



THE VOICE OF THE DUCTWORK INDUSTRY

An ADCAS Guide to

# Ductwork Cleaning Requirements and Access Doors

How to interpret DW/144, TR/19 and BS EN 15780

# Contents

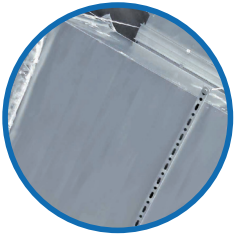
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This document has been produced in good faith by ADCAS to help inform and guide members. It should not be taken as a definitive summary of all the requirements of **BS EN 15780:2011** or in any way be considered a substitute. Members are strongly advised to fully acquaint themselves with the requirements and guidance given in all the documents referenced.

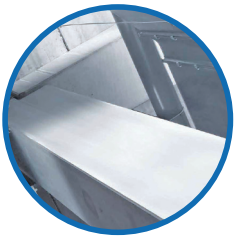
# 1. Introduction

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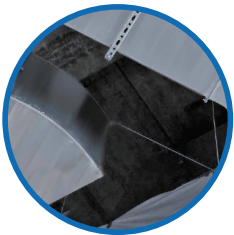
Ductwork air systems can be a source of spreading disease and infections. With this greater understanding the requirement for access into the ductwork systems for maintenance, inspection and cleaning has increased.

The importance of regularly cleaning ductwork ventilation systems is well established. This can be cleaning of ductwork as part of a building maintenance programme or of new ductwork systems prior to handover. The cleanliness of ductwork, both existing and new; location of access doors; and the cleaning and maintenance of ventilation systems are all closely linked.



Two important documents were released in 2014, **DW/144 Second Edition (Specification for Sheet Metal Ductwork Low Medium and high pressure/velocity air systems)**; and **TR/19 (Internal Cleanliness of Ventilation Systems)**. Both are from B&ES Publications.

These documents are important to anyone involved in the ductwork industry, and they need to be read in conjunction with the British and European Standard, **BS EN 15780 (Ventilation for Buildings – Ductwork – Cleanliness of Ventilation Systems)**.



All three of these documents relate to one or all of the topics: cleaning access, access doors and duct cleanliness.

This ADCAS Guide has been produced to explain the similarities and differences between these documents and to provide practical recommendations for the system designers, ductwork contractors and cleaning contractors to help them work with all three publications.

## 2. DW/144

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### **DW/144 Second Edition 2013 Specification for Sheet Metal Ductwork - Low, Medium & High Pressure/Velocity Air Systems** (released 22nd May 2014).

**DW/144** is recognised throughout the UK as the good practice standard specification for the manufacture and installation of ductwork constructed from sheet metal. It is neither a British nor European Standard.

The 2nd Edition takes into consideration advances in manufacture, technology and statute requirements. There are particular changes to the access door and cleaning requirements in this version compared to its predecessor, the 1998 version.

The sections of this document that relate to access doors and cleaning requirements are:

#### **Section 20**

##### **ACCESS/INSPECTION OPENINGS**

page 90

#### **Appendix G**

##### **HANDLING, STORAGE AND PROTECTION OF DUCTWORK**

page 148

#### **Appendix H**

##### **GUIDANCE NOTES FOR CLEANING INSPECTION AND CLEANING ACCESS OPENINGS**

page 151

**DW144** does not specifically relate to fire rated ductwork systems, however with many overlaid fire rated products in common use, the recommendations of **DW/144** are generally interpreted as equally applicable to such systems. B&ES Document **DW/172** offers more information on this topic.

## 3. TR/19

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### **Internal cleanliness of Ventilation Systems Second Edition 2013** (released 22nd May 2014).

**TR/19** is a good practice guide for the internal cleanliness of ventilation systems. The guide was first published in 2005 as an amalgamation of the **TR/17** guide and publication **DW/TM2**, which related to the internal cleanliness of new ductwork systems. This second edition incorporates reference to **BS EN 15780**. Also in this edition, changes have been made to highlight the current best practices for the maintenance of kitchen extract systems. It should be noted that such systems are often of fire-rated construction.

The main sections of this document that relate to access doors and cleaning requirements are:

#### **Section 2**

##### **NEW DUCTWORK SYSTEM CLEANLINESS**

page 8

#### **Section 3**

##### **DESIGN AND ACCESS TO THE INTERNAL SURFACES OF THE VENTILATION SYSTEM**

page 11

#### **Section 7**

##### **SPECIFIC CONSIDERATIONS FOR KITCHEN EXTRACT SYSTEMS**

page 29

#### **Appendix A**

##### **ACCEPTABLE DUST ACCUMULATION (NEW DUCTWORK)**

page 44

## 4. BS EN 15780:2011

### Ventilation for buildings – Ductwork - Cleanliness of Ventilation Systems (released in 2011).

**BS EN 15780:2011** is the British and European Standard that applies to and specifies the assessment criteria for the cleanliness and cleaning procedures for both new and existing ventilation and air conditioning systems. It does not relate to kitchen systems.

The whole document is of relevance, but of particular note is **Annex F** pages 25 to 27.

## 5. Location of Access Doors

**DW/144:** Table 20 page 92.

**TR/19:** Table 3 page 13.

<b>LOCATION OF ACCESS PANELS FOR INSPECTION/SERVICE AND/OR INTERNAL CLEANLINESS</b>			
In-line equipment	Location	Party responsible for provision of suitable access panel	
		Ductwork Contractor	Specialist Cleaning Contractor
Control dampers	Both sides	Up-stream panel	Down-stream panel
Fire dampers	Both sides	To suit damper maintenance	Opposite side
Heating/cooling/re-claim rolls	Both sides	Panel on both sides	–
Attenuators (rectangular)	Both sides	Up-stream panel	Down-stream panel
Attenuators (circular)	Both sides	Up-stream panel	Down-stream panel
Filter sections	Both sides	Up-stream panel	Down-stream panel
Air turning vanes	Both sides	Up-stream panel	Down-stream panel
Changes of direction	One side	–	One panel to suit
In-duct fans/devices	Both sides	Up-stream panel	Down-stream panel
Inlet/exhaust louvre	One side	One panel to suit	–
Intermediate cleaning panels		–	To suit frequency specified in DW/172

The above table is shown in both **TR/19** and **DW/144** as tables 3 and 20 respectively. It is important to read the accompanying notes (1-8 in **TR/19** and 1-4 in **DW/144**).

The table below consolidates the information from both documents and their respected accompanying notes. It also adds further points which ADCAS believe will assist interpretation.

ADCAS table amplifying **DW144** and **TR19** information

<b>LOCATION OF ACCESS PANELS FOR INSPECTION/SERVICE AND/OR INTERNAL CLEANLINESS</b>			
In-line equipment	Location	Party responsible for provision of suitable access panel	
		Ductwork Contractor	Specialist Cleaning Contractor
Circular control dampers $\geq 100$	Both sides	Up-stream panel	Down-stream panel
Rectangular control dampers $\geq 100 \times 100$	Both sides	Up-stream panel	Down-stream panel
Fire dampers	Both sides	To suit damper maintenance	Opposite side
Heating/cooling/re-claim coils	Both sides	Panel on both sides	–
Attenuators (rectangular)	Both sides	Up-stream panel	Down-stream panel
Attenuators (circular)	Both sides	Up-stream panel	Down-stream panel
Filter sections	Both sides	Up-stream panel	Down-stream panel
Air turning vanes	Both sides	Up-stream panel	Down-stream panel
Changes of direction	One side	–	One panel to suit
In-duct fans/devices	Both sides	Up-stream panel	Down-stream panel
Inlet/exhaust louvre	One side	One panel to suit	–
Intermediate cleaning panels in fire rated duct	–		To suit frequency specified in DW/172
Intermediate cleaning panels in standard ductwork		–	Every 15m in horizontal ductwork
Vertical ductwork		One panel top and bottom	At each accessible floor
Circular pressed bends		Not required	–
Circular segmented bends		Up-stream panel	–

Of note are the following statements:

**Section 3.2** of **TR/19** with reference to table 3:

“In a new ductwork system these are the only access panels that a ductwork contractor will provide unless there is a clear indication by the designer /specifier as to their requirements for access to facilitate cleaning/survey/inspection or cleaning activity.”

Note 6, **TR/19**, Table 3:

“A change of direction is deemed to be a 90 degree bend and branches. With regard to circular ductwork it is not necessary for there to be an access panel on every change of direction.”

This statement can be interpreted in various ways. ADCAS recommends that there is no requirement to have cleaning access doors at circular pressed bends, which in any event is not the responsibility of the ductwork contractor. It would seem logical as there are no obstructive elements to a pressed bend. These bends can be considered part of the ductwork “run” and therefore require access panels at every 15.0m installed by a specialist cleaning contractor.

Note 2, **DW/144**, Table 20

This note infers that access panels may be required at: “segmented bends in spirally wound ductwork”. Again, ADCAS believes it would be the responsibility of the specialist cleaning contractor to install these.

Of significant note is this statement:

**Appendix H, H.1 DW/144:**

“In the absence of any indication by the system designer for cleaning requirements only the access panels for inspection and servicing set out in Section 20 of this specification will be incorporated into a new ductwork system.”

## 6. Size of access doors

**TR/19: Page 14**

**TABLE 4: RECOMMENDED SIZE OF OPENINGS (RECTANGULAR AND FLAT OVAL)**

Duct size up to longest side major axis	Recommended dimension of openings	
200 mm	300 mm	150 mm
300 mm	300 mm	200 mm
400 mm	450 mm	300 mm
≥500 mm	450 mm	450 mm

**TABLE 5: RECOMMENDED SIZE OF OPENINGS (CIRCULAR)**

Duct diameter up to	Recommended dimension of openings	
310 mm	250 mm	150 mm
450 mm	400 mm	300 mm
550 mm	400 mm	300 mm
≥600 mm	500 mm	400 mm



Ductwork and cleaning contractors often use square “tab” type doors on rectangular and flat oval ductwork. These will not comply with the above tables and as such prior approval to deviate from the recommended sizes should be obtained.

As a general rule, ductwork of and above 560mm diameter and 550mm x 550mm requires man access to the interior of the ductwork to facilitate cleaning. Consideration for this must be taken into account as: “**DW/144** ductwork or supports do not take into account either man-loading or the support of other building services, system designers must take this into account in accordance with **BS EN 12236**.” (**Section 20** page 90 **DW/144**). Note: Bracketry design responsibility often falls to the ductwork contractor.

## 7. How clean does the ductwork need to be?

**BS EN 15780** schedules at table A.1 the quality classes of ventilation systems that serve certain rooms, buildings and areas. This information is replicated in TR/19.

**Table A.1 BS EN 15780 Annex A: Typical applications of cleanliness quality classes**

Quality class	Typical examples
Low	Rooms with only intermittent occupancy eg. storage rooms, technical rooms
Medium	Offices, hotels, restaurants, schools, theatres. residential homes, shopping areas, exhibition buildings, sport buildings, general areas in hospitals and general working areas in industries
High	Laboratories, treatment areas in hospitals, high quality offices

**BS EN 15780** table A.4 shows the maximum acceptable levels of dust accumulation within. An exact facsimile of this table is also shown in **TR/19** as table F.1.

It is to be noted that these acceptable levels of cleanliness are at handover from the builder to the user. It cannot be stressed strongly enough that it is unlikely that dust levels will be as low as this unless there is a specialist clean. The timing of such a clean is also an important consideration as there may be significant time delays between completion of installation, commissioning and final handover to the end user.

**BS EN 15780** states: “Construction sites are inevitably dusty workplaces and so there are severe practical difficulties in keeping duct systems clean. If defined levels of cleanliness are required, then it is often necessary to carry out deliberate post-installation cleaning immediately before commissioning, in order to achieve defined, measurable levels of cleanliness.” It would therefore be prudent to clean all newly installed ductwork and should be carried out by a specialist. **DW/144** states:

“Ductwork cleaning is a specialist contractor activity and would not be included for or undertaken by a ductwork installation contractor.”

Great care must also be taken to avoid cross contamination when connecting new ductwork to an existing system not only during the installation, but also at the commissioning stage. **DW/144** makes its position very clear: “It will be in the interests of the contract, both financially and practically, to employ a specialist cleaning contractor at the outset of a contract to internally clean newly installed ductwork prior to handover.”

**TR19 Table F.1 Acceptable dust accumulation levels in new ductwork**

Cleanliness quality class	Acceptable dust accumulation level Supply, recirculation or secondary air ductwork	Acceptable dust accumulation level Extract ductwork
Low	< 0.9 g/m <sup>2</sup>	< 1.8 g/m <sup>2</sup>
Medium	< 0.6 g/m <sup>2</sup>	< 1.8 g/m <sup>2</sup>
High	< 0.3 g/m <sup>2</sup>	< 0.9 g/m <sup>2</sup>

“It will be in the interests of the contract, both financially and practically, to employ a specialist cleaning contractor at the outset of a contract to internally clean newly installed ductwork prior to hand over.”

## 8. How should I protect, deliver and install the ductwork?

Both **BS EN 15780** and **TR/19** include the following table which offers guidance for minimising unnecessary contamination of ductwork.

**BS EN 15780 & TR/19 Table F.2 Protection, Delivery and Installation (PDI)**

PDI Level	Factory seal	Protection during transit	Protection during site storage	Site clean	Cap off	Post-Installation on site clean
Basic PDI	No	No	No	No	Risers only	No <sup>#</sup>
Intermediate PDI	No	No	Yes	Yes	Yes	Not unless shown to be necessary <sup>#</sup>
Advanced PDI	Yes*	Yes*	Yes*	Yes*	Yes*	Yes

### Notes to Table F.2

- # If inspection and testing indicates that the cleanliness is not considered acceptable due to a failure to meet acceptable dust accumulation levels for the relevant cleanliness quality class, then despite the general guidance in the table above, cleaning would in fact be required.
- \* Since the ductwork will be cleaned post-installation many costly and onerous procedures such as capping during transit can be dispensed for most installations.

It is important to note that there is no correlation between PDI levels (basic, intermediate and advanced) with cleanliness quality class as shown in the previous table. Even strict adherence to the PDI guidelines will not ensure that the acceptable dust accumulation levels shown in table F1 will be met.

**DW/144**, Appendix G, point 5, page 150 states: “Practical experience shows that due to various activities that typically occur on site, there is a risk that the stored and installed ductwork will not avoid airborne contamination regardless of any measures of protection employed.”

**BS EN 15780** also states for intermediate and advanced levels: “The area provided for storage should be permanently clean dry and protected from site dust and this may require a boarded floor and water resistant covering.”

For intermediate level, “The working area should be clean and dry and protected from the elements.”

For advanced level, “The working area should be clean, dry and dust-free.”

ADCAS therefore recommends that it would be prudent to clean all newly installed ductwork and this operation should be carried out by a specialist, as noted earlier in this document.

The air tightness requirements of ductwork are also important for cleanliness. Leakage into voids can have a large influence on the indoor air quality.

**BS EN 15780** states the following: “The minimum recommended air tightness class related to these cleanliness levels can be expressed as follows:

#### Annex F, Table F.3 BS En 15780 Application of cleanliness levels - air tightness

Level	Recommended minimum air tightness class
Basic	B
Intermediate	C
Advanced	D

This particular section of **BS EN 15780** has the potential to cause significant confusion and places the onus on the system designer to consider the issue air tightness in conjunction with air quality. ADCAS members are strongly encouraged to raise this issue pre-contract with their clients. It should be noted that where a PDI requirement has been specified class A ductwork has effectively become obsolete.

## 9. Frequently Asked Questions

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It cannot be stressed enough that at the pre-contract stage all issues relating to cleanliness levels, cleaning, access provision and the like should be addressed and agreed before work starts.

### Q.1 How does a ductwork contractor and cleaning contractor know where to fit access doors?

A.1 Discuss and agree with your client. Refer to **TR/19** table 3 (page 13) and **DW/144** table 20 (page 92) to help inform those discussions.

### Q.2 Do all volume control dampers require access doors?

A.2 Check the project-specific requirements. If/where **DW/144** or **TR/19** apply all volume control dampers of 100 mm diameter and above in circular ducts and rectangular ducts with a longest side of 100mm and above require access doors. See **DW/144** Table 20 for guidance.

### Q.3 I've fitted access doors as required and specified by the designer, but now some of them are inaccessible owing to other services blocking them and or other building constraints (ceiling bars, petitions, steelwork, etc.).

A.3 Refer your client to **TR/19** section 3.8 (page 12) which is quite clear: "It is for the designer and the other project parties responsible for the implementation of the design under CDM "cascade" principles, to ensure that access panels are not obstructed by pipework cable trays or any other obstacle during the building process. Consideration should be given to the future use of the building occupation."

Costly waste and site variations can be avoided if due time and care is taken by the designer at design stage. Using procedures and software such as BIM can eradicate this common problem.

### Q.4 Can I use "tab" type access doors?

A.4 Tab type access doors can be used, but you need to ensure that you have received written confirmation from the designer or his representative allowing you to do so. This is important, as the size of access doors can be critical in the on going maintenance and inspection requirements and considerations of a building.

### Q.5 We are the ductwork contractor and have installed access doors as shown in table 20. Our client is now asking us to install additional access doors for cleaning purposes.

A.5 Unless you have agreed otherwise. refer your client to **DW/144** section 20.3, page 92, paragraph 3: "Additional panels may be required for cleaning inspection and cleaning access and these will be site-fitted where necessary by a specialist cleaning contractor"

### Q.6 The newly installed ductwork I have installed has failed an acceptable dust accumulation test. Who now pays for it to be cleaned?

A.6 There is no easy answer to this. It will depend upon your contract, but if your contract is clear and you have used the ADCAS matrix this problem will not arise.

**Q.7 Can I use a flexible duct to a grille as a way to access the ductwork?**

A.7 Unless expressly forbidden by the project particulars, yes you can. **TR/19**, Section 3.11, page 12 states: “Generally it is acceptable to access a branch for cleaning by removal of the flexible duct that connects to the grille plenums”

**Q.8 Do I need to put an access door adjacent to a single blade damper?**

A.8 Assuming there is no express statement in the project particulars and assuming that **DW/144** applies to the project there is no specific reference to single blade dampers. Table 20, **DW/144** calls for access doors at control dampers, but makes no reference or difference between a damper being multi-bladed or single. There is however no requirement for an access door adjacent to dampers smaller than 100mm, which would almost certainly be of single blade construction. It would be beneficial to use the ADCAS pre-contract matrix to determine whether access doors are required.

**Q.9 Do I need to provide an access panel for the OBD (opposed blade damper) on the back of a grille?**

A.9 A.9 Assuming there is no express direction in the project particulars and assuming that **DW/144** applies to the project Table 20 does not ask for an access panel adjacent to a grille. Refer your client to **DW/144** section 20.3, page 92, paragraph 3: “additional panels may be required for cleaning inspection and cleaning access and these will be site-fitted where necessary by a specialist cleaning contractor” Note also that removal of flexible ducts is generally considered an acceptable means of access

**Q.10 I have installed access panels to the sizes stipulated in DW/144 and TR/19, but my client is now asking for bigger ones as he says that he cannot get into the duct.**

A.10 Assuming there is no other express statement in the project requirements and assuming that you have installed the access panels the correct distance from the piece of equipment to be inspected/serviced/cleaned then you have carried out your obligations. Refer your client to **DW/144**, Section 20.2 “The opening will be sized to provide hand and/or arm access only and the system designer shall specify the size and location of panels where larger openings are required”

**Q.11 We have installed a ductwork system very carefully and exactly to Intermediate PDI as defined in Table F.2 in TR/19. It has however failed the acceptable dust accumulation levels as defined in Table F.1 of TR/19. How can this happen and who should now clean it?**

A.11 Firstly PDI levels and dust accumulation levels are two different things. PDI is a protocol which if adopted may help to keep contamination down. Dust accumulation levels are measureable levels of contamination. The only way to guarantee that dust accumulation levels will be met is to plan for a post installation clean. Use the pre-contract checklist (at the end of this guide) to determine each parties responsibilities. Be very wary of contracts that say something along the lines of “it will be the duct workers’ responsibility to clean the ductwork if upon testing it fails to meet acceptable dust accumulation levels”.

**Q.12** The specification requires the ductwork to be installed to Advanced PDI with a specialist after clean. It seems a waste of time, money and resources to factory seal/protect during transport/site clean/cap off on site when it is to be cleaned afterwards.

A.12 ADCAS agrees. Refer to **TR/19**, Table F2, Note 2\* that states “Since the ductwork will be cleaned post-installation many costly and onerous procedures such as capping during transport can be dispensed for most installations.” It is important that at pre-contract this issue is clarified.

**Q.13** I believe there has been no consideration within the design information to ensure that the ductwork supports are able to support manned access. What should I do?

A.13 Firstly check and understand your design liabilities on the project. It is very common for the ductwork contractor to be expected to hold this responsibility. Where the responsibility rests with others refer it back to the design team. It is their responsibility to take into consideration the loading on ductwork supports, where the ductwork is likely to be internally accessed by a man when cleaning. Refer also to **BS EN 12236** for more information.

**Q.14** Do I install access panels at circular bends?

A.14 As always the first consideration in arriving at an answer is “What are the particular contract requirements?” “Have they been defined?” If **DW/144** alone applies and you are a ductwork contractor the answer is no. If you are a specialist cleaning contractor the answer is more difficult. Please read this document for further clarification, and ideally achieve clarification before the project starts.

**Q.15** We are a ductwork contractor, but the client wants us to fit the cleaning access panels and clean the ductwork. How can I persuade him otherwise?

A.15 **DW/144**, clause H.2.3 lists seven reasons why a specialist cleaning contractor should be employed. These reasons are practically and financially beneficial to the project.

**Q.16** Who is responsible for providing a permanently clean and dry storage area protected from site dust with a boarded floor and waterproof covering?

A.16 The various documents referenced here do not seek to allocate responsibility. Use the ADCAS pre-contract checklist to define who takes ownership of the issue.



## 10. Conclusion

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The release of the two revised guides to good practice **DW/144** and **TR/19** has given ductwork contractors, cleaners and their clients a lot of information to assimilate into working practice.

Both documents take into account **BS EN 15780** and other construction industry requirements. However, certain issues do require careful consideration by ductwork specialists. In particular, these are: likelihood of ductwork passing deposit levels; location of access doors; and access into large ductwork for cleaning.

In relation to location of access doors and cleaning requirements, the designer bears responsibility for liaising with specialists for practical advice. This point is included in The Construction (Design and Management) Regulations 2007 (CDM 2007): “The Designer is therefore advised to seek guidance from a specialist cleaning contractor to ensure that system cleaning of any new design is practicable”. Note that it is important to define who holds design responsibility. For certain aspects it may well be you.

**DW/144**, Section 20.1, also makes this clear: “The services coordinator should ensure that there is an area free of services and other obstructions to enable a panel/cover to be removed.”

**DW/144** and **TR/19** does not differentiate between large or small ductwork installations on minor building projects. It seems extremely unlikely and unreasonable that there will be a designer with the knowledge and ability on small contracts able to give the relevant information required on a project such as a small store or retail outlet.

There are however some points and general notes that can be deduced from reading the two new documents along with **BS EN 15780**:

1. Specifiers/designers must state and demonstrate clearly where access doors are required.
2. Despite a ductwork contractor’s best endeavours of keeping to the PDI recommendations listed in table F.2 – **TR/19**, it is very unlikely that acceptable dust accumulation levels in new ductwork will be met.
3. To be able to meet the acceptable dust accumulation levels in new ductwork it is strongly recommended that all ductwork is cleaned by a specialist cleaning contractor prior to handover.
4. It is in the best interests of contractors that a specialist-cleaning contractor is employed from the outset.
5. Specifiers/designers must state and demonstrate clearly what size and type of ductwork supports are required where a cleaning contractor will require man access into the duct to facilitate cleaning.
6. If connecting to existing ductwork, ensure that a removable membrane or plate is fitted to avoid cross contamination of the new ductwork during installation.
7. PDI levels (basic, intermediate and advanced) bear no relation to cleanliness quality classes (low, medium and high).
8. Table F.3 within **BS EN 15780** effectively makes Class A ductwork obsolete.
9. The recommendations on access doors at circular pressed bends contained in this ADCAS guidance should be noted carefully.



# 11. Pre-Contract Checklist

It is highly recommended that the following pre-contract checklist be used to establish the requirements for each system from the outset, prior to a contract being awarded and starting on site.

SYSTEM DESCRIPTION	
Duct Material	GSS/UPVC/Aluminium/Stainless/Fire rated/ Other:
Pressure Class (Note if Class A is selected PDI requirements cannot be achieved to recommended standards)	A, B, C, D. Other:
Acceptable dust accumulation level	Low, Medium, High
Who is responsible for carrying out and paying for cleanliness tests?	Ductwork contractor / Others
Who will clean the duct if it fails the acceptable dust accumulation level test?	Ductwork contractor / Others
Access door locations	DW/144 Table 20 / Other requirement (Separate schedule)
Are access doors required adjacent to single blade dampers?	Yes / No
Size of doors	TR/19 Tables 4&5 / Largest Square door that can be fitted/ Other:
PDI level (Note if there is a PDI requirement and class A ductwork is specified full compliance with the recommendations of <b>BS EN 15780</b> cannot be met)	Basic / Intermediate / Advanced
Will any of the ductwork require a person to get inside it to facilitate cleaning and if so has the construction of the ductwork and brackets been taken into account?	Yes / No Yes / No
Who will design the bracketry?	Ductwork contractor / Others
Will a specialist contractor clean the ductwork afterwards? If Yes can PDI recommendations be adjusted?	Yes / No Yes / No
Who is responsible for providing suitable storage areas, weather protected and boarded as set out in <b>BS EN 15780:2011</b> ?	Ductwork Contractor / Main Contractor / Other



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