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Ventilation for buildings — Ductwork — Requirements for ductwork components to facilitate maintenance of ductwork systems

ICS 91.140.30

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Committees responsible for this British Standard

The preparation of this Draft for Development was entrusted to Technical Committee RHE/2, Air distribution and air diffusion, upon which the following bodies were represented:

Association of Consulting Engineers
Association of Manufacturers of Domestic Electrical Appliances
Building Services Research and Information Association
Chartered Institution of Building Services Engineers
Department of Health
Department of the Environment (Building Research Establishment)
Electricity Association
Heating and Ventilating Contractors' Association
HEVAC Association
Institute of Energy
Loss Prevention Council
Society of British Gas Engineers

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National foreword

This Draft for Development has been prepared by Technical Committee RHE/2 and is the English language version of ENV 12097 : 1997 *Ventilation for buildings — Ductwork — Requirements for ductwork components to facilitate maintenance of ductwork systems*, published by the European Committee for Standardization (CEN). ENV 12097 : 1997 was produced as a result of international discussions in which the UK took an active part.

The draft standards prEN XXXB, prEN XXXC and prEN XXXD had not been published at the time of publication of this Draft for Development. CR 12792 : 1997 was published subsequently to ENV 12097 : 1997 and was originally referred to as CR XXXX in the European Prestandard.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because it is considered that further experience is required in its application before it is converted into a British Standard. It should be applied on this provisional basis so that information and experience of its practical application may be obtained. Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the European organization responsible for its conversion to a European Standard. A review of this publication will be initiated 2 years after its publication by the European organization so that a decision can be taken on its status at the end of its three-year life. The commencement of the review period will be notified by an announcement in *BSI News*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European standard, to extend the life of the prestandard or to withdraw it. Comments should be sent in writing to the Secretary of BSI Technical Committee RHE/2 at BSI, 389 Chiswick High Road, London W4 4A1 giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 24, an inside back cover and a back cover.

ICS 91.140.30

Descriptors: air conditioning equipment, air conditioners, heat pumps, compressors, electric motors, acoustic measurement, sound power, engine noise, airborne noise

English version

**Ventilation for buildings - Ductwork -
Requirements for ductwork components to
facilitate maintenance of ductwork systems**

Ventilation des bâtiments - Réseau de conduits
- Prescriptions relatives aux composants
destinés à faciliter l'entretien des réseaux de
conduits

Lüftung von Gebäuden - Luftleitungen -
Anforderungen an Luftleitungsbauteile zur
Wartung von Luftleitungssystemen

This European Prestandard (ENV) was approved by CEN on 1996-01-19 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword	3
1 Scope	5
2 Normative references	5
3 Definitions	6
4 Requirements	6
5 Dimensions	7
6 Installation and location in ductwork	9
Annexes	
A (informative) Service and access recommendations	11
B (informative) Components to facilitate cleaning and maintenance	16
C (informative) Levels of cleanliness for delivery, installation and protection of ductwork	19

Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 156 "Ventilation for buildings", the secretariat of which is held by BSI

This standard is a part of a series of standards for ductwork used for ventilation and air conditioning of buildings for human occupancy. The position of this standard in the field of mechanical building services is illustrated in figure 1.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

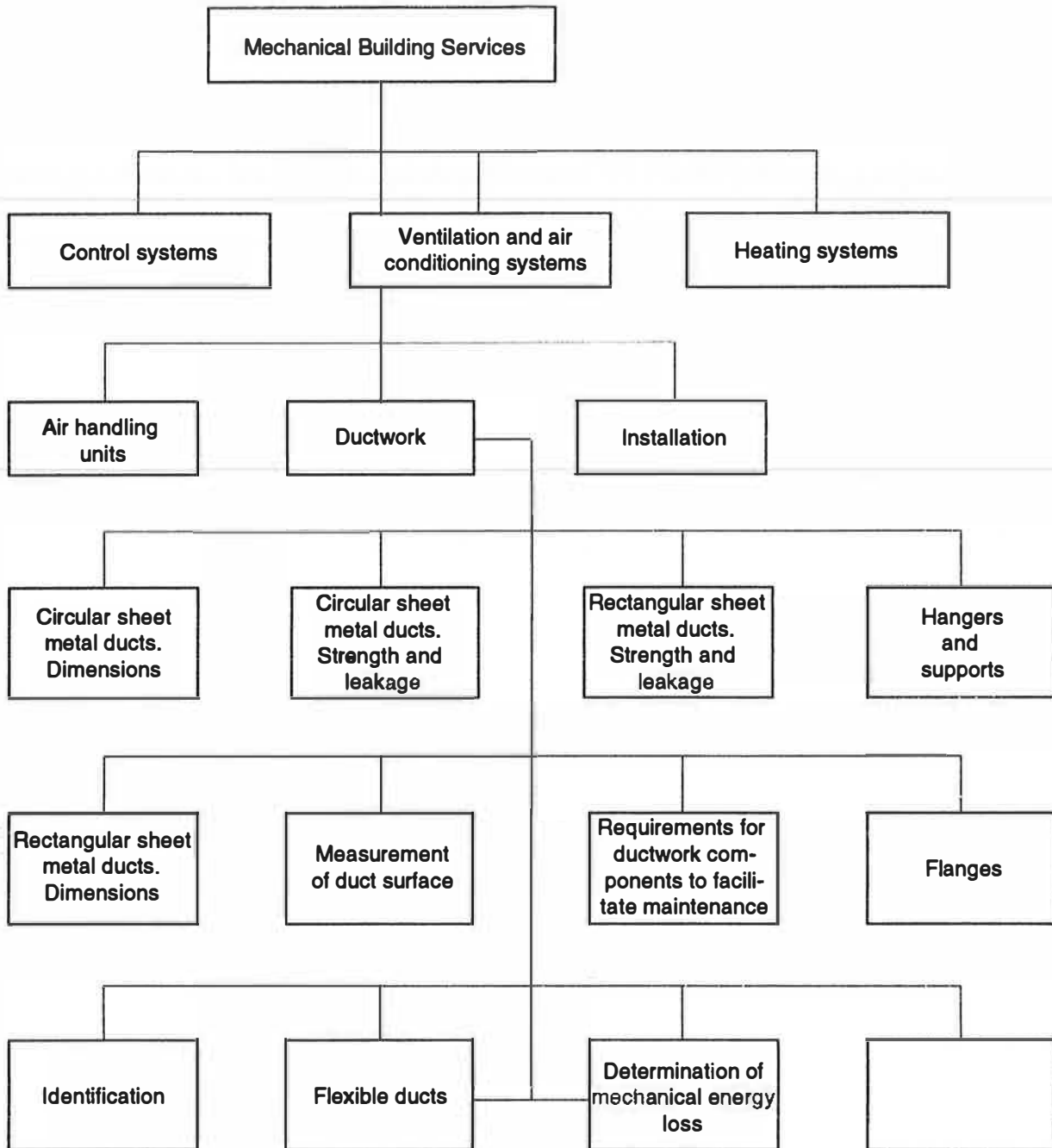


Figure 1: Position of ENV 12097 in the field of mechanical building services

1 Scope

This Prestandard applies to ductwork in buildings subject to human occupancy. It specifies requirements for dimensions, shape and location for openings, access and inspection covers and access doors for cleaning and service in supply and exhaust air ducts which conform to prEN 1505, prEN 1506 and prEN XXXD.

This Prestandard does not specify requirements related to fire safety.

2 Normative references

This European Prestandard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references the subsequent amendments to or revisions of any of these publications apply to this European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

CR 12792	Ventilation for buildings - Symbols, units and terminology.
prEN 1505	Ventilation for buildings - Sheet metal air ducts and fittings with rectangular cross section - Dimensions.
prEN 1506	Ventilation for buildings - Sheet metal air ducts and fittings with circular cross section - Dimensions.
prEN 1507	Ventilation for buildings - Strength and leakage of sheet metal air ducts with rectangular cross section - Requirements and testing.
prEN 12237	Ventilation for buildings - Strength and leakage of sheet metal air ducts with circular cross section - Requirements and testing.
prEN XXXB	Ventilation for buildings. System Performance (in preparation)
prEN XXXC	Ventilation for buildings. Air handling units. Ratings and performance, Components and sections (in preparation)
prEN XXXD	Ventilation for buildings. Flexible ducts. Dimensions and mechanical requirements. (in preparation)

3 Definitions

For the purpose of this Prestandard the definitions given in CR 12792 shall apply.

4 Requirements

4.1 General

The air distribution system shall be designed, manufactured and installed in such a way that cleaning of all internal surfaces and components is possible.

The components (e.g. dampers, sensors, air flow measuring devices etc.) shall be installed in such a way that they can be cleaned, or located so that they can be removed for service and cleaning. If removal is not possible, service access shall be provided in compliance with clause 6.1. Access to service openings shall not be obstructed by suspended ceilings, electric wires, pipes, other ducts etc. (See annex A).

Stiffeners and other equipment in the ductwork shall be installed so that the cleaning of ducts is not obstructed. Stiffeners inside a rectangular duct shall be smooth in shape preferably circular, and shall not be perforated strips or difficult to clean.

Sharp bends and abrupt reductions shall be avoided. Sharp pointed screws and other objects which can cause injury to persons or damage to cleaning equipment shall not be used. Sharp edges in openings, access covers and doors are not allowed.

4.2 Openings

Access components shall be provided to ensure that the whole ductwork can be cleaned.

The arrangements for cleaning depend on the category of air system, as specified in prEN XXXB. This category influences the frequency of access covers or doors, the method for cleaning and the cleaning intervals.

The requirements for the strength and airtightness of ducts equipped with access components shall conform to those for the whole ductwork, as specified in prEN 12237 and in prEN 1507.

Where the air distribution system requires any thermal, acoustic or fire insulation the design documentation shall define how the insulation value is maintained across the opening. Components shall be constructed and installed in the ductwork such that the integrity of the thermal, acoustic or fire insulation is maintained.

Covers and access doors shall be easy to open. Consideration shall be given to the security of access doors installed in public areas. Detachable access doors shall be secured to prevent them falling into the duct or causing injury.

The air leakage due to a number of openings shall be related to life time and determined according to the air tightness tests given in prEN 12237 and prEN 1507.

Where the duct is large enough to allow human access for cleaning, the following requirements apply:

- the duct and its supports shall withstand the additional loads;
- the type and location of access components shall allow the cleaning person to enter and exit from the ducts.

A ductwork component which may be dismantled for cleaning may also be regarded as an access cover, provided that its dimensions are in accordance with table 1 or 2, and it fulfils the other requirements stated, or if its dimensions are suitable for the specified and documented cleaning method. (See clause 5).

Examples are given in annex B.

5 Dimensions

5.1 General

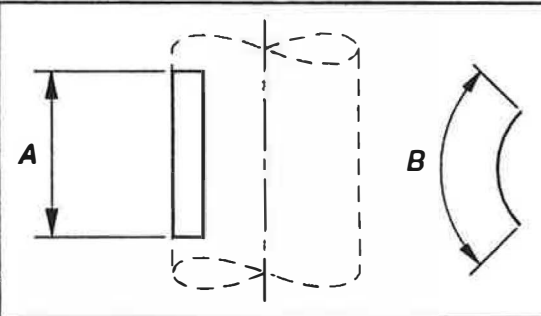
Unless otherwise specified (e.g. in cases where the cleaning method is known and allows smaller openings for cleaning), the dimensions shall conform to 5.2 and 5.3.

5.2 Openings for cleaning for rigid circular ducts

Removable end caps or T-pieces with end caps shall be provided for cleaning access in all ducts up to 200 mm diameter. For larger ducts, either openings of sizes according to table 1, or T-pieces with a minimum diameter of 200 mm shall be provided.

Table 1: Openings for circular ducts. Minimum dimensions

Duct diameter (mm)	Minimum dimensions of openings on duct walls (mm)	
	A	B
d	A	B
$200 \leq d \leq 315$	300	100
$315 < d \leq 500$	400	200
> 500	500	400
¹⁾	600	500



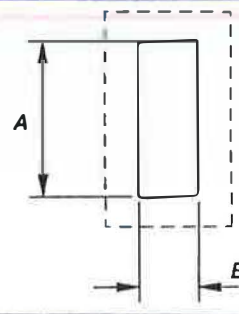
¹⁾ A manhole is required if it is necessary for a person to gain access to the ducts.

Consideration shall be given to access points where the dimensions of a circular duct changes more than two diameter steps according to the recommended sizes in table 1 of prEN 1506: 1996 to enable another cleaning equipment to match these sizes to be introduced into the duct system.

5.3 Openings for rectangular ducts

Table 2: Openings for rectangular ducts. Minimum dimensions

Duct side (mm)	Minimum dimensions of openings on duct sides (mm)	
	A	B
$s^{1)}$	A	B
≤ 200	300	100
$200 < s \leq 500$	400	200
> 500	500	400
²⁾	600	500



¹⁾ The side where the opening is installed.

²⁾ A manhole is required if it is necessary for a person to gain access to the ducts.

For an opening installed in the end of a duct, the dimensions of the opening shall be equal to those of the duct or if one or both of the dimensions are smaller than required in table 2, then s is the smaller of the two dimensions.

Where a component is to be removed to facilitate cleaning, the openings created shall be at least equal to the openings specified in table 2, for each duct size.

If the height of an opening is greater than 1000 mm, 400 mm is a sufficient width, e.g. access openings in air handling units.

Consideration shall be given to access points where rectangular ducts change dimensions or profile to enable another cleaning equipment to match the size to be introduced into the duct system.

5.4 Openings in suspended ceilings

An unobstructed access to the access covers of the ducts shall be provided. An example is given in figure A.1.

5.5 Location and type of components

The design and installation documentation shall indicate by dimensions the location of all access components and provide details of the size and type of component required. The documentation shall also indicate the location of components mentioned in 6.1 to enable proper service and re-adjustment.

6 Installation and location in ductwork

6.1 General

Guidelines are given in annex C for design and installation such that the ductwork may meet the required levels of cleanliness during the lifetime of the ventilation system.

Access to duct-mounted components shall also be provided at the following locations in the duct system:

Dampers	both sides ¹⁾
Fire dampers	one side
Heating and cooling coils	both sides
Circular sound attenuators	one side
Rectangular sound attenuators	both sides ¹⁾
Filter sections	both sides ¹⁾
In-duct fans	both sides ¹⁾
Heat recovery devices	both sides ¹⁾
Air flow control devices	both sides ¹⁾

The components listed above and other equipment like flow regulators, measuring devices and control gauges shall be located in the ductwork in such a way that they may be easily serviced and cleaned. The equipment or device should whenever possible be located centrally in machine rooms, near the terminals and main branches.

Figure A.4 provides examples of access locations and distances between components for cleaning. The top and bottom of vertical ducts shall be equipped with openings located in spaces with easy access

Access locations in ducts that are insulated for noise, thermal or fire protection shall be individually considered to define whether the insulation is contained in the access component or is achieved by secondary insulation across the component.

The thermal, acoustic and fire properties of a duct system shall be maintained at all access locations.

¹⁾ Unless easily removable for cleaning.

6.2 Special considerations

All access components shall be constructed and installed to match the performance of the system and to facilitate the cleaning process in the future.

The cleaning method may vary depending on the category of the air distribution system.

Some systems and components require careful design and installation to ensure that condensed vapours and cleaning fluids can be drained from the system.

NOTE: Instructions for a “wet” cleaning method should include a warning of the restriction of use, e.g. in case the method is applicable only for ducts with high requirements of tightness.

If a component is to be removed for service and/or cleaning its construction shall allow replacement, and the service instructions shall include sufficient guidance for the checking of its function. This group of components includes e.g. flow controllers, dampers and measuring devices. These requirements are also valid for dismountable measuring instruments, flexible pipes, gauges etc. Removal, servicing or inspection of these components shall not be obstructed by suspended ceilings, other equipment, ducts, pipelines etc. Air flow direction shall be labelled on all these devices. Removable electric devices, like ducted fans, shall be equipped with connecting plug or a flexible cable long enough to allow dismounting.

If re-setting of an equipment, e.g. fire damper or controller, inside a duct is required, the inspection opening shall be located to allow the necessary work and inspection. The equipment should preferably be located with access from outside the occupied area, e.g. from corridors or machine rooms.

Terminal devices and additional components like pressure balancing boxes, diffusers, exhaust valves, grilles etc. shall allow easy cleaning, e.g. by opening the pressure balancing box or removing the diffuser part. Terminals may also be cleaned through an inspection opening located close to the terminal.

Flexible ducts shall where possible be removed for inspection and cleaning, unless they can satisfactorily be cleaned in situ.

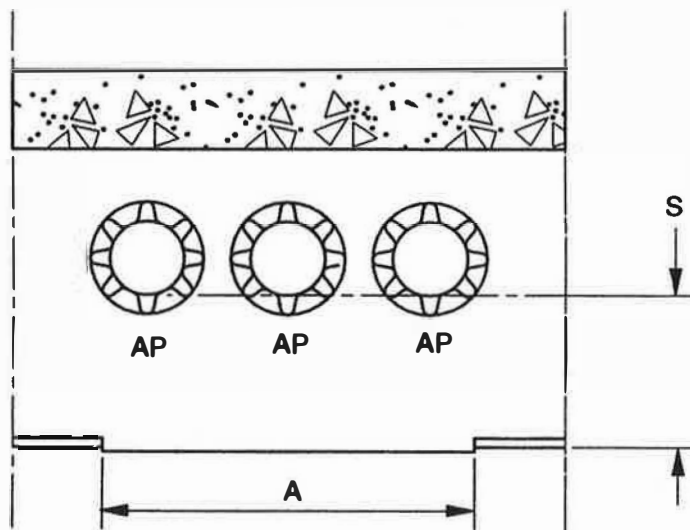
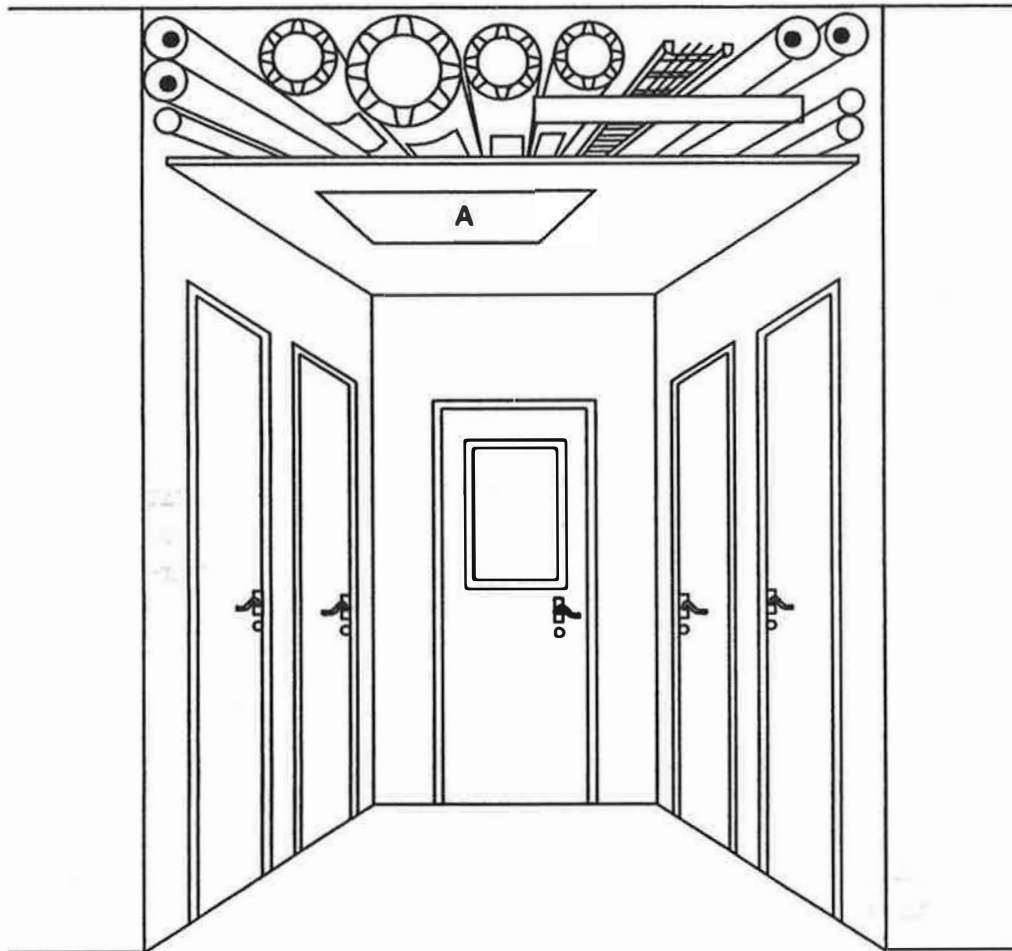
Requirements for cleaning and service for central air handling units and machine rooms are presented in prEN XXXC.

Installation examples are presented in annex B.

Annexes

Annex A (informative)

Service and access recommendations

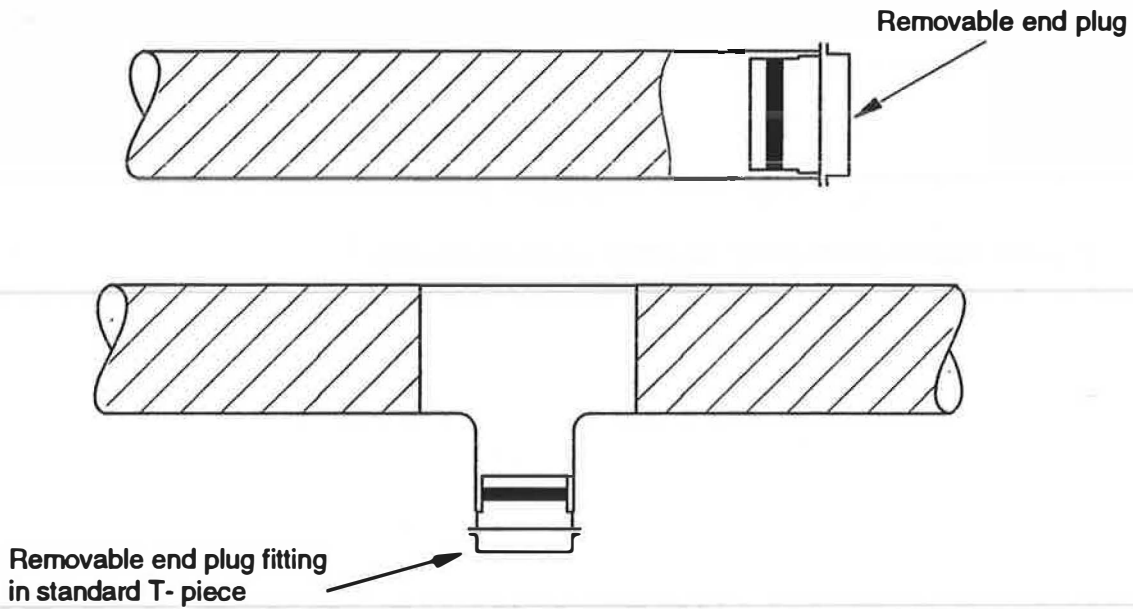


S	A**
0 - 200 mm	200 × 300 mm
>200 ≤ 500 mm	250 × 350 mm
> 500 mm	600 × 600 mm

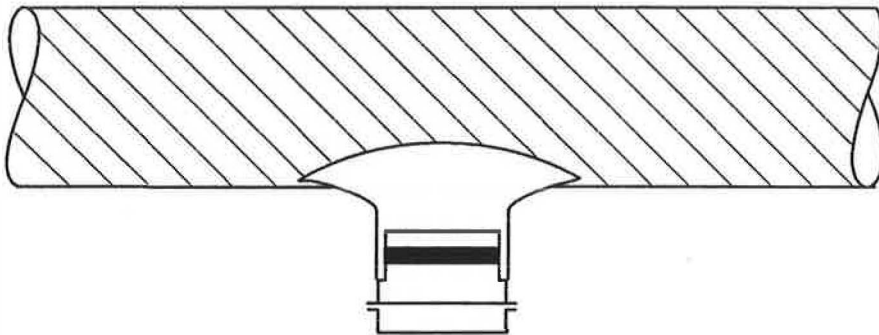
** Or the size of access cover as a minimum.

Figure A.1: Service openings in suspended ceilings - Minimum dimensions of access panels

* S *



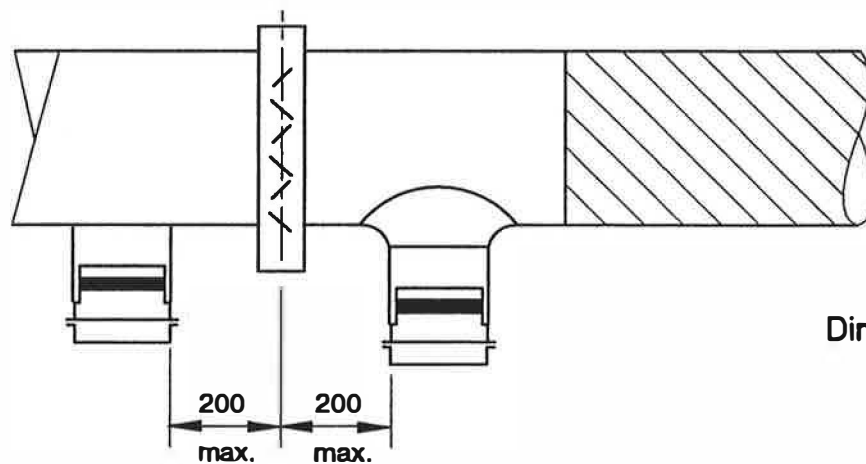
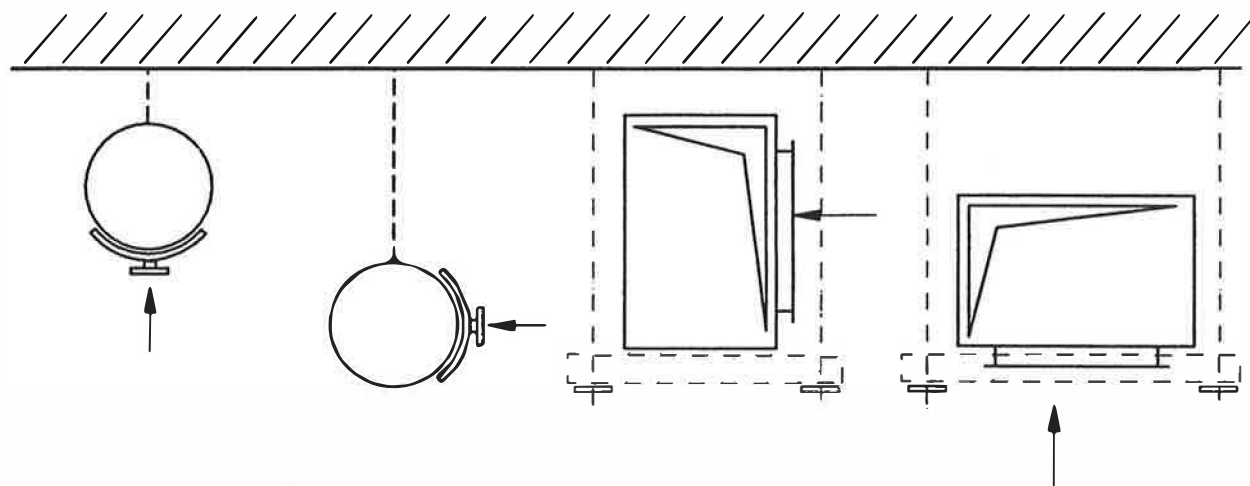
a) Circular ducts up to 200 mm diameter



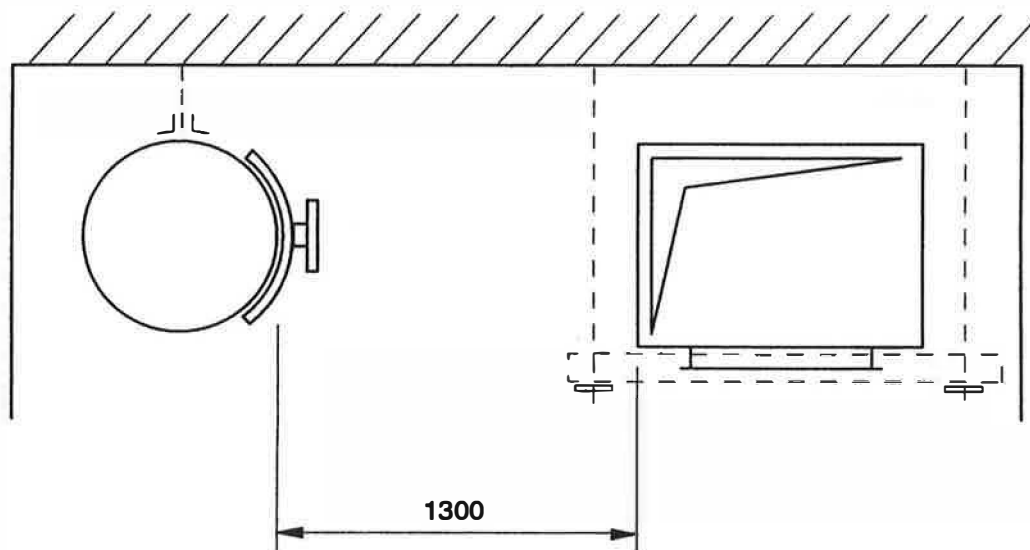
Removable end plug fitting in circular spigot mounted
on main duct or as an unequal tee piece

b) Circular ducts over 200 mm diameter

Figure A.2: Typical cleaning components



Dimensions in mm



Recommended space
required for access

Figure A.3: Examples of cleaning component location

* 5 *

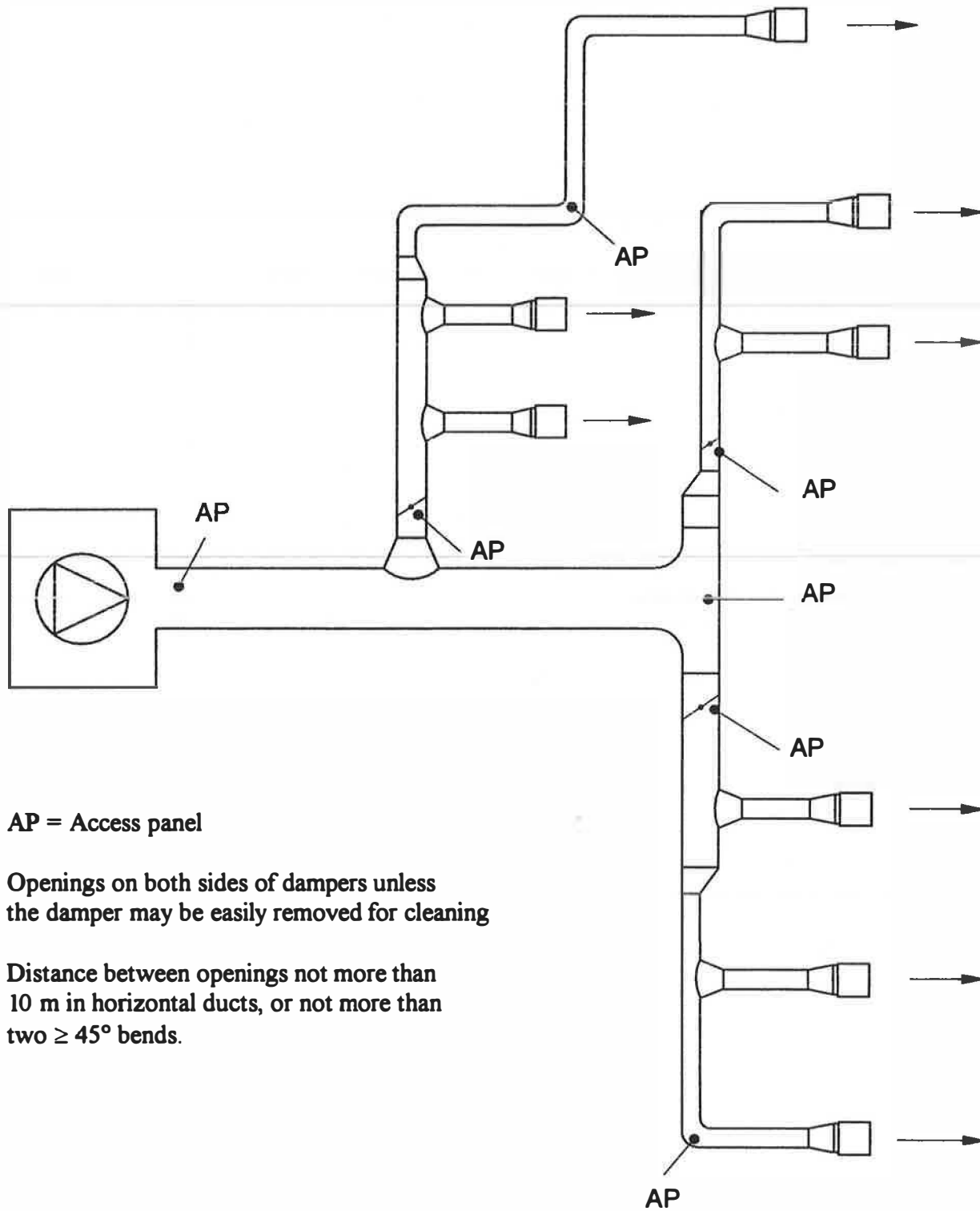
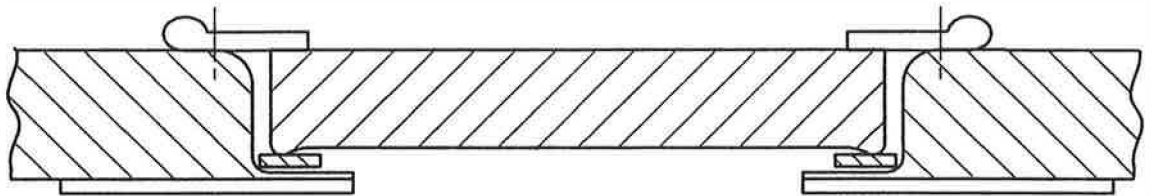


Figure A.4: Example of openings in the ductwork

Rectangular ducts



Removable insulated or uninsulated
panel secured in surround
mounted on duct wall

Circular ducts

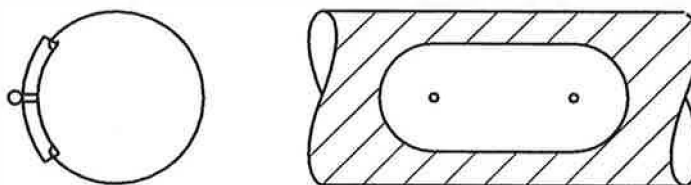


Figure A.5: Examples of access components

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Annex B (informative)

Preferred and non-preferred components to facilitate cleaning and maintenance

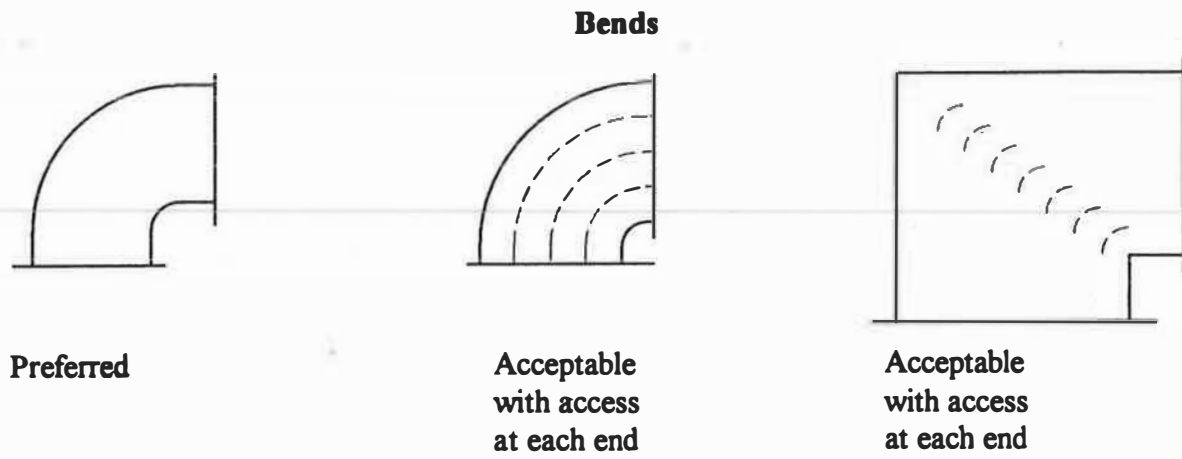


Figure B.1: Bends

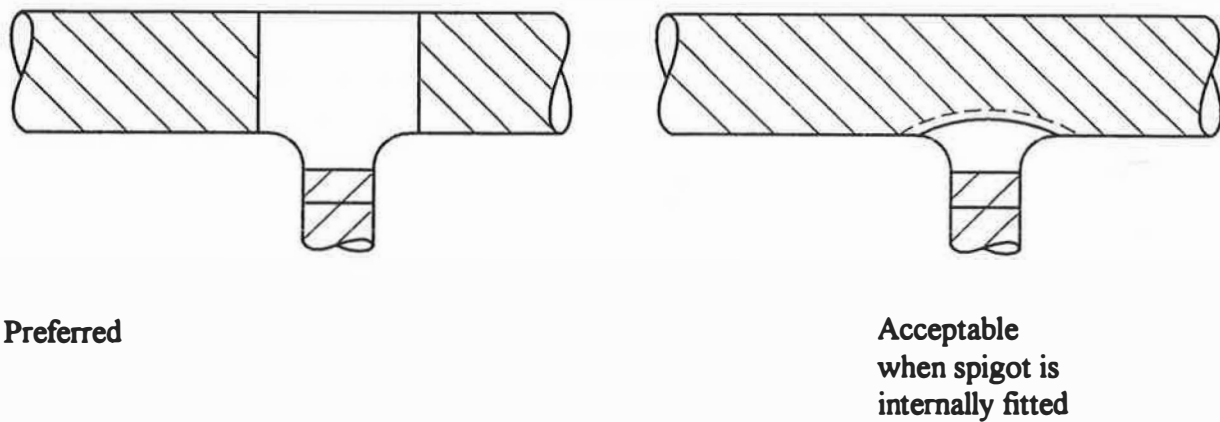
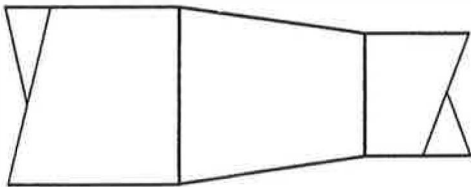
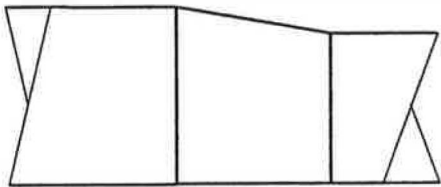


Figure B.2: T-pieces

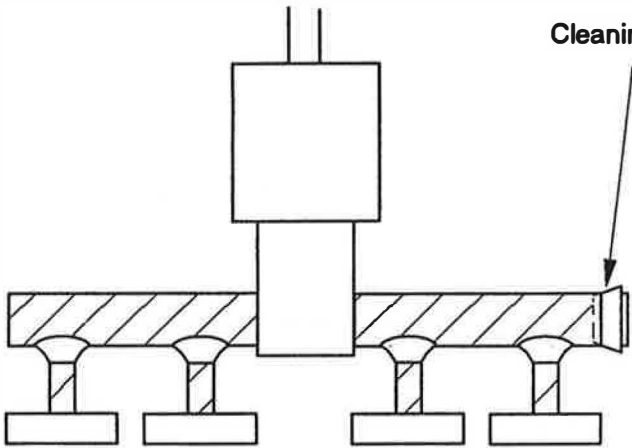


Preferred



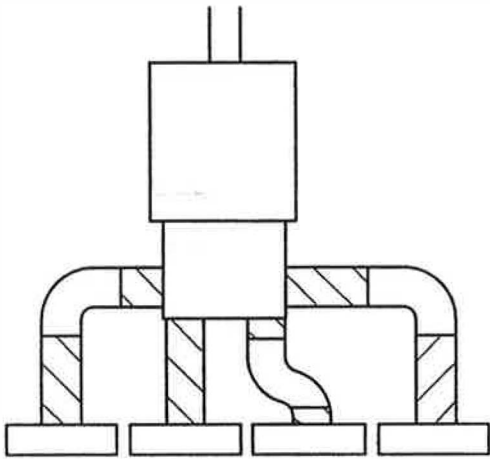
Acceptable

Figure B.3 : Transformation pieces



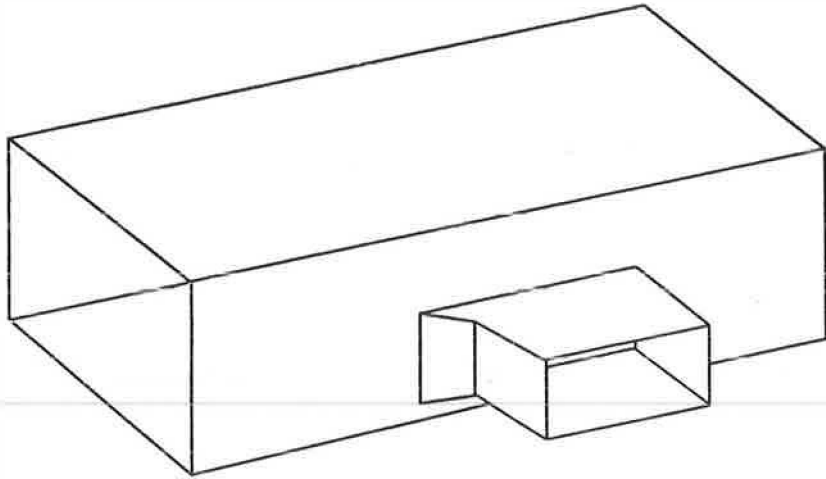
Preferred

Cleaning door



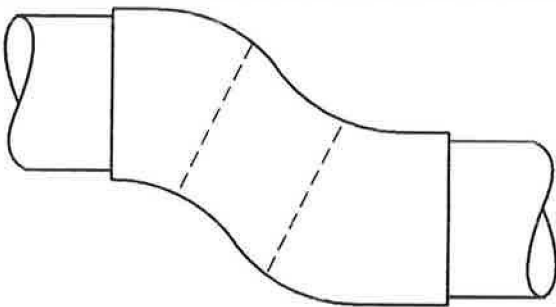
Not recommended

Figure B.4: Plenums

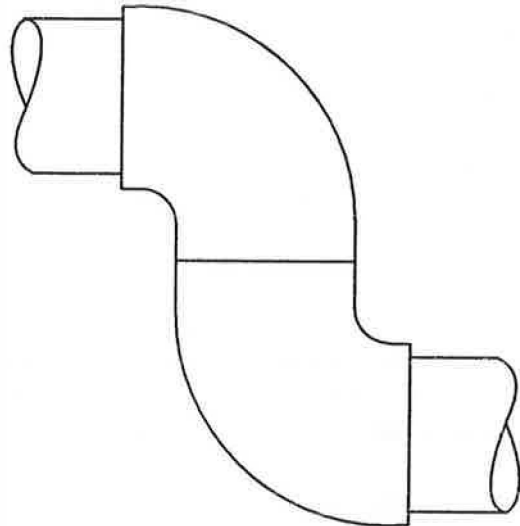


Acceptable

Figure B.5 : Rectangular T-pieces



Preferred



Acceptable

Figure B.6 : Offsets (Circular or rectangular)

Annex C (informative)

Levels of cleanliness for delivery, installation and protection of ductwork

C.1 General

This annex defines levels for the delivery, installation and protection of ductwork.

The classification for care and protection is selected according to C.2, based on different levels of cleanliness. The basic level is normally sufficient for e.g. office buildings, while the higher level is often required in hospitals and other buildings where more stringent degrees of care and protection are needed.

C.2 Design and installation aspects

The specification for plant and equipment should ensure that the internal cleanliness, protection and storage of the equipment is compatible with the levels of cleanliness specified for the ductwork.

A dry and clean storage area should be reserved in the neighbourhood of the installation area that shall also be dry and clean. For higher levels of cleanliness, more stringent requirements for the installation environment are needed, especially if the installation work has to be done before the construction work has reached an advanced stage.

In the design layout drawings the following should be clearly defined:

- the location of all openings for cleaning;
- the size and elevation of such openings.

On intermediate and advanced levels of cleanliness, defined in clause 3, prior to the installation of air terminal devices, any remaining protective end covers should be removed before installing the terminal device with the damper in the closed position.

Swarf may be generated in case of site drilling of ductwork, and may remain unless cleaning after installation is specified.

In the handing-over documents the cleaning methods should be specified, and guidelines for reaching the points to be cleaned should also be given.

Examples of cleaning methods:

DRY CLEANING

- vacuum cleaning
- compressed air
- brush cleaning

WET CLEANING

- steam blasting
- chemical cleaning
- disinfecting

These methods may be used also for periodical cleaning during the operation, according to the handing-over documentation.

C.3 Levels of cleanliness

C.3.1 General

Three levels of cleanliness and protection are defined in C.3.2 to C.3.4.

C.3.2 Basic level

C.3.2.1 Condition of ducts ex-works

Ductwork leaving the premises of the manufacturer may include some or all of the following:

- a) internal and/or external self-adhesive labels or marking for part(s) identification;
- b) exposed mastic sealant;
- c) light zinc oxide coating on the metal surface;
- d) a light coating of oil on machine formed ductwork;
- e) minor protrusions into the airway of rivets, screws, bolts and other jointing devices;
- f) internal insulation and associated fixings;
- g) discoloration marks from plasma cutting process.

The ductwork is not generally wiped down or specially cleaned at this level unless specified.

C.3.2.2 Delivery to site

Unless otherwise specified, ductwork delivered from the premises of the manufacturer is not protected. However, care should be taken to prevent damage during transportation and off loading.

C.3.2.3 Installation

Before the installation of individual duct sections they should be inspected to ensure that they are free from all debris but not be wiped or specially cleaned.

C.3.2.4 Protection of ductwork risers

All risers should be covered to prevent the entry of debris into the duct. In respect of the safety of personnel full regard should be given to requirements of health and safety at work

C.3.2.5 Downward facing and horizontal duct openings

Downward facing and horizontal openings are not covered.

C.3.3 Intermediate level

The intermediate level includes the following requirements in addition to the provisions of the basic level.

C.3.3.1 Site storage

The area provided for storage should be permanently clean, dry and dust free and this may require a boarded floor and water resistant covering.

C.3.3.2 Installation

- a) the working area should be clean and dry and protected from the elements;
- b) the internal surfaces of the ductwork should be wiped to remove excess dust immediately prior to installation;
- c) open ends on completed ductwork and overnight work-in-progress should be sealed.

C.3.4 Advanced level

Advanced level includes the following requirements in addition to the provisions of the intermediate level!

C.3.4.1 Production and site delivery

- a) all self-adhesive labels for part identification should be applied to external surfaces only;
- b) to maintain cleanliness during transportation, all ductwork should be sealed either by blanking or capping duct ends, bagging small fittings, surface wrapping or shrink-wrapping (see C.4 with regard to hazardous conditions).

C.3.4.2 Site storage

- a) a clean, dry and dust free environment should be provided for the storage of ductwork prior to installation;
- b) all sealed ends should be visually examined and if damaged resealed with polythene or another appropriate material.

C.3.4.3 Installation

The working area should be clean, dry and dust free. Protective coverings should only be removed immediately before installation.

C.3.5 The three levels - summary

Table C1 summarizes the three levels.

Table C.1: Levels of cleanliness, summary

level	factory seal	protection during transit	protection during site storage	site clean	cap off on site
Basic	no	no	no	no	risers only
Intermediate	no	no	yes	yes	yes
Advanced	yes	yes	yes	yes	yes

C.4 Special considerations

If substances used for cleaning may cause health risk, measures should be taken to ensure the supply air does not contain harmful gases after cleaning.

This guidance is also valid for the cleanliness of the other parts of ventilation systems. Before starting a fan for the first time after installation, the cleanliness of the air handling unit, filters, sound attenuators and terminals should be inspected in order to prevent the pollutants being spread into the whole system.



S



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