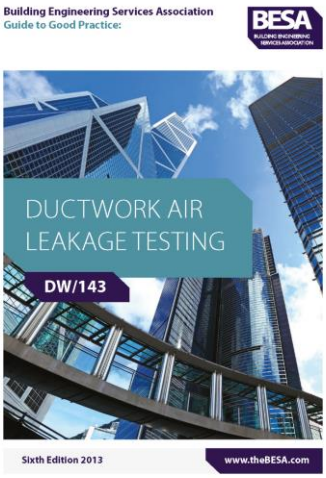
DW/143

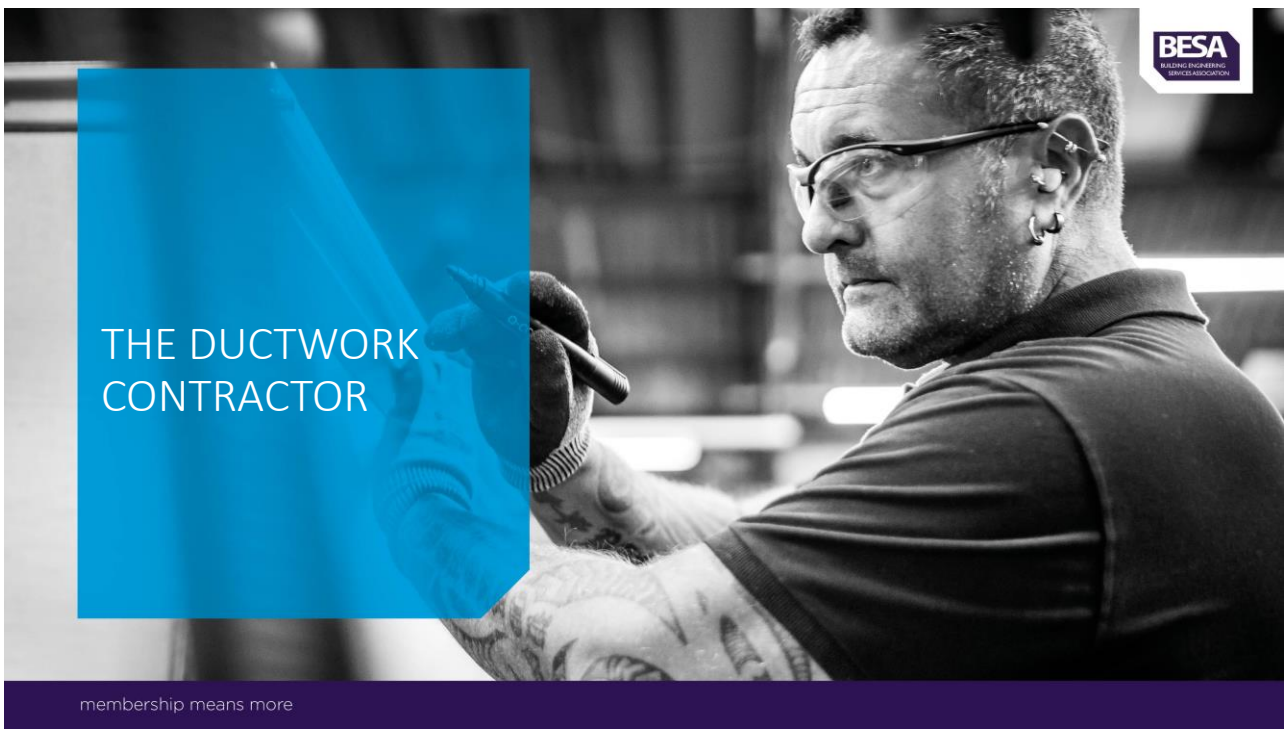
Peter Rogers:

BESA Chairman of Ventilation Group Technical Committee.



GENERAL

- With regard to air leakage, the responsibilities for ensuring the achievement of a satisfactory project are divided between the ductwork contractor, production and the on-site installation team. It is essential that there is full co-operation between them.
- Establish with the system designer, client or representative the class of ductwork called for in the project specification.
- Leakage testing is always done under positive pressure even when the ductwork is to operate under negative pressure.



THE DUCTWORK CONTRACTOR

- Ensure that components have been manufactured and sealed in accordance with the design specification.
- Agree with the system designer the test pressure for each section of the installation
- Decide the best way to isolate the installation into test zones.
- Make sure that test points and blanking devices can be reached with minimum difficulty.
- Prepare test sheets giving the information required for each section being tested.

PRODUCTION

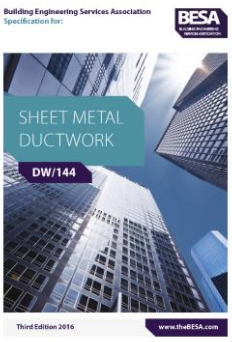
- Manufacture components with a good fit to minimize the use of sealant. A poor fit cannot be remedied by the use of additional sealant.
- Seal all longitudinal seams joints.
- Special care must be taken in the fitting of access doors and panels.
- Ductwork must be handled and delivered with care to avoid the danger of breaking the seals.

ON SITE INSTALLATION TEAM

- Before installation, inspect all duct sections to make sure that factory applied seals have not been damaged during transit.
- Fix blanking plates or other temporary seal in the positions shown by the ductwork contractor.
- Agree with the client a progressive testing programme.
- Carry out a preliminary test and look for any obvious places where there may be leakage.
- Offer the test section to the client for formal acceptance and signature on the test sheet.

CLASSIFICATION, AIR LEAKAGE AND TEST PROCEDURES

- Air leakage testing of low and medium pressure ductwork is not mandatory under BESA DW/144 specification for Sheet Metal Ductwork.
- Air leakage testing of high-pressure ductwork is mandatory under BESA DW/144 specification for sheet metal ductwork.



DUCTWORK CLASSIFICATION AND AIR LEAKAGE LIMITS

Table 1 Ductwork Classification and Air Leakage Limits
(Reproduced from DW/144, Part One, Section 1.1)

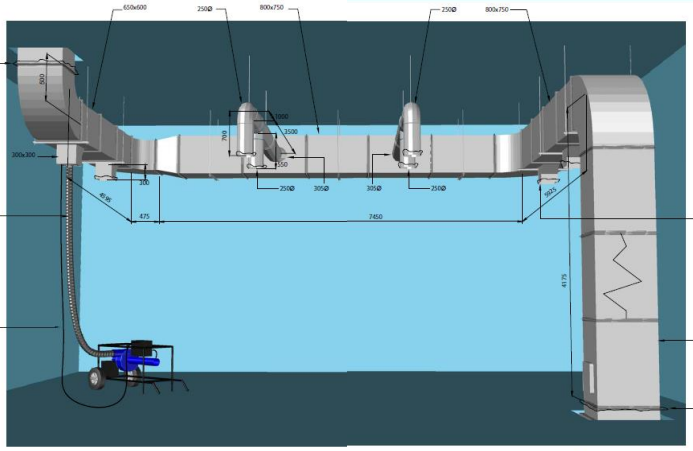
Duct pressure class	Static pressure limit		Maximum air velocity	Air leakage limits litres per second per square metre of duct surface area
	Positive	Negative		
1	*2*	*3*	*4*	*5*
	Pa	Pa	m/s	
Low pressure – Class A	500	500	10	$0.027 \times p^{0.65}$
Medium pressure – Class B	1000	750	20	$0.009 \times p^{0.65}$
High pressure - Class C	2000	750	40	$0.003 \times p^{0.65}$
High pressure - Class D	2000	750	40	$0.001 \times p^{0.65}$

Where p is the differential, pressure in pascals.

AIR LEAKAGE TESTING PROCEDURE

- Determine the extent of ductwork to be tested and the method selected.
- Fit blanking devices in accordance with the system test zones.
- The section of ductwork area to be tested shall have an area large enough to enable the test rig to register a measurable leakage.
- Follow the recommendations of the manufacturer of the test equipment and ensure that it has a calibration certificate.
- Due notice of tests shall be given, so that arrangements for witnessing can be made.
- NOTE Testing shall be completed before any insulation or enclosure of the ductwork.

HINTS ON DUCTWORK LEAKAGE TESTING



SEQUENCE OF TEST

1. Prepare test sheet.
2. Connect and adjust test rig to correct pressure.
3. Read off leakage rate.
4. Reseal if necessary (allow time to cure)
5. Maintain test for 15 minutes.
6. Record details on test sheet and obtain signature.

WARNING

Take care not to over pressurise system under test

HOW TO FIND LEAKS

1. Look	- particular at blanks, access openings and difficult joints
2. Listen	- with test rig running, leaks should be audible
3. Feel	- running your hand (particularly if wet) over joints can help to locate leaks
4. Soap and water	- paint over joints and look for bubbles.
5. Smoke pellet	- placed inside ductwork (obtain permission for use).

EXAMPLE OF COMPLETED TEST SHEET

SECTION 5 **EXAMPLE OF A COMPLETED TEST SHEET**

Based on ductwork illustrated in Fig. 1

Test Certificate No.	24033 / 001	Date	12/12/2013

Project:	New Hospital Project	Building No.	Ward Block 2
Material:	Pre-Galvanised	Location	3rd Floor - Supply
Test Pressure	1500 Pa	Drawing No.	24033 - 012
Leakage Class	Class "C"	Sheet No.	01 of 01

Test Equipment Details

Equipment	Serial No.	Calibration Certificate No.	Expiry Date
Digital Pressure Meter	123456	FM - 123456/001	Dec 1401

Duct Item No(s).								Equipment	
								Type	Ref No.
01	02	03	04	05	06	07	08	Sound Attenuator	S-1098
09	10	11	12	13	14	15			

Surface Area M²

Length (M)	Duct Size (mm)	Periphery (mm)	Surface Area (M²)
17.55	800 x 750	3100	54.40
5.57	600 x 650	2500	13.93
1.20	300 x 300	1200	1.44
7.00	305Ø	958	6.70
4.50	250Ø	785	3.53
		Total:	80.00

Test Particulars

a)	Surface area under test (as above)	80.00	M²
b)	Leakage factor (DW143 Table-22)	0.35	l/s/M²
c)	Maximum permitted leakage (A x B)	28.0	l/s/M²
d)	Duct Static Pressure Reading	1500	Pa
e)	Air Flow Leakage	18.00	l/s/M²
f)	Duration of Test (Minimum 15 minutes)	15	min
g)	Test Result (Pass / Fail)	Pass	

Final Acceptance (Ductwork Contractor)	Signed	Andrew Other	Final Acceptance (Client or their representative)	Signed	A Windsor
	Print	A N OTHER		Print	A WINDSOR
	Date	ABC Ducts Ltd		Date	A B Consultants

BUILDING REGULATIONS

- ADL2A (new buildings) and ADL2B (existing buildings) state that “Ductwork leakage testing should be carried out in accordance with the procedures set out in BESA DW/144” (refers to DW/143) Specification for Sheet Metal Ductwork.

RANDOM TESTING

- If the system designer considers the testing of medium pressure class ductwork to be unavoidable then it is recommended that random tests are identified.

SYSTEM LEAKAGE LOSS

- It is generally accepted that in a typical good quality system the leakage from each class of ductwork under operating conditions will be in the region of:

Class A low pressure	6%
Class B medium pressure	3%
Class C high pressure	2%
Class D high pressure	0.5%

TESTING OF PLANT ITEMS

- Items of in-line plant items will not normally be included in an air leakage test.
- The ductwork contractor may include such items in the test if the plant item has a manufacturers certificate of conformity for the pressure classification for the system under test.

AIR LEAKAGE RATES

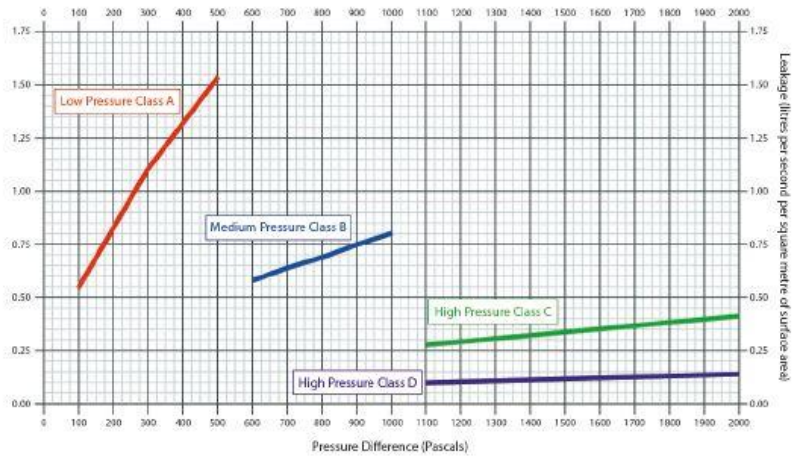
Table 22 Air leakage rates

Note: Recommended 'mean' test pressures are highlighted in **bold** type with the actual selection being left to the test operator.

Static pressure differential	Maximum leakage of duckwork			
	Testing not mandatory		Testing mandatory	
	Low pressure Class A	Medium pressure Class B	High pressure Class C	High pressure Class D
1	2	3	4	5
Pa	Litres per second per square metre of surface area			
100	0.54			
200	0.84			
300	1.10			
400	1.32			
500	1.53			
600		0.58		
700		0.64		
800		0.69		
900		0.75		
1000		0.80		
1100			0.29	0.10
1200			0.30	0.10
1300			0.32	0.11
1400			0.33	0.11
1500			0.35	0.12
1600			0.36	0.12
1700			0.38	0.13
1800			0.39	0.13
1900			0.40	0.14
2000			0.42	0.14

PERMITTED LEAKAGE AT VARIOUS PRESSURES

Permitted leakage at various pressures



OTHER **DUCTWORK–RELATED** PUBLICATIONS

DW/143
A Practical Guide to Ductwork Leakage Testing

DW/145
Guide to Good Practice for the Installation of Fire and Smoke Dampers

DW/154
Specification for Plastic Ductwork

DW/172
Specification for Kitchen Ventilation Systems

DW/191
Guide to Good Practice: Glass Fibre Ductwork

TR/19
Guide to Good Practice: Internal Cleanliness of Ventilation Systems(incorporating DW/TM2 and TR/17)

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