CJ

中华人民共和国城镇建设行业标准

CJ 202—2004

建筑排水系统吸气阀

Air admittance valves for building drainage systems

2004-12-02 发布　　2005-06-01 实施

中华人民共和国建设部　发布

前　言

条文 5.8、5.9 为强制性条文，其余为推荐性条文。

为提高吸气阀安全的可靠性、保证产品质量，制定本标准。

本标准修改采用欧盟 EN 12380.2:2002《排水系统吸气阀　要求、试验方法和一致性评定》。

考虑到对我国开发吸气阀技术的发展要求，本标准不规定产品的结构，只适用于采用重力方式密封。

本标准的附录 A、B、C、D 为规范性附录，附录 E 为资料性附录。

本标准由建设部标准定额研究所提出。

本标准由建设部给水排水产品标准技术委员会归口。

本标准由北京国泰业兴建材有限公司、北京建筑工程学院负责起草，思都得(Studor)中国有限公司参加起草。

本标准主要起草人：于飞、吴俊奇、陈永祥。

建筑排水系统吸气阀

1 范围

本标准规定了建筑排水系统吸气阀的分类、要求、试验方法、检验规则、标志、包装、运输和贮存。

本标准适用于承受不超过正压力 10 000 Pa，且在－20℃～＋60℃的温度范围内工作的吸气阀。

化工、实验室以及其他特殊场合下使用吸气阀，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，其随后所有的修改单(不包括勘误的内容)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 700 碳素结构钢

GB/T 3190 变形铝及铝合金化学成分

GB/T 3511 硫化橡胶或热塑性橡胶 直接自然气候老化试验方法

GB/T 5836.2 建筑排水用硬聚氯乙烯管件

GB/T 7306.1 55°密封管螺纹 第1部分：圆柱内螺纹与圆锥外螺纹

GB/T 7306.2 55°密封管螺纹 第2部分：圆锥内螺纹与圆锥外螺纹

GB/T 8802 热塑性塑料管材、管件 维卡软化温度的测定

GB/T 8803 注射成型硬质聚氯乙烯(PVC-U)、氯化聚氯乙烯(PVC-C)、丙烯腈-丁二烯-苯乙烯三元共聚物(ABS)和丙烯腈苯乙烯-丙烯酸盐三元共聚物(ASA)管件 热烘箱试验方法

GB/T 14162—1993 产品质量监督计数抽样程序及抽样表(适用于每百单位产品不合格数为质量指标)

GB/T 15256 硫化橡胶低温脆性的测定(多试样法)

CJ/T 177—2002 建筑排水用卡箍式铸铁及管件

HG/T 3091—2000 橡胶密封件给、排水管及污水管道用接口密封圈 材料规范

EN 12380:2002 《排水系统吸气阀——要求，试验方法和一致性评定》Air admittance valves for drainage systems-requirements, test methods and evaluation of conformity by *European Committee for Standardization*

3 术语和符号

3.1 术语

3.1.1

吸气阀 air admittance valve(缩略号 AAV)

只允许空气进入建筑排水系统的单向阀。

3.1.2

吸气量 determined airflow capacity

在(－250±10) Pa 的压力下，单位时间内通过吸气阀的气体流量(L/s)。

3.1.3

开启压力 opening pressure

吸气阀自动开启时，阀内的负压值。

3.1.4

气密性　air tightness

吸气阀在其内部承受规定的正压力时所具有的密封性能。

3.1.5

过渡接头　connector

吸气阀与排水管道之间的连接件。

3.2　**符号**

吸气阀符号：

注1：箭头方向表示气流方向。

注2：采用国际通用符号。

4　分类

按安装位置不同可分为立管用吸气阀和支管用吸气阀两类。

按材质不同可分为金属吸气阀和热塑性塑料吸气阀两类。

5　要求

5.1　环境要求

吸气阀应适应－20℃～＋60℃的温度范围内，无严重的油污污染的环境下使用。

5.2　材料要求

5.2.1　产品的阀体材料采用热塑性塑料类的，按 GB/T 8802、GB/T 8803 的规定执行；采用金属类的，按 GB/T 3190、GB/T 700 的规定执行。

5.2.2　产品的密封隔膜宜采用三元乙丙橡胶、氯丁橡胶、硅橡胶或性能更好的材料。材料的性能应符合 GB/T 3511、GB/T 15256 规定的标准。

5.2.3　用于特殊强腐蚀性场合（如化工行业、实验室等）的吸气阀，产品供应商应提供产品阀体和密封材料的抗化学性证明。

5.2.4　当直接在阳光照射下使用时，吸气阀应具有抗老化功能。产品供应商应提供产品阀体的原材料抗紫外线的证明或对其外表保护方式的说明。

5.3　过渡接头

5.3.1　吸气阀与过渡接头宜采用螺纹接口、橡胶密封或卡箍等可拆卸的方式，不宜采用与排水管永久性连接或直接粘接。

5.3.2　其连接的气密性应符合本标准附录 B 的要求。

5.3.3　过渡接头与排水管的连接应不影响排水系统内的正常通气效果。过渡接头应符合GB/T 5836.2、GB/T 7306.1、GB/T 7306.2、CJ/T 177 的规定。

5.3.4　过渡接头安装应保证吸气阀的垂直倾斜度不超过 5°的范围。

5.4　颜色

产品颜色可由供需双方商定。

5.5　外观

5.5.1　产品的外观应光滑，没有毛刺，无气泡、裂口、裂纹、脱皮、严重的冷斑、凹坑、色泽不均及分解变色线，合模缝、浇口应平整、无开裂。

5.5.2　外形应最大限度地限制外来异物或材料进入阀内，对不能实现这一要求的产品应有外围措施得以保证。

5.6 内部结构

5.6.1 产品的内部结构应无缺损、变形，且无气泡、裂口、裂纹、脱皮、严重的冷斑、色泽不均及分解变色线，合模缝、浇口应平整、无开裂。

5.6.2 内部构造应保证凝结水回流到排水系统中。

5.7 抗冲击性

当按附录 A 进行坠落试验后，功能不应改变，且产品不得变形或破裂。

5.8 气密性

吸气阀分别在其内部承受 30 Pa、500 Pa 和 10 000 Pa 正压力下，按附录 B 进行气密性试验，保压 5 min后的压力应分别不小于 5 min 前的压力的 90%。

5.9 抗疲劳和耐温性

当按附录 C.1 在常温和高温的条件下进行疲劳性试验后，吸气阀应符合附录 B.3 的规定。吸气阀冷冻试验后，应符合附录 C.2.3 的准则。

5.10 开启压力和吸气量

在 0 Pa～－150 Pa 之间，应测出吸气阀的开启压力，且在(－250±10)Pa 压力下测得的吸气量符合附录 D.3 的准则。吸气量不应小于表 1、表 2 规定的要求。

表 1 立管用吸气阀

排水管公称直径/mm	最小吸气量/(L/s)
50	4
75	16
90	22
110	32

表 2 支管用吸气阀

排水管公称直径/mm	最小吸气量/(L/s)	
	支管 50%充满度	支管 75%充满度以上
32	0.60	1.2
40	0.75	1.5
50	0.75	1.5
75	3.00	6.0
90	3.40	6.8
110	3.75	7.5

6 试验方法

6.1 试验温度

试验应在 15℃～30℃的自然环境下进行；当测试项目对温度有要求时，按要求进行。

6.2 试验内容

6.2.1 材料

生产供应商应提供原材料的物理机械性能指标，其中属热注塑材料的，应进行维卡软化温度和烘箱试验，应满足 5.2 的要求。

6.2.2 过渡接头

采用内插式橡胶接头，除检查内外部有无残缺外，还要检查与吸气阀和排水管的尺寸是否匹配；采

用卡箍式连接，除检查密封橡胶外，外卡套应采用不锈钢；采用螺纹连接，按 GB/T 7306.1、GB/T 7306.2 的规定检查，应满足 5.3 的要求。

6.2.3 外观

用目测检查外观，应满足 5.5 的要求，并用精度至 0.01 mm 的量表测量接口中部相互垂直的两个外径，计算其算术平均值；接口采用螺纹连接的按 GB/T 7306.1、GB/T 7306.2 的规定检验。

6.2.4 内部结构

用光源照射，应满足 5.6 的要求。

6.3 测试吸气阀时按照生产厂家的要求安装后，应按下列顺序进行试验：

1) 坠落(规范性附录 A)；

2) 在 30 Pa、500 Pa 和 10 000 Pa 压力下的气密性(规范性附录 B)；

3) 抗疲劳和耐温性(规范性附录 C)；

4) 开启压力和吸气量(规范性附录 D)。

试验使用仪器的精度应与本标准的规定相符。

7 检验规则

检验分为出厂检验和型式检验。

7.1 抽样

7.1.1 分类

同一原料、配方和工艺生产的同一规格产品，以每百单位产品不合格数为质量指标，采用 GB/T 14162抽样方案；按质量特性分为：A 类不合格，B 类不合格。

7.1.2 A 类不合格：

监督质量水平 p_0 为 0.65，检验水平为Ⅰ，随机抽取 8 个样品，不合格数小于 1。

对 8 个样品按附录 A、附录 B 逐个检验，再随机抽取其中的 1 个样品进行附录 C 的检验，随机抽取 3 个样品(包含附录 C 的样品)进行附录 D 的检验。

7.1.3 B 类不合格：

监督质量水平 p_0 为 4.0，检验水平为Ⅱ，随机抽取的 8 个样品中，不合格数小于 2。

检验的项目为外观、内部结构、过渡接头；属热塑性塑料产品，应随机抽取其中的 1 个样品进行烘箱和维卡软化温度试验。

7.2 出厂检验

7.2.1 验收标准不得大于 GB/T 14162—1993 中表 8.1.2、8.1.3 的质量水平和检验水平。

7.2.2 出厂检验项目要求和方法见表 3。

表 3 吸气阀出厂检验项目

检验项目	本标准的章、条	
	要求	方法
外观	5.5	目测
内部结构	5.6	光源
过渡接头	5.3	6.2.2
气密性试验	5.8	附录 B
开启压力和吸气量	5.10	附录 D

7.2.3 产品应经过企业质检部门检验合格方可出厂。

7.3 型式检验

7.3.1 一般情况下每年至少 1 次进行型式检验，属于下列情况之一时，应进行型式检验：

a) 新产品试制鉴定时；

b) 停产 1 年以上恢复生产时；

c) 当结构、原料、工艺有较大变动、可能影响产品质量时；

d) 出厂检验与上次型式检验结果差异较大时；

e) 国家质量监督机构认为需要时。

7.3.2 型式检验试样在出厂检验合格批中随机抽取 8 个样品进行检验。

7.3.3 型式检验项目和试验方法见表 4。

表 4 型式检验项目

项目	本标准章、条	
	要求	试验方法
出厂检验项目	表 3	表 3
烘箱试验	热注塑材料	GB 8803
维卡软化温度	热注塑材料	GB 8802
坠落试验	5.7	附录 A
抗疲劳和耐温性试验	5.9	附录 C

7.3.4 判定：如果有 1 个(或以上)项目不符合 A 类不合格、B 类不合格的质量要求，可随机抽取双倍样品进行该项的复验。如仍不合格，则判该批产品为不合格。

8 标志、标签、标记、使用说明

8.1 标志、标签

每个产品应标明以下内容：

1) 产品名称、商标、识别条码；

2) 本标准编号、检验机构标志；

3) 生产企业名称、详细地址、联系方式和产品原产地；

4) 产品的吸气量、公称直径、使用温度和适用范围；

5) 生产日期。

8.2 标记

产品上应有明显的警示标记或警示说明。

8.3 使用说明书

产品说明书应放在每个产品的包装盒内。说明书中除给出与排水管的连接方法和安装示意图外，还应对安装位置和地点作如下说明：

1) 易于接近，又不易被人为损坏的地方，避免严重油污的环境；

2) 垂直安装；

3) 良好的自由空气流动空间；

4) 产品安装于排水横管上时，其吸气阀进气口与排水管上部间距不小于 100 mm；安装于立管顶部应保持吸气阀进气口与吊顶板距离不小于 150 mm；

5) 排水系统闭水试验后方可安装；

6) 使用年限。

9 包装、运输、贮存

9.1 包装

每个吸气阀产品都应设计包装盒，盒内应有适当的绝热壳保护产品。

每个包装箱重量不宜超过 25 kg，产品不同规格尺寸应分别装箱。不得散装。

9.2 运输

产品在装卸、运输时，不得受剧烈撞击、抛摔和重压。

9.3 贮存

存放场地应平整，堆放应整齐，距离热源不得少于 1 m 的范围，通风良好，不得露天曝晒。

附 录 A
（规范性附录）
坠 落 试 验

A.1 程序

本测试应在平整干净的水泥面上进行（见图 A.1）；对外带绝热壳的吸气阀应去掉外绝热壳后测试。

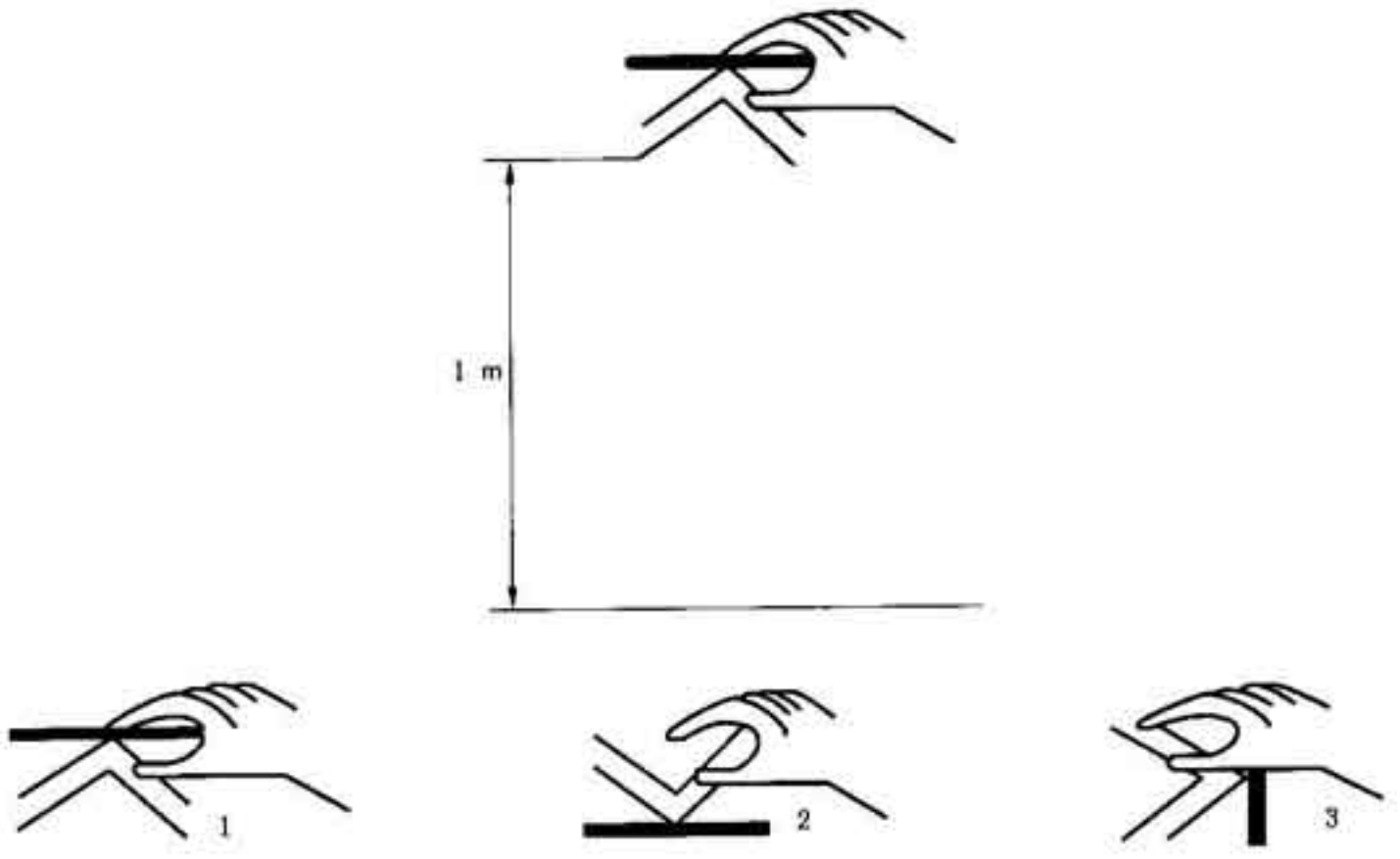
a） 确定测试地表干净；

b） 把吸气阀置于距地面 1(+0.02,0)m 的高度，见方位 1；

c） 放开吸气阀坠落；

d） 拿起吸气阀，换成方位 2 坠落；

e） 拿起吸气阀，换成方位 3 坠落。



1——方位 1；

2—— 方位 2；

3— 方位 3。

图 A.1 坠落试验——高度和吸气阀的方位

A.2 准则

坠落后，样品应无变形和破裂，且使用功能正常。

附 录 B
（规范性附录）
气密性试验

B.1 装置

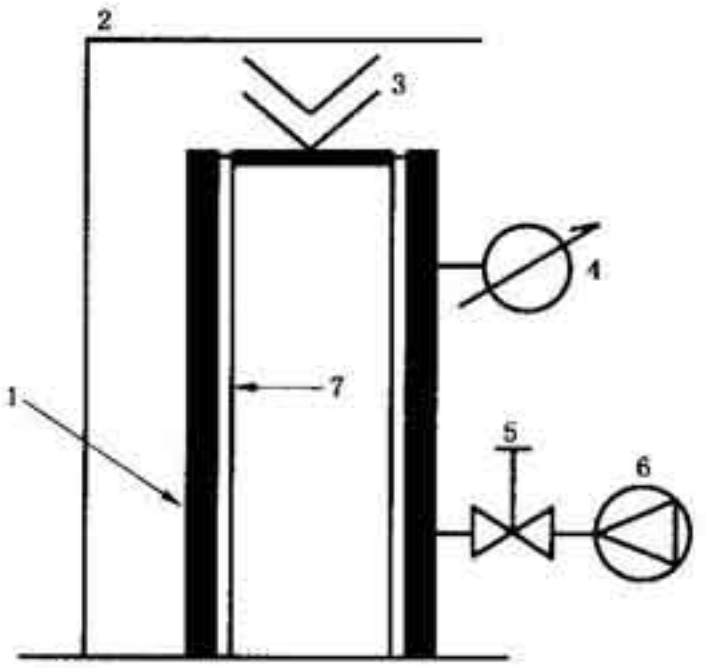
a） 与吸气阀过渡接头相匹配的绝热管 1 根，长度至少为管径的 2.5 倍以上，底部封闭（见图 B.1）；

b） 充气阀 1 个；

c） 气泵 1 台；

d） 压力表 1 块（精度为±0.5 Pa）；

e） 固定吸气阀的可调支架 1 台。



1——绝热的管；
2——可调支架；
3——吸气阀；
4——压力表；
5——充气阀；
6——气泵；
7——排水管。

图 B.1 气密性试验装置图

B.2 程序

程序应按下列顺序进行：

a） 安装与该管径相一致的堵头（符合 GB/T 5836.2），在 10 000（0，－100）Pa 检查下，至少保压 5 min，检查设备的密封情况；在符合密闭要求的情况下，再进行下列测试；

b） 拆下堵头，按厂家说明的要求安上包括过渡接头在内的吸气阀；

c） 打开充气阀开关，缓慢加压到 30（＋10，0）Pa。关闭充气阀并记录初始压力；

d） 保压 5 min 后，记录实时压力；

e） 如果内在压力值减少到初始值的 90%，测量精度在±0.5 Pa 内，检查装置的密闭性；如果装置中漏气，修堵漏气部分并重新进行步骤 c）、d）；

f） 打开充气阀开关，缓慢加压到 500（＋10，0）Pa。关闭进气阀并记录实时压力；

g） 保压 5 min 后，记录实时压力；

h) 如果内在压力少于 450 Pa，测量精度在±0.5 Pa 内，检查装置是否仍然密闭；如果在装置中查到漏气，修堵漏气部分并重新进行步骤 f)，g)；

i) 如果实现上述的试验要求后，继续打开充气阀把气加压到 10 000 (0，−100)Pa。关闭充气阀并记录实时压力；

j) 保压 5 min 后，记录实时压力；

k) 如果测得的内在压力少于 90%，用肥皂水观察气泡的办法检查装置的气密性；如果在装置中查到漏气，修堵漏气部分并重新进行步骤 i)，j)。

B.3 准则

保压 5 min 后记录的实时压力应分别不小于：

a) 初始值 30(+10，0)Pa 的 90%；

b) 实时值 500(+10，0)Pa 的 90%；

c) 实时值 10 000(0，−100)Pa 的 90%。

附 录 C
（规范性附录）
抗疲劳和耐温性试验（仅在其中一个样品上做）

C.1 装置

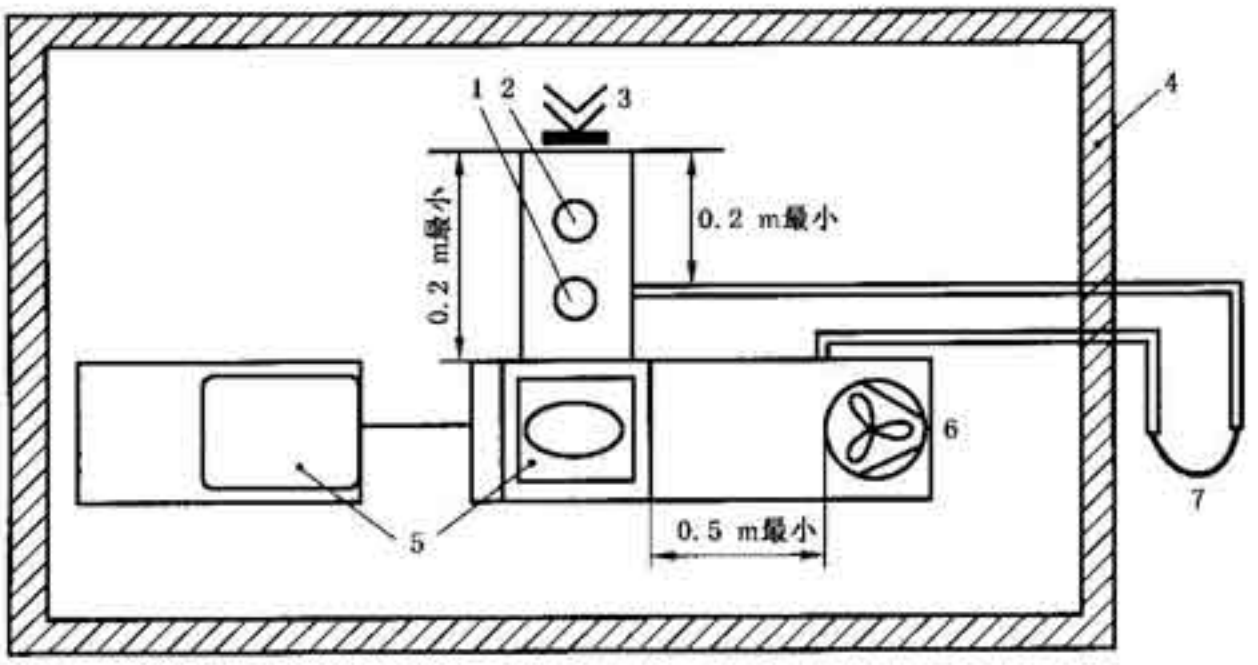
C.1.1 适用于温度在(20±5)℃和(60±2)℃的装置，见图 C.1，其组成有：

a) 可控制 2 种温度内运行的机械装置 1 套；

b) 气流转换装置和接头 1 套；

c) 温度计(0.1℃)和压力测试仪器(±0.5 Pa)附带循环记录仪各 1 套；

d) 通风管 1 根。



1——探头；

2——通气孔；

3——吸气阀；

4——环境温度控制箱；

5——气流转换器；

6——电风扇；

7——吸气阀动作显示仪。

图 C.1 抗疲劳性测试装置图(+20℃～+60℃)

注：用于气流转换器的传动动力装置不能设置在环境控制箱内。

C.1.2 气流转换器应按(15±2)次/min 开闭吸气阀阀门，压力/时间关系的结果见图 C.2。

C.1.3 程序

产品有外保温盖时，该盖要安装在吸气阀上；在 8 个样品吸气阀中随机选 1 个测试。

a) 将环境控制箱保持在(20±5)℃，时间为 16 h±5 min 的条件下对吸气阀进行开闭循环试验；

b) 实验结束后，复检附录 B 的气密性试验；

c) 将环境控制箱保持在(60±2)℃，时间为 8 h±5 min 的条件下对吸气阀进行开闭循环试验；

d) 实验结束后，复检附录 B 的气密性试验。

C.1.4 准则

气流转换装置应保证吸气阀开启、关闭次数为(15±2)次/min(见图 C.1 和图 C.2)；吸气阀应满足附录 B.3 的准则。

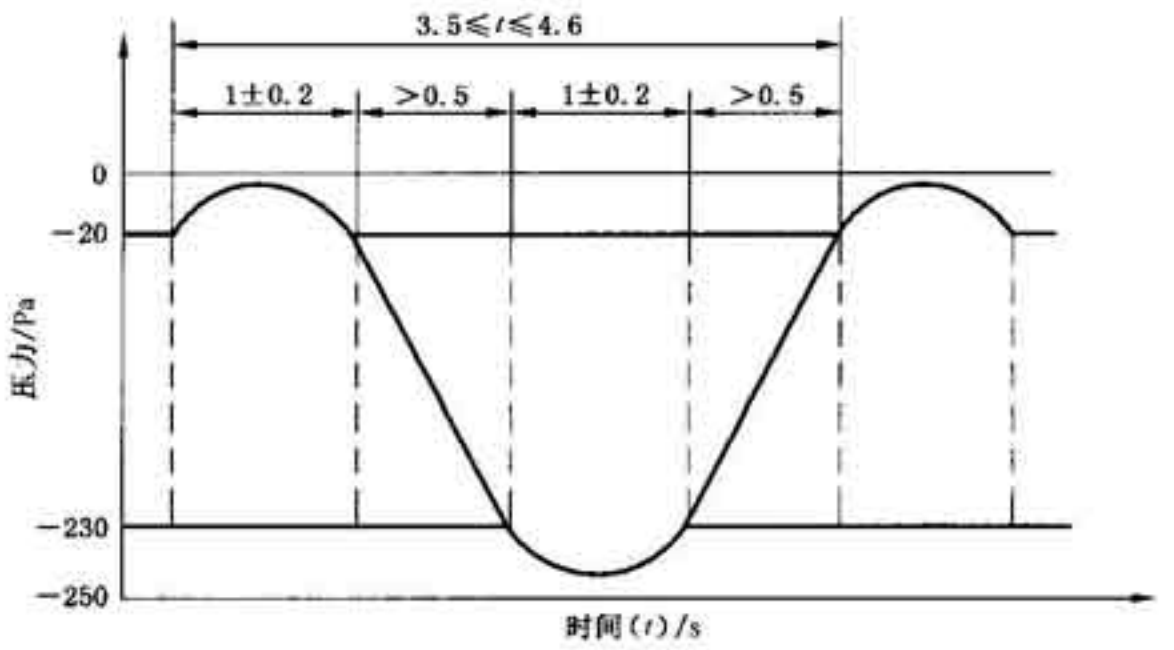


图 C.2 抗疲劳性测试——压力/时间关系图

C.2 适用于温度−20℃的装置(见图 C.3)

C.2.1 装置应包括:

a) DN110 mm,长 2.1 m 的立管 1 根;

b) 与立管直径相同长度为 1.5 m 的支管 1 根,连接在距立管顶端下(1.3±0.01)m 处;

c) 气体流量表和具有调速功能的电风扇各 1 个,安装支管端头;

d) 堵盖 1 个,设在电风扇出口处;

e) DN110 mm 的 P 形存水弯 1 个,接在立管底部;

f) DN50 mm 的 U 形存水弯 1 个,接在 P 形存水弯的最大水封的水平面以上(0.5±0.01)m 处;

g) 静压力探头和静压记录仪 1 套,设在距立管顶部 1 m 处;

h) 1 个 0.8 m×0.8 m×0.8 m 的箱体,箱体有 100 mm 厚的隔热绝缘体,其顶部有可开启的顶盖;盖子上开(120±10)cm^2 的进气口;立管的顶部装在箱内,立管顶端距箱体底部(0.4±0.01)m,且立管穿越箱体底部处密封;

i) 2 支精度为 0.2℃温度传感器;其中 1 支温度传感器应安装在距吸气阀 20 mm 的范围内。

C.2.2 程序

a) 按照生产厂家的说明书,必要时用适当的工具把吸气阀连在立管的顶端;

b) 打开箱体上设置的进气口盖;

c) 用水灌满 2 个存水弯,调解电风扇将压力调至(−250±10)Pa;

d) 记录初始气流率;

e) 关闭电风扇,进气口密闭并封闭电风扇的排风口;

f) 冷却箱体内部;

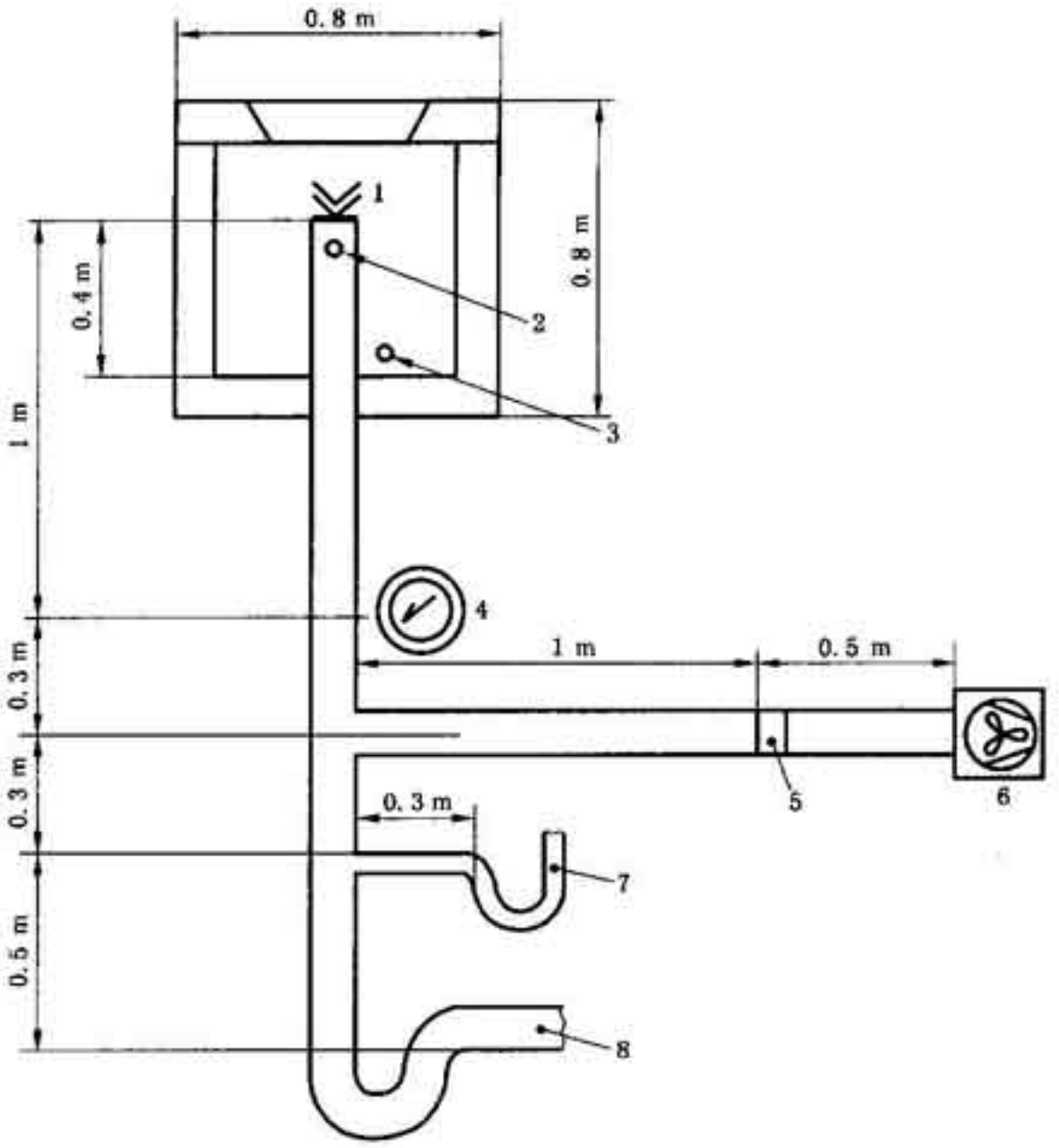
g) 当箱体温度达到(−20±3)℃后,在(5±0.5)min 期间内,持续用流量为(10±1)L/s、温度为(40±3)℃的温水灌入 DN50 mm 的存水弯,让水从下部的存水弯流出;

h) 等待(1±0.1)h,必要时堵住水封的各个出口;

i) 打开进气口并取下排风口堵盖,启动电风扇;

j) 在 30 s 内调节电风扇将压力调至(−250±10)Pa;

k) 记录第二次的气流量。



1——吸气阀；
2——温度探头；
3——温度探头；
4——压力表；
5——气体流量表；
6——电风扇；
7——DN50 mm 存水弯；
8——DN110 mm 存水弯。

图 C.3　冷冻试验的测试装置

C.2.3　准则

第二次气流量应不少于初始气流量的 90%，DN50 mm 管的水封保持深度应大于 25 mm。

附 录 D
（规范性附录）
开启压力和吸气量试验

D.1 装置

适当的装置（见图 D.1）由以下组成：

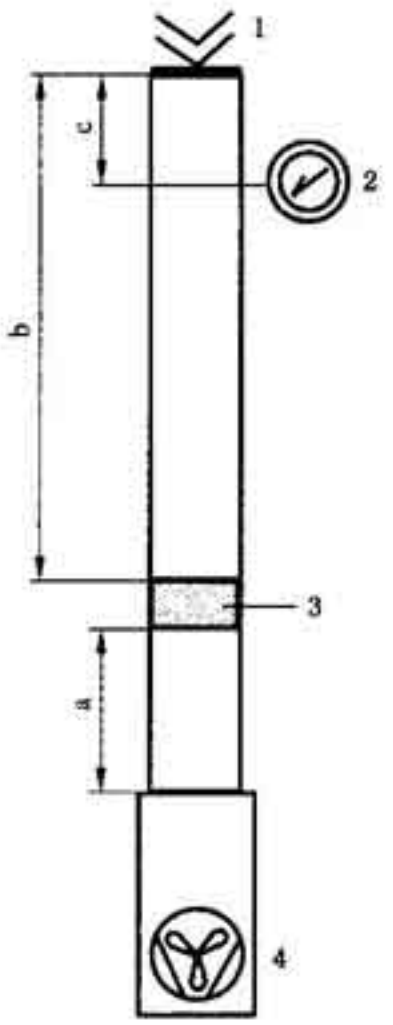
a） 带有连接压力表的静压探头的立管 1 根；

b） 压力表 1 个（±0.5 Pa）；

c） 可调节各种速率并保持气流向下的电风扇 1 个；

d） 平均气流表 1 个（最小气流量 0.1 L/s）。

注：测试应在自然干燥的固定的温度环境中，测定吸气阀开启瞬间的手段。既可以通烟气来观察，也可以通过压力变化来看气流变化。



1——吸气阀；

2——压力表；

3——平均气流表；

4——电风扇；

a——5 倍立管内径；

b——>10 倍立管内径；

c——2 倍立管内径。

图 D.1 吸气量测试装置

D.2 程序

a） 将吸气阀连接在管子顶端，与厂家说明书相一致；

b） 启动电风扇，导入向下的气流同时记录产生的静压和气流量；

c） 缓慢增加风扇速度直到吸气阀阀门打开，当静压突然升高时吸气阀就视为开启；

d) 记录瞬间开启前的压力值，该值就认定为开启压力；

注：在吸气阀打开即压力升高前，所测得最大压力值为开启压力。

e) 调整电风扇的气流率达到压力为(−250±10)Pa；

f) 测量并记录气流穿过管子的实际值；在试验的3个吸气阀中，最低实际流量定义为测定的吸气量；

g) 减少气流量，使压力为−150(0，−10)Pa；

h) 记录3个吸气阀的气体通过管段的实际流量值。

D.3 准则

a) 开启压力应在0 Pa～−150 Pa；

b) 3个吸气阀中的最低气体流量为吸气量；

c) 压力为−150 Pa时应产生可测量的气流量。

附 录 E
（资料性附录）
试 验 报 告

E.1 吸气阀的性能测试报告内容应包括下列有关的资料：

1） 测试机构的名称和地址；
2） 报告的识别号；
3） 要求测试的人(出资者)的名字和地址；
4） 送样及其他情况(负责送样的人和日期)；
5） 试验物品的名称和编号；
6） 测试期间，试验样品的条件、环境数据(温度、压力等)；
7） 使用试验设备和仪器的编号；
8） 试验方法的误差；
9） 试验结果；
10） 结果的非精确度或不确定性；
11） 日期、测试人签名、测试单位公章。

Foreword

In order to ensure a product of good quality and to enhance the reliability of the air admittance valves, we hereby establish the standard.

The revision of the specification is based on requirements, test methods and evaluation of conformity as laid out according to the European Standard EN 12380:2002 Air admittance valves for drainage systems.

In consideration of the need for the development of air admittance valve technology within China, the structure of the product are not specified in the standard and is only suitable for use in the gravitational type for air proofing of the product.

Article Nos. 5.8 and 5.9 are mandatory while the others are recommendations.

Annex A, B, C, D are criterions and Annex E contains reference information only.

The standard was proposed by the Research Institute of Standards & Norms at the Ministry of Construction, PRC.

The standard has been given by the Ministry of Construction to the Drainage Department Technical Standard and Norms Committee for verification.

The standard is edited by Beijing Goldtide Building Materials Co. Ltd; Beijing Institute of Civil Engineering and Architecture; Associated editor: Studor (China) Ltd.

Editors: Yu Fei, Wu Jun Qi, Cheng Yong Xiang.

Air admittance valves for building drainage systems

1 Scope

This standard prescribes classification, requirements, test methods, evaluation, symbol, packaging, transportation and storage for air admittance valves to be used in drainage system installed inside buildings. The standard is suitable for valves within working range of pressure below 10 000 Pa positive pressure and temperature from −20℃ to +60℃. For chemical, laboratory and all other special application valves can refer to this standard for implementation.

2 Normative references

This standard incorporates by dated or under reference, provisions from other publications, these normative references are used cited at the appropriate places in the text, and the publications are listed hereafter.

For dated references, the afterwards revision (not including corrigendum) or the revised edition are not applicable to this standard. However, the agreement within all professional institutions are encouraged that the latest version of these documents can or cannot apply to the standard. For undated references, the latest edition of the publication referred to applies.

GB/T 700 Carbon structural steels

GB/T 3190 Wrought aluminium and aluminium alloys— Chemical composition limits

GB/T 3511 Rubber, vulcanized and thermoplastic—The test method of resistance to direct natural weathering

GB/T 5836.2 Unplasticized polyvinyl chloride fittings for drainage in buildings

GB/T 7306.1 Pipe threads with 55 degree thread angle where pressure-tight joints are made on the threads—Part 1: Parallel internal and taper external threads

GB/T 7306.2 Pipe threads with 55 degree thread angle where pressure-tight joints are made on the threads—Part 2: Taper internal and external threads

GB/T 8802 Thermoplastic pipes and fitting—Determination of vicat softening temperature

GB/T 8803 Injection-moulded unplasticized poly (vinyl chloride) (PVC-U), chlorinated poly (vinyl chloride) (PVC-C), acrylonitrile butadiene-styrene (ABS) and acrylonitrile-styrene-acrylester (ASA) fittings—Hot oven test method

GB/T 14162—1993 Sampling procedures and tables for product quality audit (Apply to inspection by attributes for nonconformities per hundred units)

GB/T 15256 Rubber, vulcanized—Determination of low-temperature brittlenenss (multiple test piece method)

CJ/T 177—2002 Work coupling type cast iron pipe and fittings for building drainage

HG/T 3091—2000 Rubber seals—Joint rings for water supply, drainage and sewerage pipelines—

Specification for materials

EN 12380:2002 Air admittance valves for drainage systems—requirements, test method and evaluation of conformity by *European Committee For Standardization*

3 Terms and definitions

3.1 Terms

3.1.1

Air admittance valve

AAV

Only allowing air enter into the drainage systems as one way valve.

3.1.2

Determined airflow capacity

Lowest flow rate of an air admittance valve while producing a pressure of (-250 ± 10)Pa at the manometer tapping.

3.1.3

Opening pressure

Value of the pressure at the instant of opening of the air admittance valve.

3.1.4

Air tightness

The ability of air admittance valve can withstand positive air pressure in a specified time.

3.1.5

Connector

The joining device installed between air admittance valve and drainage pipe.

3.2 Symbols

The symbols for air admittance valve used in this standard.

NOTE 1. the arrows designate the direction of airflow.

NOTE 2. adoption of the international common symbol.

4 Classification

Air admittance valves are classified according to their installed location: stack pipe system and

branch pipe system.

Air admittance valves are classified according to their material properties: metal and thermo plastic.

5 Requirements

5.1 Environment requirement

Air admittance valves are design for use within a temperature range between −20℃ to +60℃ .in a non-greasy environment.

5.2 Material requirement

5.2.1 Materials used to manufacture the body of air admittance valve are made according to GB/T 8802,GB/T 8803 standard of thermoplastic materials.and GB/T 3190.GB/T 15256 for metal standards.

5.2.2 Ethylene-propylene-non-conjugated diene rubber (EPDM).neoprene and silicone rubber or any other better performing materials are recommended as materials for the airtight membrane in the air admittance valve. Performances of materials are subject to GB/T 3511 and GB/T 15256 standards.

5.2.3 The manufacture must provide proof of chemical resistance for body and membrane on air admittance valve if it is to be used in corrosive environment (chemical application.laboratory etc.).

5.2.4 The manufacturer must provide proff of anti-anti-ultraviolet.anti-aging and instruction of body surface protection when air admittance valve are used outdoor under direct sunlight.

5.3 Connector

5.3.1 Air admittance valve may be connected with thread.rubber sealed.or clamp etc with its connector. Direct or indirect permanent joints are not permitted.

5.3.2 An assembly of an air admittance valve fitted to a pipe.in accordance with the manufacturer's instructions.shall be airtight when tested according to the air tightness test (Annex B).

5.3.3 The connection of connector and drainage pipe should be not affect the operating performance of air admittance valve. Connectors are subject to the standards of GB/T 5836-2.GB/T 7306-1. GB/T 7306-2 and CJ/T 177.

5.3.4 Installation of connector should be fixed air admittance valve within 5° vertically.

5.4 Color

Color of air admittance valve to be agreed between the manufacturer and buyer.

5.5 Appearance

5.5.1 The appearance of air admittance valve should be smooth and does not have any sharp edges, air-bubble, breach, crack, desquamation, speckle, pit, uneven luster, lines of decomposition change, dehiscence, etc. Seam of edges should be matched between sub-assemblies. The gate of injection should be flat and have no cracks.

5.5.2 The screening of air admittance valve should provide maximum restriction for external substance or materials, Optional accessory is required for product without this function.

5.6 Internal structure

5.6.1 The internal structure of the air admittance valve should be smooth and does not have any sharp edges, air-bubble, breach, crack, desquamation, speckle, pit, uneven luster, lines of decomposition change, dehiscence, etc. Seam of edges should be matched between sub-assemblies. The gate of injection to be flatted and have no cracks.

5.6.2 The internal structure is designed to ensure condensed water is flowed back into drainage system.

5.7 Drop test

AAV should undergo the drop test according to Annex A. the performance of the valve shall not be affected or be distorted or crack in any way.

5.8 Air tightness test (mandatory)

Air tightness test for air admittance valve should be undertaken at 30 Pa, 500 Pa and 10 000 Pa under positive pressure according to annex B. the pressure recorded after 5 min shall not be less than 90% of the initial recorded pressure.

5.9 Endurance and temperature test (mandatory)

When the test according to Appendix C has been completed under room temperature and high temperature conditions, the air admittance valve should conform to the specifications as stated in Annex B. After the freezing test, the air admittance valve should conform to the requirements stated in Annex C. 2. 3.

5.10 Opening characteristic and air flow capacity test

The opening pressure shall be measured between 0 Pa and −150 Pa. Airflow capacity test shall be measured when pressure is −250 Pa ± 10 Pa according to annex D. 3 requirement. Airflow capacity is designated to be not less than table 1 and table 2.

Table 1 Air admittance valve for stack pipes

Nominal Pipe Size/mm	Minimum air flow capacity/(L/s)
50	4
75	16
90	22
110	32

Table 2 Air admittance valve for branch pipes

Nominal Pipe Size/mm	Minimum air flow capacity/(L/s)	
	50% Sufficiency	75% Sufficiency or more
32	0.60	1.2
40	0.75	1.5
50	0.75	1.5
75	3.00	6.0
90	3.40	6.8
110	3.75	7.5

6 Testing Methods

6.1 testing temperature

Testing shall be carried out in the natural environment at a temperature range of 15℃ – 30℃. The temperature requirement should be followed where specified.

6.2 testing content

6.2.1 Material

The manufacturer should provide the required technical specification. Thermoplastic shall be tested according to the relevant requirement (see 5.2).

6.2.2 Connector

Where internal connectors are used, the rubber seal connection shall be inspected and free from any deformity and fittings with air admittance valve; clamp connector shall be made from stainless steel and inspection of airproof shall be checked. Thread connection shall be inspected according to GB/T 7306-1, GB/T 7306-2 standard (see 5.3).

6.2.3 Appearance

The appearance shall be inspected by visual observation according to requirements (see 5.5).

A air admittance valve with thread connection shall be inspected according to GB/T 7306-1, GB/T 7306-2 (see 5.3) where a measuring device shall measure two outside diameters at the middle of the thread that are perpendicular to each other, with an accuracy 0.01 mm.

6.2.4 Internal structure

Internal structures are inspected with illumination according to requirement (see 5.6).

6.3 Air admittance valve tests shall be carried out according to the following order after it has been installed according to manufacture's instructions.

1) Drop test (criteria annex A);
2) air tightness test at pressure 30 Pa, 500 Pa and 10 000 Pa (criteria annex B);
3) Endurance and temperature test (criteria annex C);
4) Opening characteristic and airflow capacity test (criteria annex D).

Accuracy of testing equipment is designated to be according to this standard.

7 Evaluation of Conformity

Compliance of an air admittance valve is checked using factory and type inspection.

7.1 Sampling

7.1.1 Class

Quality index shall be applied within standard GB/T 14162 according to the failure per 100 unites of air admittance valves with identical material, formula, technology and specification. Grade A and grade B are unqualified.

7.1.2 Unqualified grade A

Eight samples are extracted stochastically at the inspection level is I with inspection quality p_0 is 0.65. Unqualified number of samples is less than 1.

Eight samples are tested according to annex A and annex B. one samples to be randomly chosen to be tested according to annex C. Three samples are chosen for test according to annex D, including the one undertake the annex C test.

7.1.3 Unqualified grade B

Eight samples are extracted stochastically at inspection level is II with inspection quality p_0 is 4.0. Unqualified number of samples is less than 2.

Appearance, internal structure and connector shall be tested. One sample is chosen randomly to be tested according to the thermo plastic standard.

7.2 Factory production control

7.2.1 The approval quality shall not be larger than table 8.1.2 of quality index and 8.1.3 of inspection index in standard GB/T 14162—1993.

7.2.2 Inspection requirement and methods for factory production control see table 3.

Table 3 Requirement and methods for factory production control

Inspection subject	Chapter in this standard	
	Requirement	Method
Appearance	Inspection	Observation
Internal structure	5.6	Illumination
Connector	5.3	6.2.2
Air tightness test	5.8	Annex B
Opening characteristic and airflow capacity test	5.10	Annex D

7.2.3 The product shall be inspected and approved by qualified inspectors at the enterprise's quality control department before delivery.

7.3 Type inspection

7.3.1 Type inspection shall be carried out at least one time per year. It shall be tested in one of the following situations.

a) Appraisal of new product during trial manufacturing;
b) Valves to be remanufactured which has been suspended more than one year;
c) Quality of valve shall be affected by major modification in terms of structure, material and manufacturing technology;
d) Large different between production test and previous type test;
e) Necessary is required by the national quality control organization.

7.3.2 Eight samples shall be inspected for type test after they have passed factory production control.

7.3.3 Inspection requirement and methods for type test see table 4.

Table 4 Requirement and methods for type inspection

Inspection subject	Chapter in this standard	
	Requirement	Method
Factory production control	Table 3	Table 3
oven test	Thermo plastic	GB 8803
Vika soft temp test	Thermo plastic	GB 8803
Drop test	5.7	Annex A
Endurance and temperature test	5.9	Annex C

7.3.4 Determination: when one or more of the samples during inspection do not pass the quality requirement of grade A or Grade B, a double quantity of samples should be selected and tested a second time. The products shall be deemed disqualified when it fails the re-examination.

8 Symbol, labeling, marking and manual of instructions

8.1 Symbol, labeling

Every air admittance valve is designated to be marked the following information:

1) Product name, logo and barcode identification;
2) Serial number of this standard and logo of the inspection organization;
3) Manufacturer name, detail address, contact information and manufacture of origin;
4) Air flow capacity, nominal pipe size DN, range of use and operating temperature;
5) Date of manufacture.

8.2 Marking

Product shall be marked with warning of symbol or instruction.

8.3 Manual of instructions

An instruction manual accompanies each pack of air admittance valve. Drainage connection and installation sketch shall be provided in the instruction manual with the following information:

1) Easily accessible, safe location and avoid a heavy greasy environment;
2) Vertical installation required;
3) Good circulation of fresh air;
4) When installing on a horizontal drainage pipe, the distance between the pipes and valve should be at least 100 mm; when installing on stack pipes, the minimum distance in between should be at least 150 mm;
5) Air admittance valve shall be installed after the drainage systems have been tested;
6) Life time.

9 Packaging, transportation and storage

9.1 Packaging

Each air admittance valve shall be packed in individual packaging boxes, with the appropriate temperature insulation protection. Each box should not be more than 25 kg and each product with different sizes should be packed separately. There should be no loose packing.

9.2 Transportation

Air admittance valves shall not be subject to external force, thrown and weighted by heavy objects during loading, unloading and transportation.

9.3 Storage

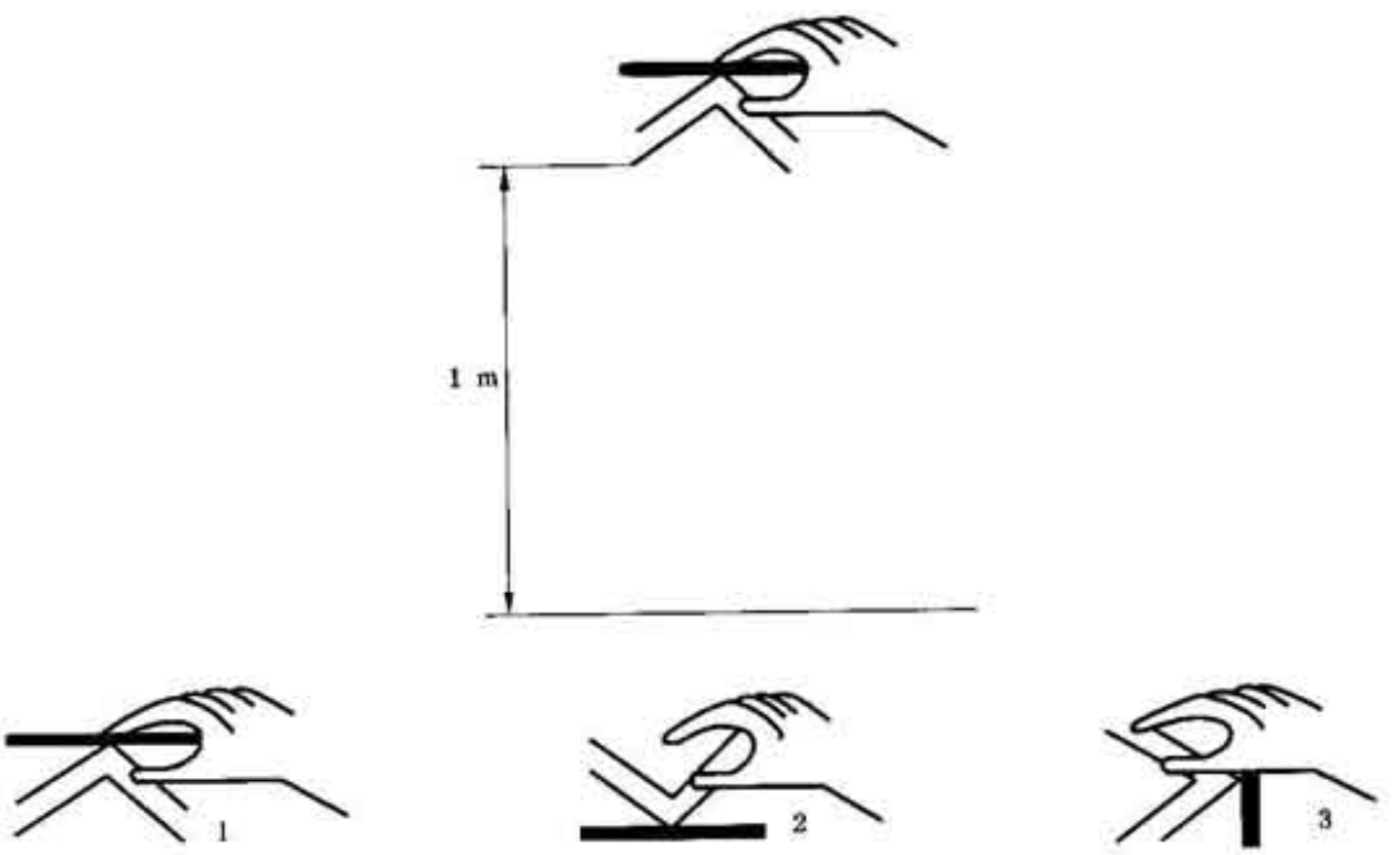
The air admittance valves should not be stored unprotected in open air. Storage floor shall be level off, well-ventilated and protected from direct sunlight, minimum 1 m from and minimum 1 m from heat source. Piles up are in good order.

Annex A
(Normative)
Drop test

A.1 procedure

Valves with removable insulation shall be tested without the insulation in position. The test shall be carried out as follows over a concrete surface as shown in figure A.1.

a) ensure that the surface is clean;
b) hold the air admittance valve with its lowest point $1^{+0.02}_{0}$ m above the concrete surface, in orientation 1 (upside down);
c) release the air admittance valve;
d) pick up valve, change to orientation 2 (top uppermost) and drop;
e) pick up valve, change to orientation 3 (sideways) and drop.



1—Orientation 1;
2—Orientation 2;
3—Orientation 3.

Figure A.1 Drop test; Height and valve orientation

A.2 Criteria

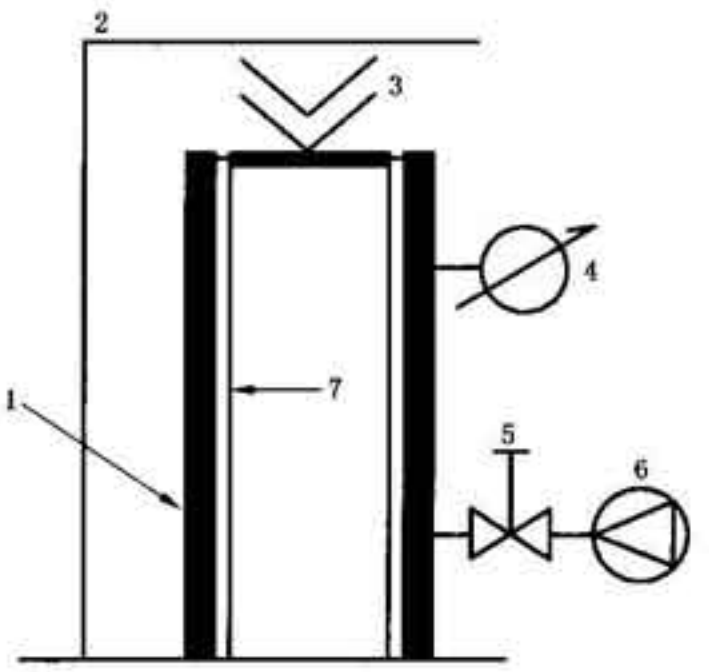
The valve shall show no signs of deformation or breakage which may effect the functioning.

Annex B
(Normative)
Air tightness test

B.1 Apparatus

The test apparatus shall consist of:

a) an insulated pipe of appropriated diameter to suit air admittance valve size, with a length of 2.5 times of diameter in mm, which shall be sealed at the base (see Figure B.1);
b) an air inlet valve, connected to the pipe;
c) a pump;
d) a manometer (with ±0.5 Pa accuracy);
e) a suitable clamp may be required to restrain push-fit valves during testing.



1 Insulation;
2—Adjustable clamp;
3—air admittance valve;
4—Manometer;
5—Air inlet valve;
6 Pump;
7 drainage pipe.

Figure B.1 Air tightness test apparatus

B.2 Procedure

The procedure shall be carried out as follows:

a) with a plug (according to GB/T 5836.2) fitted check that the test apparatus, shown in Figure B, is airtight when subject to pressure 10 000 $^{0}_{-100}$ Pa for at least 5 min;
b) remove the plug and fit the air admittance valve as the manufacture's instructions;

c) open the air inlet valve and slowly raise the pressure to 30^{+10}_{0} Pa. Close the air inlet valve and record the initial pressure;

d) record the internal pressure after 5 min;

e) if the pressure is less than 90% of the initial valve, measured with an accuracy of ±0.5 Pa, check the apparatus is still airtight. If a leak is detected in the apparatus, rectify and repeat from c), d);

f) open the air inlet valve and slowly raise the pressure to 500^{+10}_{0} Pa. Close the air inlet valve and record the set pressure;

g) record the internal pressure after 5 min;

h) if the pressure is less than 90% of the set value, measured with an accuracy of ±0.5 Pa, check the apparatus is still air tight. If a leak detected in the apparatus, rectify and repeat from f), g);

i) if the previous test criteria are achieved, raised the pressure by opening the air inlet valve and pumping air into the apparatus until it reaches 10.000^{0}_{-100} Pa. Close the valve and record the set pressure;

j) after five minutes record the internal pressure;

k) if the pressure is less than 90% of the set value, measured with an accuracy of ±0.5 Pa, check the apparatus is still airtight using a soap solution and inspecting for air bubbles. If a leak is detected in the apparatus, rectify and repeat from i), j).

B.3 Criteria

The pressure recorded after 5 min period shall not be less than:

a) 90% of the first record 30^{+10}_{0} Pa;

b) 90% of the actual record 500^{+10}_{0} Pa;

c) 90% of the actual record $10\,000^{0}_{-100}$ Pa.

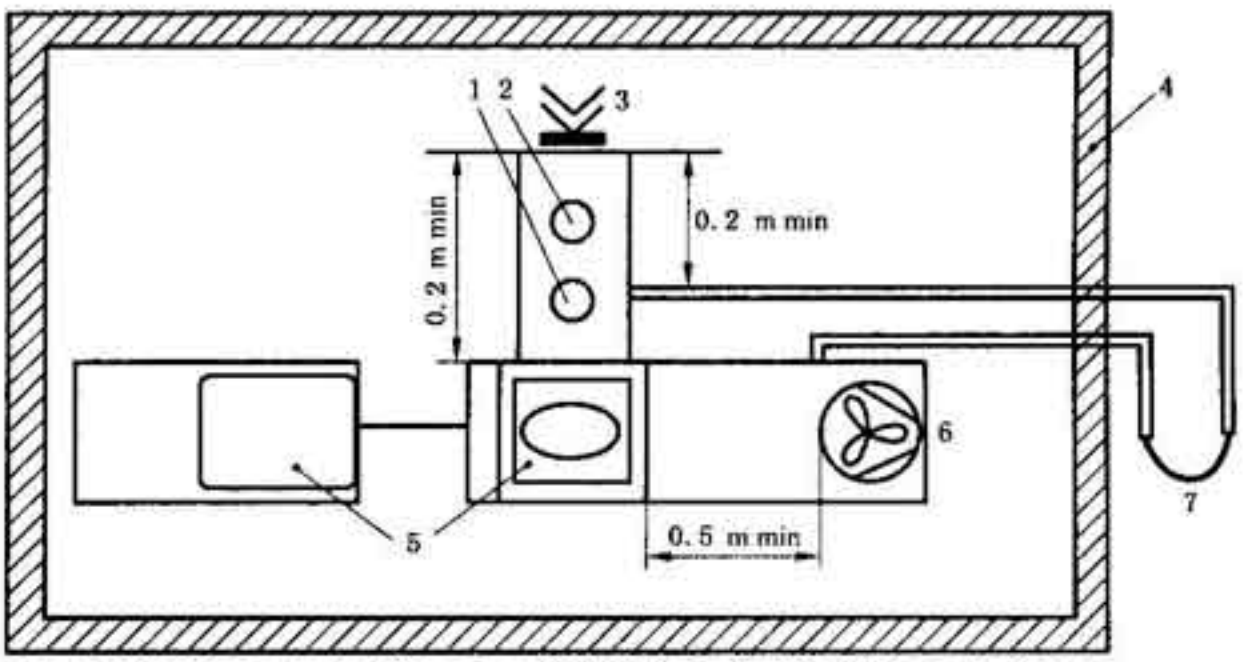
Annex C
(Normative)
Endurance and temperature test
(Only one sample to be tested)

C.1 Apparatus

C.1.1 The test apparatus (see figure C.1) can provide temperature range between (20±5)℃ and (60±2)℃ shall consist of:

a) a mechanism which can be operated within two temperature environments. The mechanism comprises a tube, fitted with an electric fan at one end;
b) a means of diverting air flow at the other end and a connection for AAV;
c) Temperature (0.1℃) and pressure measuring devices (±0.5 Pa) and cycle recording means;
d) An atmospheric vent pipe.

An example of suitable apparatus is shown in Figure C.1.



1—Pressure tapping;
2—Atmospheric vent;
3—Air admittance valve;
4—Temperature controlled environment container;
5—Means of diverting air flow;
6—Fan;
7—AAV operating indicator.

Figure C.1 Endurance test apparatus (+20℃ ~ +60℃)

NOTE: The airflow diverting actuator does not have to be housed within the controlled environment container.

C.1.2 The means of diverting airflow shall open and close the air admittance valve (15±2) times per minute and result in the specified pressure/ time function shown in figure C.2.

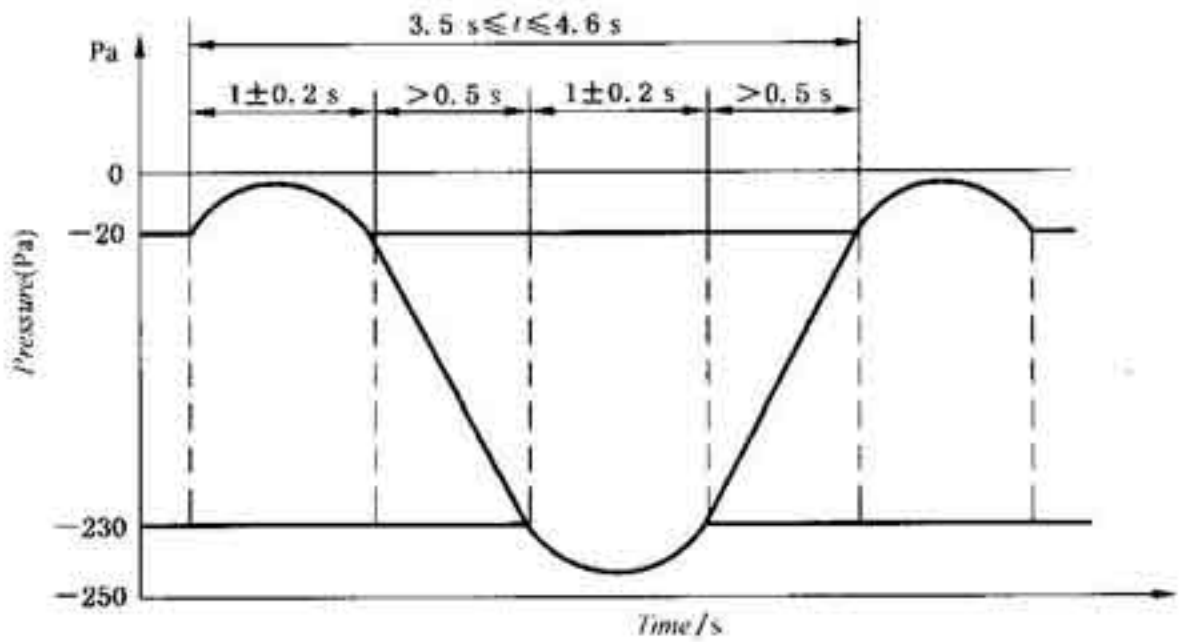


Figure C.2 Endurance test pressure/time curve

C.1.3 Procedure

When supplied with an insulating cap, the cap shall be installed on the air admittance valve. Only one sample to be tested from 8 samples.

a) The air admittance valve and valve and test apparatus shall be placed, and operated, in an environment where the ambient air is maintained at (20±5)℃ for a period of 16 h±5 min;
b) Upon completion of this test, conduct the air tightness test again (see annex B);
c) The air admittance valve and test apparatus shall be placed, and operated, in an environment where the ambient air is maintained at (60±2)℃ for a period of 8h±5min;
d) Upon completion of this test, conduct the air tightness test again (see annex B).

C.1.4 Criteria

The airflow diverting device shall guaranty open and close of the air admittance valve (15±2) times per minute (see Figure C.1 and C.2); AAV shall be satisfied annex B.3 requirement.

C.2 Test for effectiveness at −20℃ (see Figure C.3)

C.2.1 Apparatus

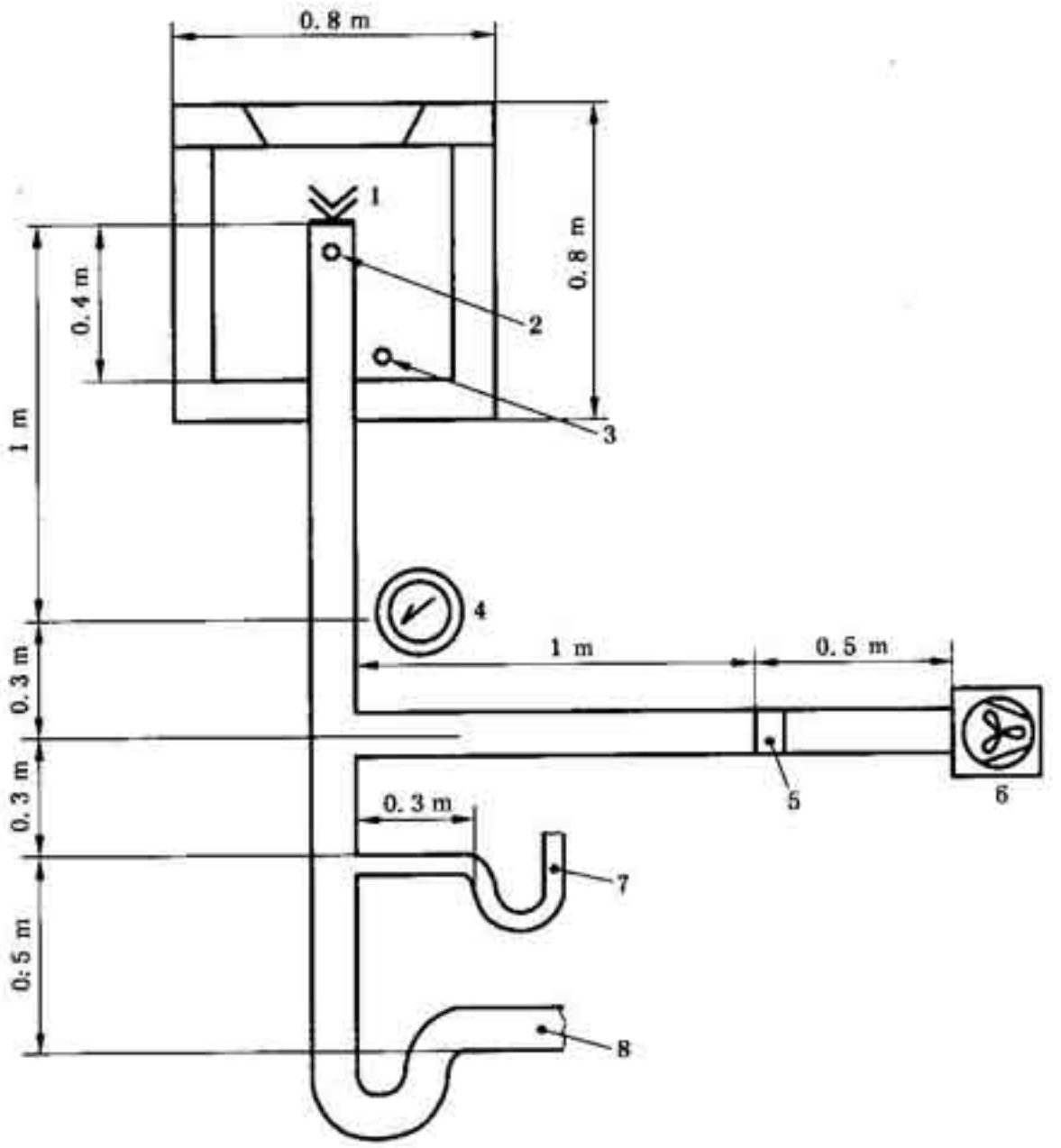
The test apparatus shall consist of:

a) a nominally 2.1 m long vertical stack of DN 110;
b) a nominal 1.5 m long branch of DN 110 connected at (1.3±0.01) m below the top of the stack;
c) an averaging air flow meter and electric fan with variable speed;
d) a plug for the fan's outlet;
e) a "p" trap seal of DN 110 at the bottom of stack;
f) a "U" trap seal of DN 50 above (0.5±0.1) m of "P" trap seal level;

g) a static pressure tapping with a manometer;

h) the box, of approximate overall dimensions 0.8 m × 0.8 m × 0.8 m with a removable top for (120 ± 10) cm^2 air in let, is line with 100 mm insulation inside, such that the top of stack is (0.4 ± 0.01) m above the insulation;

i) two temperature sensors having an accuracy of 0.2℃, one with 20 mm of the AAV.



1—AAV;

2—Temperature sensor;

3—Temperature sensor;

4—Manometer;

5—Air flow meter;

6—Fan;

7—50 mm Trap;

8—110 mm Trap.

Figure C.3 Test apparatus for frost test

C.2.2 Procedure

The test shall be carried out on one valve as follows:

a) connect the AAV to the top end of the stack, using appropriate means where mecessary, in accordance with the manufacture's instructions;

b) fit the lid of air inlet on the box;

c) fill the trap with water when adjust the fan to create a pressure of (−250±10) Pa, at the manometer;

d) record the first airflow rate;

e) switch off the fan close the air inlet and seal the fan's outlet;

f) reduce the temperature inside the box;

g) when the temperature inside the box has reached (−20±3)℃ run warm water at (40±3)℃ at the rate of (10±1) litre per minute into the 50 mm trap for a period of (5±0.5) min, allowing water to flow out the lower trap;

h) after waiting for (1±0.1) h, top up the traps if required;

i) open the air inlet and unseal the fan's outlet;

j) adjust the fan to create a pressure of (−250±10) Pa at the manometer within 30 s;

k) record the second airflow rate.

C.2.3 Criteria

The second airflow rate shall not be less than 90% of the first airflow rate, and the 50 mm trap contain more than 25 mm water.

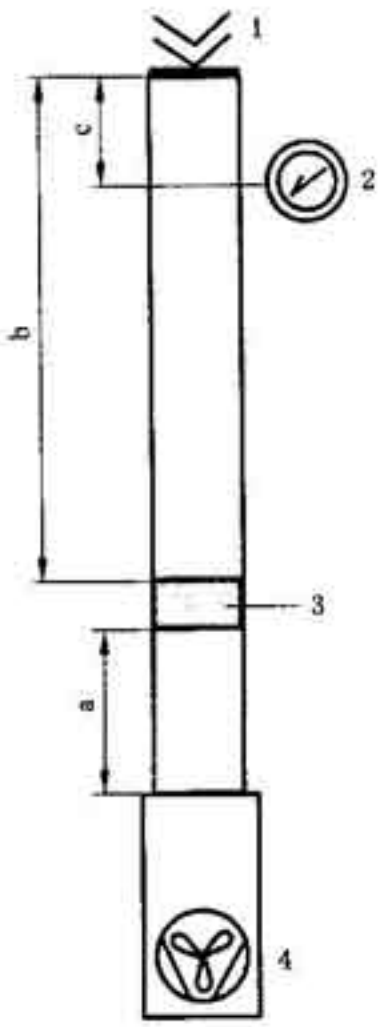
Annex D
(Normative)
Opening characteristic and air flow capacity test

D.1 Apparatus

The test apparatus (see Figure D.1) shall consist of an appropriate diameter fitted with:

a) a stack with a static pressure tapping connected to a manometer;
b) a pressure manometer;
c) a variable airflow rate electric fan (or equivalent means to induce and air flow down the pipe);
d) an averaging airflow meter capable of resolving 0.1 L/s.

Note: a mean of detecting the instant of opening of the air admittance valve; for example either flow visualization by using ventilation smoke tubes or by detecting the pressure change.



1—AAV;
2—Manometer;
3—Averaging air flow meter;
4—Fan;
a— 5x stack ID;
b—>10x Stack ID;
c— 2x stack ID.

Figure D.1 Air flow test apparatus

D.2 Procedure

The test shall be carried out as follows:

a) connect the air admittance valve to the top of the pipe, using appropriate means where necessary, in accordance with the manufacturer's instructions;
b) Start the fan, to create an air flow down the pipe while recording the development static air pressure and the air flow rate;
c) Increase slowly the speed of the fan until the air admittance valve opens; the valve is considered to be open at the moment the static pressure suddenly rise;
d) Record the value of the pressure at the instant of opening, this will be designated the opening pressure;

Note: the opening pressure is the maximum pressure measured just before the valve opens, i. e. just before the pressure rise.

e) Using the fan, the air flow rate shall be adjusted so that the measures pressure is (-250 ± 10) Pa;
f) Measure, and record, the mean value of the air flow rate across the pipe. The lowest mean flow rate of the three valves tested will be designated the determined airflow capacity;
g) Reduce the air flow rate so that the measured pressure is -150^{0}_{-10} Pa;
h) Record the mean value of any air flow rate across the pipe for three valves.

D.3 Criteria

a) the opening pressure shall be between 0 Pa and -150 Pa;
b) the lowest of the three determined air flow capacities shall be the determined airflow capacity of the valve;
c) With an applied suction of -150 Pa, a measurable flow rate shall be produced.

Annex E
(informative)
Test Report

E.1 A test report on air admittance valve performance shall include the following information if relevant:

1) name and address of testing body (if relevant);
2) identification number of the report;
3) name and address of the person requisitioning the test (the sponsor);
4) method of sampling and other circumstances (date and person reaponsible for the sampling);
5) name or identification of tested object;
6) condition of the test specimens, environmental data during the test (temperature, pressure stc.);
7) identification of the test equipment and instruments used;
8) any deviation from the test methods;
9) test results;
10) inaccuracy or uncertainty of the results;
11) date、signature and seal of testing body.