稀释成苯含量分别为 2.0、5.0、10.0、50.0 μg/ml 的标准液。取 1 μl 标准液进样，测量保留时间及峰高。每个浓度重复 3 次，取峰高的平均值。分别以 1 μl 苯的含量（μg/ml）为横坐标（μg），平均峰高为纵坐标（mm），绘制标准曲线。并计算回归线的斜率，以斜率的倒数 Bs［μg/mm］作为样品测定的计算因子。

B.6.3 样品分析：将采样管中的活性炭倒入具塞刻度试管中，加 1.0 ml 二硫化碳，塞紧管塞，放置 1 h，并不时振摇。取 1 μl 进样，用保留时间定性，峰高（mm）定量。每个样品作三次分析，求峰高的平均值。同时，取一个未经采样的活性炭管按样品管同时操作，测量空白管的平均峰高（mm）。

B.7 结果计算

B.7.1 将采样体积按式（1）换算成标准状态下的采样体积

$$V_0 = V\frac{T_0}{T}\cdot\frac{P}{P_0} \quad \cdots\cdots (1)$$

式中：V_0——换算成标准状态下的采样体积，L；

V——采样体积，L；

T_0——标准状态的绝对温度，273 K；

T——采样时采样点现场的温度（t）与标准状态的绝对温度之和，（$t+273$）K；

P_0——标准状态下的大气压力，101.3 kPa；

P——采样时采样点的大气压力，kPa。

B.7.2 空气中苯浓度按式（2）计算：

$$c = \frac{(h-h')\cdot B_S}{V_0\cdot E_S} \quad \cdots\cdots (2)$$

式中：c——空气中苯或甲苯、二甲苯的浓度，mg/m^3；

h——样品峰高的平均值，mm；

h'——空白管的峰高，mm；

B_S——由 6.2 得到的计算因子，μg/mm；

E_S——由实验确定的二硫化碳提取的效率；

V_0——标准状况下采样体积，L。

B.8 方法特性

B.8.1 检测下限：采样量为 20 L 时，用 1 ml 二硫化碳提取，进样 1 μl，检测下限为 0.05 mg/m^3。

B.8.2 线性范围：10^6。

B.8.3 精密度：苯的浓度为 8.78 和 21.9 μg/ml 的液体样品，重复测定的相对标准偏差 7% 和 5%。

B.8.4 准确度：对苯含量为 0.5，21.1 和 200 μg 的回收率分别为 95%，94% 和 91%。

附 录 C
（规范性附录）
室内空气中总挥发性有机物（TVOC）的检验方法
（热解吸/毛细管气相色谱法）

C.1 方法提要

C.1.1 相关标准和依据

ISO 16017－1 "Indoor, ambient and workplace air—Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/capillary gas chromatography—part 1: pumped sampling"

C.1.2 原理

选择合适的吸附剂（Tenax GC 或 Tenax TA），用吸附管采集一定体积的空气样品，空气流中的挥发性有机化合物保留在吸附管中。采样后，将吸附管加热，解吸挥发性有机化合物，待测样品随惰性载气进入毛细管气相色谱仪，与保留时间定性，峰高或峰面积定量。

C.1.3 干扰和排除

采样前处理和活化采样管和吸附剂，使干扰减到最小；选择合适的色谱柱和分析条件，本法能将多种挥发性有机物分离，使共存物干扰问题得以解决。

C.2 适用范围

C.2.1 测定范围：本法适用于浓度范围为 0.5 $\mu g/m^3$～100 mg/m^3 之间的空气中 VOC_S 的测定。

C.2.2 适用场所：本法适用于室内、环境和工作场所空气，也适用于评价小型或大型测试舱室内材料的释放。

C.3 试剂和材料

分析过程中使用的试气应为色谱纯。如果为分析纯，需经纯化处理，保证色谱分析无杂峰。

C.3.1 VOC_S：为了配置浓度，需用 VOC_S 作为基准试剂，配成所需浓度的标准溶液或标准气体，然后采用液体外标法或气体外标法将其定量注入吸附管。

C.3.2 稀释溶剂：液体外标法所用的稀释溶剂应为色谱纯，在色谱流出曲线中应与待测化合物分离。

C.3.3 吸附剂：使用的吸附剂粒径为 0.18～0.25 mm（60～80 目），吸附剂在装管前都应在其最高使用温度下，用惰性气流二次活化处理过夜。为了防止二次污染，吸附剂应在清洁空气中冷却至室温，储存和装管。解吸温度应低于活化温度。由制造商装好的吸附管使用前也需活化处理。

C.3.4 高纯氮：99.999%。

C.4 仪器和设备

C.4.1 吸附管：是外径 6.3 mm 内径 5 mm 长 90 mm（或 180 mm）内壁抛光的不锈钢管，吸附管的采样入口一端有标记。吸附管可以装填一种或多种吸附剂，应使吸附层处于解吸仪的加热区。根据吸附剂的密度，吸附管中可装填 200～1 000 mg 的吸附剂，管的两端用不锈钢网或玻璃纤维毛堵住。如果在一支吸附管中使用多种吸附剂，吸附剂应按吸附能力增加的顺序排列，并用玻璃纤维毛隔开，吸附能力最弱的装填在吸附管的采样入口端。

C.4.2 注射器：10 μl 液体注射器；10 μl 气体注射器；1 ml 气体注射器。

C.4.3 采样泵：恒流空气个体采样泵，流量范围 0.02～0.5 L/min，流量稳定。使用时用皂膜流量计校准采样系统在采样前和采样后的流量，流量误差应小于 5%。

C.4.4 气相色谱仪：配备氢火焰离子化检测器、质谱检测器或其他合适的检测器。

色谱柱：非极性（极性指数小于10）石英毛细管柱。

C.4.5 热解吸仪：能对吸附管进行二次热解吸，并将解吸气用惰性气体载带进入气相色谱仪。解吸温度、时间和载气流速是可调的。冷阱可将解吸样品进行浓缩。

C.4.6 液体外标法制备标准系列的注射装置：常规气相色谱进样口，可以在线使用也可以独立装配，保留进样口载气连线，进样口下端可与吸附管相连。

C.5 采样和样品保存

将吸附管与采样泵用塑料或硅橡胶管连接。个体采样时，采样管垂直安装在呼吸带；固定位置采样时，选择合适的采样位置。打开采样泵，调节流量，以保证在适当的时间内获得所需的采样体积（1～10 L）。如果总样品量超过1 mg，采样体积应相应减少。记录采样开始和结束时的时间、采样流量、温度和大气压力。

采样后将管取下，密封管的两端或将其放入可密封的金属或玻璃管中。样品可保存14天。

C.6 分析步骤

C.6.1 样品的解吸和浓缩

将吸附管安装在热解吸仪上，加热，使有机蒸汽从吸附剂上解吸下来，并被载气流带入冷阱，进行预浓缩，载气流的方向与采样时的方向相反。然后，再以低流速快速解吸，经传输线进入毛细管气相色谱仪。传输线的温度应足够高，以防止待测成分凝结。解吸条件（见表C.1）。

表C.1 解吸条件

解吸温度	250～325℃
解吸时间	5～15 min
解吸气流量	30～50 ml/min
冷阱的制冷温度	+20～－180℃
冷阱的加热温度	250～350℃
冷阱中的吸附剂	如果使用，一般与吸附管相同，40～100 mg
载气	氦气或高纯氮气
分流比	样品管和二级冷阱之间以及二级冷阱和分析柱之间的分流比应根据空气中的浓度来选择

C.6.2 色谱分析条件

可选择膜厚度为1～5 μm 50 m×0.22 mm的石英柱，固定相可以是二甲基硅氧烷或7%的氰基丙烷、7%的苯基、86%的甲基硅氧烷。柱操作条件为程序升温，初始温度50℃保持10 min，以5℃/min的速率升温至250℃。

C.6.3 标准曲线的绘制

气体外标法：用泵准确抽取100 μg/m^{3}的标准气体100 ml、200 ml、400 ml、1 L、2 L、4 L、10 L通过吸附管，为标准系列。

液体外标法：利用4.6的进样装置分别取1～5 μl含液体组分100 μg/ml和10 μg/ml的标准溶液注入吸附管，同时用100 ml/min的惰性气体通过吸附管，5 min后取下吸附管密封，为标准系列。

用热解吸气相色谱法分析吸附管标准系列，以扣除空白后峰面积为纵坐标，以待测物质量为横坐标，绘制标准曲线。

C.6.4 样品分析

每支样品吸附管按绘制标准曲线的操作步骤（即相同的解吸和浓缩条件及色谱分析条件）进行分析，用保留时间定性，峰面积定量。

C.7 结果计算

C.7.1 将采样体积按式（1）换算成标准状态下的采样体积

$$V_0 = V\frac{T_0}{T}\cdot\frac{P}{P_0} \quad \cdots\cdots (1)$$

式中：V_0——换算成标准状态下的采样体积，L；

V——采样体积，L；

T_0——标准状态的绝对温度，273 K；

T——采样时采样点现场的温度（t）与标准状态的绝对温度之和，（$t+273$）K；

P_0——标准状态下的大气压力，101.3 kPa；

P——采样时采样点的大气压力，kPa。

C.7.2 TVOC 的计算

（1）应对保留时间在正己烷和正十六烷之间所有化合物进行分析。

（2）计算 TVOC，包括色谱图中从正己烷到正十六烷之间的所有化合物。

（3）根据单一的校正曲线，对尽可能多的 VOC_S 定量，至少应对十个最高峰进行定量，最后与 TVOC 一起列出这些化合物的名称和浓度。

（4）计算已鉴定和定量的挥发性有机化合物的浓度 S_{id}。

（5）用甲苯的响应系数计算未鉴定的挥发性有机化合物的浓度 S_{un}。

（6）S_{id}与 S_{un}之和为 TVOC 的浓度或 TVOC 的值。

（7）如果检测到的化合物超出了（2）中 TVOC 定义的范围，那么这些信息应该添加到 TVOC 值中。

C.7.3 空气样品中待测组分的浓度按（2）式计算

$$c = \frac{F-B}{V_0}\cdot 1\,000 \quad \cdots\cdots (2)$$

式中：c——空气样品中待测组分的浓度，$\mu g/m^3$；

F——样品管中组分的质量，μg；

B——空白管中组分的质量，μg；

V_0——标准状态下的采样体积，L。

C.8 方法特性

C.8.1 检测下限：采样量为 10 L 时，检测下限为 0.5 $\mu g/m^3$。

C.8.2 线性范围：10^6。

C.8.3 精密度：根据待测物的不同，在吸附管上加入 10 μg 的标准溶液，Tenax TA 的相对标准差范围为 0.4% 至 2.8%。

C.8.4 准确度：20℃、相对湿度为 50% 的条件下，在吸附管上加入 10 mg/m^3 的正己烷，Tenax TA、Tenax GR（5 次测定的平均值）的总不确定度为 8.9%。

附 录 D
（规范性附录）
室内空气中菌落总数检验方法

D.1 适用范围

本方法适用于室内空气菌落总数测定。

D.2 定义

撞击法（impacting method）是采用撞击式空气微生物采样器采样，通过抽气动力作用，使空气通过狭缝或小孔而产生高速气流，使悬浮在空气中的带菌粒子撞击到营养琼脂平板上，经37℃、48h培养后，计算出每立方米空气中所含的细菌菌落数的采样测定方法。

D.3 仪器和设备

D.3.1 高压蒸汽灭菌器。
D.3.2 干热灭菌器。
D.3.3 恒温培养箱。
D.3.4 冰箱。
D.3.5 平皿。
D.3.6 制备培养基用一般设备：量筒，三角烧瓶，pH计或精密pH试纸等。
D.3.7 撞击式空气微生物采样器。

采样器的基本要求：

（1）对空气中细菌捕获率达95%。

（2）操作简单，携带方便，性能稳定，便于消毒。

D.4 营养琼脂培养基

D.4.1 成分：

蛋白胨	20 g
牛肉浸膏	3 g
氯化钠	5 g
琼脂	15～20 g
蒸馏水	1 000 ml

D.4.2 制法 将上述各成分混合，加热溶解，校正pH至7.4，过滤分装，121℃，20 min高压灭菌。营养琼脂平板的制备参照采样器使用说明。

D.5 操作步骤

D.5.1 选点要求见附录A。将采样器消毒，按仪器使用说明进行采样。一般情况下采样量为30～150 L，应根据所用仪器性能和室内空气微生物污染程度，酌情增加或减少空气采样量。

D.5.2 样品采完后，将带菌营养琼脂平板置36±1℃恒温箱中，培养48 h，计数菌落数，并根据采样器的流量和采样时间，换算成每立方米空气中的菌落数。以cfu/m^3报告结果。

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National Standard of the People's Republic of China

GB/T 18883—2002

Indoor Air Quality Standard

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Issued by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China
Standardization Administration of the People's Republic of China

Foreword

This standard is formulated for the purpose of protecting human health, preventing and controlling the indoor air pollution.

Annex A, B, C and D of this Standard are normative.

This standard is of the first release.

This standard was drafted by the Joint Drafting Group for *Indoor Air Quality Standard* from the Ministry of Health and State Environmental Protection Administration.

This standard was drafted by Institute for Environmental Health and Related Product Safety of China CDC, Environmental Standards Institute of SEPA, National Institute for Radiological Protection and Nuclear Safety of China CDC, College of Environmental Sciences and Engineering of Peking University, College of Environmental Sciences and Engineering of Nankai University, Beijing Municipal Institute of Labor Protection, School of Architecture of Tsinghua University, Research Center of Eco-Environmental Sciences of Chinese Academy of Sciences, Institute of Environmental Engineering China Building Materials Academy.

This standard was approved by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, Ministry of Health and State Environmental Protection Administration on November 19th, 2002.

This standard was proposed by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China.

This standard shall be interpreted by State Environmental Protection Administration and the Ministry of Health.

Indoor Air Quality Standard

1 Scope

This standard specifies the indoor air quality parameters and inspection methods.

This standard is applicable to the residential buildings and office buildings, and may apply to other indoor environment by reference.

2 Normative reference

The following normative documents contain provision which, through reference in this text, constitute provisions of this national standard. For dated reference, subsequent amendments (excluding correction of error) to, or revisions of, any of these publications do not apply. However, parties to agreements based on this national standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

GB/T 9801 *Air quality—Determination of carbon monoxide—Non-dispersive infrared spectrometry*

GB/T 11737 *Standard method for hygienic examination of benzene, toluene and xylene in air of residential areas—Gas chromatography*

GB/T 12372 *Standard method for examination of nitrogen dioxide in air of residential areas—Modified saltzman method*

GB/T 14582 *Standard methods for radon measurement in environmental air*

GB/T 14668 *Air quality—Determination of ammonia—Nesslers reagent colorimetric method*

GB/T 14669 *Air quality—Determination of ammonia—Ion selective electrode method*

GB 14677 *Air quality—Determination of toluene, dimethyl benzene and styrene—Gas chromatography*

GB/T 14679 *Air quality—Determination of ammonia—Sodium salicylate-sodium hypochlorite spectrophotometric method*

Note: This is an official translation of the Chinese (GB/T 18883—2002).The Chinese version shall prevail in case of any technological contradiction between the English and Chinese versions.

GB/T 15262 *Ambient air—Determination of sulfur dioxide—Formaldehyde absorbing—Pararosaniline spectrophotometry*

GB/T 15435 *Ambient air—Determination of nitrogen dioxide—Saltzman method*

GB/T 15437 *Ambient air—Determination of ozone—Indigo disulphonate spectrophotometry*

GB/T 15438 *Ambient air—Determination of ozone—Ultraviolet photometric method*

GB/T 15439 *Air quality—Determination of benz(a)pyrene in ambient air—High performance liquid chromatography*

GB/T 15516 *Air quality—Determination of formaldehyde—Acetylacetone spectrophotometric method*

GB/T 16128 *Standard method for hygienic examination of sulfur dioxide in air of residential areas—Formaldehyde solution absorbing-pararosaniline hydrochloride spectrophotometric method*

GB/T 16129 *Standard method for hygienic examination of formaldehyde in air of residential areas—Spectrophotometric method*

GB/T 16147 *Scintillation flask method for measuring radon concentration in the air*

GB/T 17095 *Hygienic standard for inhalable particulate matter in indoor air*

GB/T 18204.13 *Methods for determination of indoor air temperature in public places*

GB/T 18204.14 *Methods for determination of indoor air humidity in public places*

GB/T 18204.15 *Methods for determination of indoor air velocity in public places*

GB/T 18204.18 *Methods for determination of air change flow of indoor air in public places*

GB/T 18204.23 *Methods for determination of carbon monoxide in air of public places*

GB/T 18204.24 *Methods for determination of carbon dioxide in air of public places*

GB/T 18204.25 *Methods for determination of indoor air velocity in public places*

GB/T 18204.26 *Methods for determination of formaldehyde in air of public places*

GB/T 18204.27 *Methods of examination of ozone in air of public places*

3 Terms and definitions

3.1

Indoor air quality parameter

Physical, chemical, biological and radioactive parameters in the indoor air which is related to human health.

3.2

Particles with diameters of 10 μm or less, PM 10

Particles suspended in the air with aerodynamic diameters of 10 μm or less.

3.3

Total volatile organic compounds,TVOC

Volatile organic compounds with retention time between that of *n*-hexane and *n*-hexadecane, which are sampled with Tenax GC or Tenax TA and analyzed with a non-polar chromatographic column (polarity index being less than 10).

3.4

Normal state

The dry matter state in which the temperature is 273 K and the pressure is 101.325 kPa.

4 Indoor air quality

4.1 The indoor air shall be non-toxic and harmless without unusual odors.

4.2 The indoor air quality standard is as shown in Table 1.

Table 1 Indoor air quality standard

No.	Category of parameters	Parameters	Unit	Standard value	Remarks
1	Physical	Temperature	℃	22～28	Summer air conditioning
				16～24	Winter heating
2		Relative humidity	%	40～80	Summer air conditioning
				30～60	Winter heating
3		Air velocity	m/s	0.3	Summer air conditioning
				0.2	Winter heating
4		Air change flow	$m^3/(h\cdot person)$	30[a]	
5	Chemical	Sulfur dioxide (SO_2)	mg/m^3	0.50	1 h mean value
6		Nitrogen dioxide(NO_2)	mg/m^3	0.24	1 h mean value
7		Carbon monoxide (CO)	mg/m^3	10	1 h mean value
8		Carbon dioxide(CO_2)	%	0.10	Daily mean value
9		Ammonia (NH_3)	mg/m^3	0.20	1 h mean value
10		Ozone (O_3)	mg/m^3	0.16	1 h mean value
11		Formaldehyde (HCHO)	mg/m^3	0.10	1 h mean value
12		Benzene (C_6H_6)	mg/m^3	0.11	1 h mean value
13		Toluene (C_7H_8)	mg/m^3	0.20	1 h mean value
14		Dimethyl benzene (C_8H_{10})	mg/m^3	0.20	1 h mean value
15		Benz[a]pyrene (B[a]P)	ng/m^3	1.0	Daily mean value
16		Particles with diameters of 10 μm or less (PM 10)	mg/m^3	0.15	Daily mean value
17		Total volatile organic compounds (TVOC)	mg/m^3	0.60	8 h mean value
18	Biological	Total number of colony	cfu/m^3	2 500	To be determined according to the instrument [b]
19	Radioactive	Radon(^{222}Rn)	Bq/m^3	400	Annual mean value (action level [c])

[a] The change air flow shall be no less than the standard value, and other parameters excluding the temperature and relative humidity shall be no more than the standard value.

[b] See Annex D.

[c] It is suggested the intervention be taken to reduce the indoor radon concentration as the action level reaches this level.

5 Indoor air quality inspection

5.1 Refer to Annex A for monitoring technologies of the parameters in indoor air.

5.2 Refer to Annex B for inspection method of benzene in indoor air.

5.3 Refer to Annex C for inspection method of TVOC in indoor air.

5.4 Refer to Annex D for inspection method of total number of colony in indoor air.

Annex A
(Normative)
Monitoring Technologies of Indoor Air

A.1 Scope

This Annex specifies the sampling point selection requirements, sampling time and frequency, sampling methods and instruments, inspection methods of parameters in indoor air, quality assurance measures, testing results and evaluation during the indoor air monitoring.

A.2 Sampling point selection requirements

A.2.1 Quantity of sampling points: the quantity of sampling points shall be determined by the monitored indoor area and the situations on the spot for the purpose of correctly reflecting the level of the indoor air pollutants. In principle, 1～3 sampling points shall be arranged for rooms of less than 50 m^2, 3～5 sampling points for rooms of 50 m^2～100 m^2,and at least 5 sampling points for rooms of more than 100 m^2, which shall be evenly arranged in a diagonal or quincuncial manner.

A.2.2 The sampling point shall keep away from the vents, and shall be more than 0.5 m away from the wall.

A.2.3 Height of sampling point: in principle, it shall be consistent with the breathing zone of people, with the relative height ranging from 0.5 m to 1.5 m.

A.3 Sampling time and frequency

The sampling time shall be at least 3 months for determining annual mean concentration, at least 18 h for daily mean concentration, at least 6 h for 8 h mean concentration and at least 45 min for 1 h mean concentration. The sampling time shall cover the period of the poorest ventilation.

A.4 Sampling methods and instruments

Proper sampling methods and instruments shall be determined according to the existential state of pollutants in indoor air. The noise value of an indoor sampler shall be less than 50 dB (A). The

specific sampling shall be subject to the methods and operating steps specified in the inspection methods for the pollutants.

A.4.1 Screening method: close all the doors and windows for 12 h before sampling. Take samples for at least 45 min, during which, the doors and windows also need to be closed.

A.4.2 Accumulating method: when the sampling by screening method fails to meet the requirements of this standard, accumulating method (as per the annual mean value, daily mean value and 8h mean value) must be adopted.

A.5 Quality assurance measures

A.5.1 Air tightness examination: if a dynamical sampler is used, the air tightness of the sampling system shall be examined before sampling to avoid the air leakage.

A.5.2 Flow calibration: the flow of sampling system shall be kept constant, and the intake air flow of the sampling system shall be calibrated with a primary soap film meter, accurate no more than 5%.

Flow calibration of sampler: in the normal state of the sampler, calibrate the scale of the sampler flowmeter with a primary soap film meter. Calibrate 5 points, draw standard flow curves. Record the atmospheric pressure and temperature during the calibration.

A.5.3 Blank inspection: during a batch of site sampling, two sampling tubes shall be left un-sampled and treated like other sampling tubes, for the purpose of blank inspection. If the blank inspection result exceeds the control scope, such batch of samples shall be abandoned.

A.5.4 The instruments shall be inspected and calibrated according to the instructions before use.

A.5.5 During the calculation of concentration, the sampling volume shall be converted into the volume in normal state according to the following formula:

$$V_0 = V \frac{T_0}{T} \cdot \frac{p}{p_0}$$

Where, V_0—Converted sampling volume in normal state, L;

V—Sampling volume, L;

T_0—Absolute temperature in normal state, 273 K;

T—The sum of the temperature (t) at the sampling point during the sampling and the absolute temperature in normal state, (t+273) K;

p_0—Atmospheric pressure in normal state, 101.3 kPa;

p—Atmospheric pressure of the sampling point during the sampling, kPa.

A.5.6 During each parallel sampling, the relative deviation between the difference of measured values and the mean value shall not exceed 20%.

A.6 Inspection methods

The inspection methods of various parameters in indoor air are as shown in Table A.1.

Table A.1 Inspection methods of various parameters in indoor air

No.	Parameters	Inspection methods	Source
1	Sulfur dioxide (SO_2)	Formaldehyde solution absorbing-pararosaniline Hydrochloride spectrophotometric method	GB/T 16128 GB/T 15262
2	Nitrogen dioxide (NO_2)	Modified saltzman method	GB/T 12372 GB/T 15435
3	Carbon monoxide (CO)	(1) Non-dispersive infrared spectrometry (2) Non-dispersive infrared catharometry Gas chromatography Mercury displacement method	(1) GB/T 9801 (2) GB/T 18204.23
4	Carbon dioxide(CO_2)	(1) Non-dispersive infrared catharometry (2) Gas chromatography (3) Capacity titration	GB/T 18204.24
5	Ammonia (NH_3)	(1) Indophenol blue spectrophotometry Nesster's reagent spectrophotometry (2) Ion selective electrode method (3) Sodium salicylate-sodium hypochlorite spectrophotometric method	(1) GB/T 18204.25 GB/T 14668 (2) GB/T 14669 (3) GB/T 14679
6	Ozone (O_3)	(1) Ultraviolet photometric method (2) Indigo disulphonate spectrophotometry	(1) GB/T 15438 (2) GB/T 18204.27 GB/T 15437
7	Formaldehyde (HCHO)	(1) AHMT Spectrophotometric method (2) MTBH Spectrophotometric method Gas chromatography (3) Ethylene acetate spectrophotometric method	(1) GB/T 16129 (2) GB/T 18204.26 (3) GB/T 15516

Table A.1 (continued)

No.	Parameters	Inspection Methods	Source
8	Benzene (C_6H_6)	Gas chromatography	(1) GB/T 18883 Annex B (2) GB 11737
9	Toluene (C_7H_8) Dimethyl benzene (C_8H_{10})	Gas chromatography	(1) GB 11737 (2) GB 14677
10	Benz[a]pyrene (B[a]P)	High performance liquid chromatography	GB/T 15439
11	Particles with diameters of 10 μm or less (PM10)	Impact-weighing method	GB/T 17095
12	Total volatile organic compounds (TVOC)	Gas chromatography	GB/T 18883 Annex C
13	Total bacterial count	Impacting method	GB/T 18883 Annex D
14	Temperature	(1) Liquid-in-glass thermometer method (2) Digital-display thermometer method	GB/T 18204.13
15	Relative humidity	(1) Ventilated psychrometer method (2) Lithium chloride hygrometer method (3) Capacitive digital hygrometer method	GB/T 18204.14
16	Air velocity	(1) Hot-bulb electric velometer method (2) Digital anemometer method	GB/T 18204.15
17	Air change rate	Tracing gas method	GB/T 18204.18
18	Radon(^{222}Rn)	(1) Scintillation flask method for measuring radon concentration in the air (2) Track etching method (3) Double filter method (4) Activated carbon box method	(1) GB/T 14582 (2) GB/T 16147 (3) GB/T 14582 (4) GB/T 14582

A.7 Records

During sampling, make a detailed record of site situations, various pollution sources, sampling date, time, place, quantity, sampling point layout methods, atmospheric pressure, temperature, relative humidity, air velocity and signature of the sample grabber, which shall be submitted to the laboratory together with the samples.

During the inspection, make a detailed record of inspection date, laboratory, instruments and their corresponding numbers, analysis methods, inspection principles, experimental conditions, original data, test person and check person.

A.8 Test results and evaluation

The test results shall be expressed in mean value. If the mean values of the chemical, biological and radioactive indicators meet the requirements of standard value, the test results are deemed to conform to this standard. If one of the values fails to meet the requirements of this standard, it is considered to be non-conforming to the standard.

The parameters of annual mean value, daily mean value and 8 h mean value may be subject to the screening sampling inspection first. If the inspection results conform to the standard value, the test results are deemed to conform to this standard. If such inspection results fail to meet the requirements of standard value, the accumulating sampling inspection results shall be used for evaluation according to the requirements of the annual mean value, daily mean value and 8 h mean value.

Annex B
(Normative)
Inspection Method of Benzene in Indoor Air
(Capillary Gas Chromatography)

B.1 Method summary

B.1.1 Related standards and principle

This method is applied mainly on GB/T 11737 *Standard method for hygienic examination of benzene, toluene and xylene in air of residential areas—Gas chromatography.*

B.1.2 Principles

Acquire Benzene with an activated carbon tube, and then extract it with carbon dioxide. Analysis with gas chromatograph of a hydrogen flame ionization detector to determine qualitatively with retention time and quantitatively with peak height.

B.1.3 Interference and elimination

If the water vapor or spray in air is condensed in the carbon tube due to the large volume, it will seriously influence the breakthrough capacity and sampling efficiency of activated carbon. The sampling efficiency of the activated carbon tube conforms to the requirements when the air humidity is below 90%. The interference of other pollutants in air may be eliminated by using the separation technology of gas chromatography and selecting proper separation conditions of gas chromatography.

B.2 Applicable scope

B.2.1 Measuring range: if the sampling volume is 20 L, extract with 1 mL carbon disulfide and take 1 μL sample, with a measuring range of 0.05 mg/m^3～10 mg/m^3.

B.2.2 Applicable place: this method is applicable to the determination of benzene concentration in indoor air and in air of residential areas.

B.3 Reagents

B.3.1 Benzene: chromatographically pure

B.3.2 Carbon disulfide: analytically pure. It needs to be purified to make sure of no abnormal peak in chromatographic analysis.

B.3.3 Coconut shell activated carbon: (20～40)meshes, which is used to be filled in the activated carbon tube.

B.3.4 High purity nitrogen: 99.999%

B.4 Apparatus

B.4.1 Activated carbon sampling tube: glass tube with a length of 150 mm, inner diameter 3.5 mm～4.0 mm and outer diameter 6 mm. Fill 100 mg coconut shell activated carbon in the tube, and fix the two ends of the tube with little glass wool, then inject the pure nitrogen for 5 min～10 min at 300 ℃～350 ℃, and finally sleeve the plastic caps to tightly seal the two ends of the tube. The tube may be kept in a dryer for 5 d. If the glass tube is sealed by fusing, it may be kept for three months with stable properties.

B.4.2 Air sampler: flow range 0.2 L/min～1 L/min, with stable flow. When in use, the air flow of sampling system before and after sampling shall be calibrated with a soap film meter, accurate less than 5%.

B.4.3 Injector: 1 mL. Its volume scale error shall be calibrated.

B.4.4 Micro injector: 1 μL, 10 μL. Its volume scale error shall be calibrated.

B.4.5 Tube with stopper & graduation: 2 mL.

B.4.6 Gas chromatograph: with a hydrogen flame ionization detector.

B.4.7 Chromatographic column: 0.53 mm×30 m large-diameter non-polar quartz capillary column.

B.5 Sampling and sample retention

Open the activated carbon tube with a diameter at two ends of at least 2 mm at the sampling point, vertically connect it with the air intake of the air sampler, and extract 20 L air at a speed of 0.5 L/min.

After sampling, sleeve a plastic cap on the two ends of the tube respectively, and keep records of the temperature and atmospheric pressure during sampling. The sample may be kept for 5 d.

B.6 Analysis steps

B.6.1 Conditions of chromatographic analysis: as the conditions of chromatographic analysis often vary with different experimental conditions, the optimum conditions of chromatographic analysis for analyzing benzene shall be determined according to the mode and performance of the gas chromatograph used.

B.6.2 Drawing standard curves and determining the calculation factor: under the same condition as the sample analysis, draw the standard curves and determine the calculation factor.

Draw the standard curves with standard solution: add a few amount of carbon disulfide in a 5.0 mL volumetric flask first, accurately take a certain amount of benzene (1 μL benzene weighs 0.878 7 mg at 20 ℃) with a 1μL micro injector and inject it into the flask, and then add carbon disulfide until the level reaches the desired scale to prepare the storage solution of a certain concentration. Take a certain amount of storage solution before use and dilute it with carbon disulfide into the standard solution with the benzene content being 2.0 μg/mL,5.0 μg/mL,10.0 μg/mL and 50.0 μg/mL respectively. Take 1 μL standard solution as a sample, and measure the retention time and peak height. Repeat the above steps three times for each concentration, and average the peak heights. Then draw the standard curves with the content of 1 μL benzene (μg/mL) as the horizontal coordinate (μg) and the mean peak height as the vertical coordinate. Calculate the reciprocal of the regression line and take the reciprocal of slope factor B_s (μg/mm) as the calculation factor for determination of the sample.

B.6.3 Sample analysis: pour the activated carbon in the sampling tube into a test tube with stopper & graduation, add 1.0 mL carbon disulfide, stuff up the tube stopper, and leave it for 1 h while shaking it out from time to time. Take 1 μL sample, which shall be determined qualitatively with retention time and quantitatively with peak height (mm). Analyze each sample three times and average the peak heights. At the same time, take an un-sampled activated carbon tube and conduct the steps as if it were a sampling tube to determine the mean peak height (mm) of the blank tube.

B.7 Calculation

B.7.1 The sampling volume shall be converted into the volume in normal state according to formula (B.1):

$$V_0 = V\frac{T_0}{T}\cdot\frac{p}{p_0} \qquad \text{(B. 1)}$$

Where, V_0—Converted sampling volume in normal state, L;

V—Sampling volume, L;

T_0—Absolute temperature in normal state, 273 K;

T—The sum of the temperature (t) at the sampling point during the sampling and the absolute temperature in normal state, (t+273) K;

p_0—Atmospheric pressure in normal state, 101.3 kPa;

p—Atmospheric pressure of the sampling point during the sampling, kPa.

B.7.2 The benzene concentration in air shall be calculated according to formula (B.2):

$$c = \frac{(h - h')B_s}{V_0 \cdot E_s} \qquad \text{(B. 2)}$$

Where, c—Concentration of benzene, toluene and xylene in air, mg/m^3;

h—Mean value of peak heights of sample, mm;

h'—Peak height of the blank tube, mm;

B_s—Calculation factor obtained from B.6.2, μg/mm;

E_s—Efficiency of extract of carbon disulfide determined through experiments;

V_0—Sampling volume in normal sate, L.

B.8 Method characteristics

B.8.1 Lower testing limit: if the sampling volume is 20 L, extract with 1 mL carbon disulfide and take 1 μL sample, with a lower testing limit of 0.05 mg/m^3.

B.8.2 Linear scope：10^6.

B.8.3 Precision：for the liquid samples with the benzene concentration being 8.78 μg/mL and 21.9 μg/mL, the relative standard error determined repeatedly is 7% and 5%.

B.8.4 Accuracy：the recovery rate of sample with the benzene content being 0.5 μg, 21.1 μg and 200 μg is 95%, 94% and 91% respectively.

Annex C
(Normative)
Inspection Method of Total Volatile Organic Compounds (TVOC) in Indoor Air
(Thermal Desorption/Capillary Gas Chromatography)

C.1 Method summary

C.1.1 Related standards and basis

ISO 16017-1 *Indoor, ambient and workplace air—Sampling and analysis of volatile organic compounds by sorbent tube/thermal desorption/ capillary gas—Part 1: Pumped sampling*

C.1.2 Principles

Select proper absorbent (Tenax GC or Tenax TA), acquire a certain volume of air sample with an absorbent tube, and make the TVOC in air flow kept in the absorbent tube. After sampling, heat the absorbent tube to desorb the TVOC. After the sample to be tested flows into the capillary gas chromatograph together with the inert carrier gas, it shall be determined qualitatively with retention time and quantitatively with peak height or peak area.

C.1.3 Interference and elimination

Treat and activate the sampling tube and absorbent to minimize the interference; this method can separate various TVOCs by selecting proper chromatographic column and analysis conditions, so as to solve the interference issue of coexistent elements.

C.2 Applicable scope

C.2.1 Measuring range: this method is applicable to the determination of VOCs with a concentration of 0.5 $\mu g/m^3$～100 $\mu g/m^3$ in air.

C.2.2 Applicable place: this method is applicable to indoor, ambient and workplace air, as well as the evaluation of release of indoor maters of small or large test chamber.

C.3 Reagents

The reagent used in the analysis process is chromatographically pure. If it is analytically pure, it shall be purified to make sure of no abnormal peak in chromatographic analysis.

C.3.1 VOCs: to ensure the concentration, it is required to prepare the standard solution or standard gas with desired concentration by using VOCs as the standard reagent, and then quantitatively inject it into an absorbent tube by liquid external standard method or gas external standard method.

C.3.2 Diluting solvent: the diluting solvent used by liquid external standard method shall be chromatographically pure, which shall be separated from the compound to be tested in the elution profile.

C.3.3 Absorbent: the particle size of absorbent used shall be 0.18 mm～0.25 mm (60 meshes～80 meshes). Before filled into the absorbent tube, the absorbent shall be activated by heating with inert gas overnight at its maximum service temperature. For avoiding the secondary pollution, the absorbent shall be cooled to the room temperature in clean air, and then stored and filled into the tube. The desorption temperature shall be lower than the activation temperature. The absorbent tube that has been filled with absorbent by the manufacturer shall also be subject to the activation treatment before use.

C.3.4 High-purity nitrogen: 99.999%.

C.4 Apparatus

C.4.1 Absorbent tube: inner-wall polished stainless steel tube with an outer diameter of 6.3 mm, inner diameter 5 mm and length 90 mm (or 180 mm). One end of the sampling inlet of the absorbent tube is marked, and the absorbent tube may be filled with one or several absorbents. The absorption layer shall be located at the heating zone of the desorption instrument. The absorbent tube may be filled with 200 mg～1 000 mg absorbent according to the concentration of the absorbent, with its two ends stuffed up with stainless steel mesh or glass fiber. If several absorbents are used in an absorbent tube, absorbents shall be arranged in order according to their absorption capacity, with the absorbent of poorest absorption capacity arranged at the sampling inlet of the absorbent tube, which shall be separated with glass fiber.

C.4.2 Injector: 10 μL liquid injector; 10 μL gas injector; 1 mL gas injector.

C.4.3 Sampling pump: constant-flow personal air sampling pump with a flow range of 0.02 L/min～0.5 L/min and steady flow. When in use, the air flow of sampling system before and after sampling shall be calibrated with a soap film meter, with an error of less than 5%.

C.4.4 Gas chromatograph: with a hydrogen flame ionization detector, mass spectrometer detector or other proper detector.
Chromatographic column: non-polar (polar index being less than 10) quartz capillary column.

C.4.5 Thermal desorption instrument: it is able to conduct the secondary thermal desorption to the absorbent tube and make the desorbed gas flow into the gas chromatograph with the inert carrier gas. The desorption temperature, time and carrier gas flowing rate are adjustable. The desorbed sample may be concentrated by a cold trap.

C.4.6 Injector for preparing the standard series by liquid external standard method: the sampling inlet of the normal gas chromatograph may be used online or assembled independently. The connection of the carrier gas at the sampling inlet is retained and the lower end of the sampling inlet may be connected with the absorbent tube.

C. 5 Sampling and sample retention

Connect the sampling tube and sampling pump with a plastic or silicone rubber tube. In the personal sampling, vertically install the sampling tube at the breathing zone; in the sampling at fixed locations, select a proper sampling location: open the sampling pump and adjust the flow to ensure to obtain the desired sampling volume (1 L～10 L) within a proper time period. If the total sample amount is more than 1 mg, the sampling volume shall be reduced accordingly. Record the starting and closing time of sampling, sampling flow, temperature and atmospheric pressure.

Take down the sampling tube after sampling, and seal two ends of the tube or put the sample into a sealable metal or glass tube. The sample may be retained for 14 days.

C.6 Analysis steps

C.6.1 Desorption and concentration of sample

Install the absorbent tube on a thermal desorption instrument, and heat to desorb the organic vapor from the absorbent, and bring it into a cold trap by the carrier gas flow, to conduct the pre-concentration. The direction of the carrier gas flow shall be reverse with the direction during sampling. Then, rapidly desorb it with a low-speed flow, and make it flow into the capillary gas

chromatography via a transmission line. The temperature of the transmission line shall be high enough to avoid the condensation of components to be tested. The desorption conditions are as shown in the following Table C.1.

Table C.1 Desorption Conditions

Desorption temperature	250 ℃～325 ℃
Desorption time	5 min～15 min
Desorbed gas flow	30 mL/min～50 mL/min
Refrigerating temperature of cold trap	+20 ℃～－180 ℃
Heating temperature of cold trap	250 ℃～350 ℃
Absorbent in cold trap	If used, it is generally the same as that in the absorbent tube, 40 mg～100 mg.
Carrier gas	Helium or high-purity nitrogen
Split ratio	The split ratio between the sample tube and the secondary cold trap and between the secondary cold trap and the analytical column shall be selected according to the concentration in air.

C.6.2 Conditions of chromatographic analysis

The 50 m×0.22 mm quartz column with a film thickness of 1 μm～5 μm may be used. The fixed phase may be dimethyl siloxane or methylsiloxane with 70% cyanpropane, 70% phenyl and 86% methyl siloxane. The operating condition of the column is programmed temperature. The initial temperature 50 ℃ is kept for 10 min and then rises to 250 ℃ at a speed of 5 ℃/min.

C.6.3 Drawing standard curves

Gas external standard method: pump 100 mL, 200 mL, 400 mL, 1 L, 2 L, 4 L and 10 L standard gas of 100 μg/m^3 respectively and make them pass through the absorbent tube, which shall be used as the standard series.

Liquid external standard method: respectively take 1 μL～5 μL standard solution containing the liquid components of 100 μg/mL and 10 μg/mL by the apparatuses of C.4.6 and inject them into the absorbent tube. At the same time, inject the inert gas into the absorbent tube at a speed of 100 mL/min, and take down the seals of the absorbent tube after 5 min, which shall be used as the standard series.

Analyze the standard series of the absorbent tube by thermal desorption gas chromatography, and draw the standard curves with the peak area from which the blank is deducted as the vertical coordinate and the mass of the substance to be tested as the horizontal coordinate.

C.6.4 Sample analysis

Analyze the absorbent tube of each sample according to the operating steps of drawing standard curves (i.e. the same conditions of desorption, concentration and chromatographic analysis), which shall be determined qualitatively with retention time and quantitatively with peak height.

C.7 Calculation

C.7.1 The sampling volume shall be converted into the volume in normal state according to formula (C.1):

$$V_0 = V \frac{T_0}{T} \cdot \frac{p}{p_0} \qquad \cdots\cdots (C.1)$$

Where, V_0—Converted sampling volume in normal state, L;

V—Sampling volume, L;

T_0—Absolute temperature in normal state, 273 K;

T—The sum of the temperature (t) at the sampling point during the sampling and the absolute temperature in normal state, (t+273) K;

p_0—Atmospheric pressure in normal state, 101.3 kPa;

p—Atmospheric pressure of the sampling point during the sampling, kPa.

C.7.2 Calculation of TVOC:

(1) Analyze all compounds with retention time between that of *n*-hexane and *n*-hexadecane.

(2) Calculate TVOC, including all compounds between the *n*-hexane and *n*-hexadecane in the chromatogram.

(3) Quantify VOCs as many as possible according to the single calibrated curve. At least 10 maximum peaks shall be quantified. Finally, list the name and concentration of these compounds with TOVC.

(4) Calculate the concentration of the identified and quantified VOCs S_{id}.

(5) Calculate the concentration of the unidentified VOCs S_{un} with the response factor of toluene.

(6) The sum of S_{id} and S_{un} shall be the concentration or value of TVOC.

(7) If the tested compounds exceed the scope defined by TVOC in item (2), the information shall be added into the value of TVOC.

C.7.3 The concentration of the components to be tested in air sample shall be calculated according to formula (C.2):

$$c = \frac{F - B}{V_0} \times 1\,000 \qquad \cdots\cdots (C.2)$$

Where, c—Concentration of the components to be tested in air sample, μg/m^3;

F—Mass of components in sample tube, μg;

B—Mass of components in blank tube, μg;

V_0—Sampling volume in normal sate, L.

C.8 Method characteristics

C.8.1 Lower testing limit: if the sampling volume is 10 L, the lower testing limit shall be 0.5 μg/m^3.

C.8.2 Linear scope: 10^6.

C.8.3 Precision: according to different substances to be tested, add 10 μg standard solution in the absorbent tube, and the relative standard deviation of Tenax TA shall fall within 0.4% and 2.8%.

C.8.4 Accuracy: At the temperature of 20 ℃ and relative humidity of 50%, add 10 $\mu m/m^3$ *n*-hexane in the absorbent tube, and the overall uncertainty of Tenax TA and Tenax GR (mean value of five tests) shall be 8.9%.

Annex D
(Normative)
Inspection Method of Total Number of Colony in Indoor Air

D.1 Applicable scope

This method is applicable to the determination of total number of colony in indoor air.

D.2 Definition

Impacting method is a sampling method for determining the total number of colony in air per cubic meter through cultivation of the bacteria on the nutrient agar tablet at 37 ℃ for 48 h, which, under the dynamic action of pumping of an impact type air microbe sampler, is to produce a high-speed airflow by making the air pass through the narrow slit or small holes, so as to make the particles with bacteria floating in air impact the nutrient agar tablet.

D.3 Apparatus

D.3.1 High-pressure sterilizer

D.3.2 Hot air sterilizer

D.3.3 Constant temperature incubator

D.3.4 Ice refrigerator

D.3.5 Plate

D.3.6 General apparatuses for preparing culture medium: measuring cylinder, triangle flask, pH meter or precision pH test paper, etc.

D.3.7 Impact type air microbe sampler

Basis requirements of the sampler:

(1) The capture rate of bacteria in air shall be 95%.

(2) Simple operation, portable, stable performance and convenient sterilization.

D.4 Nutrient agar

D.4.1 Components:

Peptone: 20 g

Beef extract: 3 g

Sodium chloride: 5 g

Agar: 15 g～20 g

Distilled water: 1 000 mL

D.4.2 Preparation method: mix the above-mentioned components and heat to solve them. Calibrate the pH value to 7.4, filter and put them into different containers. Conduct the sterilization under high pressure for 20 min at 121 ℃. Please refer to the instructions of sampler for the preparation of nutrient agar tablet.

D.5 Operating steps

D.5.1 See Annex A for the requirements of sampling point selection. Sterilize the sampler, and take the sample according to the instructions. Generally, the sampling volume is 30 L～150 L, which shall be increased or reduced subject to the performance of instrument used and the microbial contamination in indoor air.

D.5.2 Upon sampling, place the nutrient agar tablet with bacteria in a (36±1)℃ incubator for 48 h, and calculate the bacterial count which shall be converted into the bacterial count in air per cubic meter according to the flow and sampling time of the sampler. The bacterial count shall be reported in cfu/m^3.

GB/T 18883—2002 *Indoor Air Quality Standard* ,Amd.1

This modification sheet was approved by Standardization Administration of the People's Republic of China according to Document SAC Industry and Traffic No. [2003]68 on July 25, 2003, and will be implemented on October 1, 2003.

Title of the Standard: GB/T 18883—2002 *Indoor Air Quality Standard*

1. Page 6: Table A.1 (Contd) the source of Radon^{222}Rn:

Original: (1) GB/T 14582 (2) GB/T 16147

Amended to: (1) GB/T 16147 (2) GB/T 14582

2. Page 7: B.3.3 Coconut shell activated carbon:

Original: 20～40 meshes

Amended to: 0.90 mm～0.45 mm (20 meshes/in～40 meshes/in)

3. Page 10: C.3.3 Absorbent:

Original: the particle size of absorbent used shall be 0.18～0.25 mm (60～80 meshes)

Amended to: the particle size of absorbent used shall be 0.28 mm～0.18 mm (60 meshes/in～80 meshes/in)

4. Page 11: C.6.2 Conditions of chromatographic analysis

Original: The fixed phase may be dimethyl siloxane or methylsiloxane with 70% cyanpropane, 70% phenyl and 86% methyl siloxane.

Amended to: The fixed phase may be dimethyl siloxane or methylsiloxane with 7% cyanpropane, 7% phenyl and 86% methyl siloxane.
