

HEVAC Guidance on Fire Dampers and Smoke Control Dampers

**Paul White CEng BEng MIMechE
March 2019**

The information in this presentation is given in good faith as general guidance. It should not be relied on as a back stop for the support of actions and installations. It is important that reference is made to current regulations, legislation and standards, together with other industry guidance. Discussions and confirmation with authorities having jurisdiction, fire brigades etc, is recommended at all stages

Fire Dampers and Smoke Control Dampers

Questions

- ▶ Do I have any?
- ▶ Function and compartmentation?
- ▶ What is needed in my risk assessments?
- ▶ Faults?
- ▶ When and how do I test and maintain them?
- ▶ Fire Tests?
- ▶ Fire classification?
- ▶ CE marking?
- ▶ Any questions?

WHERE ARE THEY?

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Do I have any Fire Dampers and Smoke Control Dampers?

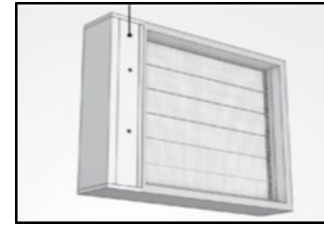
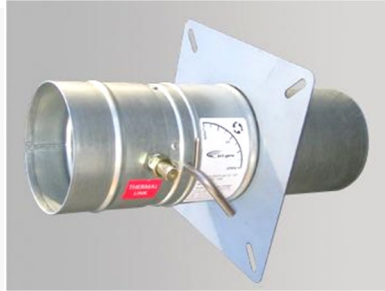
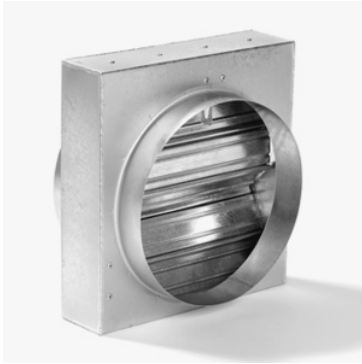
I know I have these....



But what is up here or behind that?



And you should find things that are less well known



Where normal ventilation ductwork passes through compartment boundaries, the penetration and compartment must be protected by a fire damper. It is a common misconception that fire dampers protect ductwork, what they actually do is maintain the compartmentation which is why they must be installed correctly.

In other places you may find smoke control dampers which are tested differently and provide different functionality

(NOTE: There is no such thing as a combination fire and smoke damper anymore - it will either be a leakage rated fire damper or a smoke control damper, they are not interchangeable)

An alternative is



In some instances fire resisting ductwork may be installed. This is also designed and tested to maintain compartmentation, and consequently must be constructed and installed correctly at the compartment wall.

Some of this ductwork may be smoke control ductwork and this will be slightly different to fulfil different conditions

SEE THE END OF THE PRESENTATION FOR A BRIEF REFERENCE FOR THESE

REGULATORY GUIDANCE

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Regulatory Guidance



- ▶ Approved Document B (ADB) – gives guidance to the building regulations
- ▶ BS9999 - additional guidance referred to in ADB
- ▶ HTM05-02 – additional information for hospitals
- ▶ BB100 - additional information for schools and colleges
- ▶ Regulatory Reform (Fire safety) Order (RRFSO) – requirements for fire safety in the running of buildings requiring information on how all the above are met, where items are installed and how they are to be maintained
- ▶ Building Regulation 38 - requires that all information with regard to fire protection measures is passed over at handover.

PRIME FUNCTION AND COMPARTMENTATION

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Prime Function

Fire Dampers

1. Maintain Compartmentation in the case of a fire
2. Close and stay closed
3. Must have a fusible link

After a fire, it might be that the firefighters may want to open the dampers again, using the control system, to help smoke release. Some may open, some may not, particularly if they have been exposed to the fire.

Smoke Control Dampers

1. Open or closed to allow movement of smoke away from a fire
2. Maintain compartmentation when doing the above
3. Must be motor open / motor closed - no change of position allowed except under control
4. No Fusible Link

*After a fire, it might be that the firefighters may want to operate the dampers again, using the control system, to help smoke clearance. Some may open, some may not, particularly if they have been exposed to the fire.
It might be that firefighters or others want to control the dampers during the incident to help fight the fire and protect people - in this case the dampers should be selected to be for manual activation*

Compartmentation

Fire Dampers

The fire and, where possible, most of the smoke is held in the compartment of origin and does not enter the ductwork or pass through walls and floors

Compartmentation is maintained ✓

Smoke Control Dampers

In the areas from where smoke is to be extracted and dampers in line along the smoke extract route will open

The simple way to visualise this is that the extract duct or shaft becomes part of the compartment of origin

All dampers leading to areas not along the route of extract remain closed

Compartmentation is maintained ✓

RISK ASSESSMENTS

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Risk Assessment Considerations - 1

Fire Dampers

(and related control systems, if present)

1. Is there a control system? Does it function correctly?
2. Where are all the fire dampers?
3. How is each one accessed?
4. Do records exist for each one?
 - a. Faults
 - b. Fault solutions
 - c. Actions taken to prevent recurrence
 - d. Test information
 - e. Maintenance information
 - f. Responsible person
 - g. Competent persons

Smoke Control Dampers

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1. Is there a control system? Does it function correctly?
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Risk Assessment Considerations - 2

Fire Dampers

(and related control systems, if present)

1. Physical check
 - a. Do the dampers work, are they in satisfactory condition, does the installation look sound with no damage?
2. Do the fire dampers reflect their application?
 - a. Fire compartmentation in standard DW144 ductwork?
 - b. Other - confirm what is required?
3. Is the installation acceptable?
 - a. Wall/floor type
 - b. Fire-stopping type
4. Has the building design changed in an way since the last risk assessment? Implications?

Smoke Control Dampers

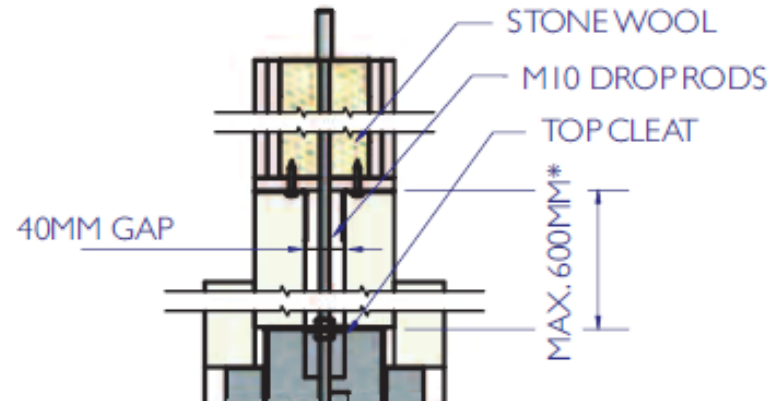
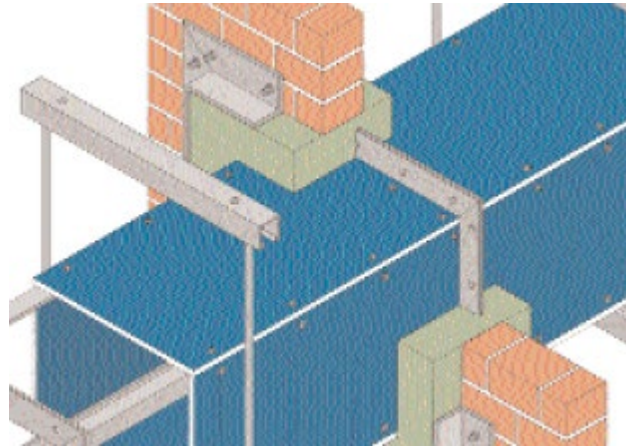
(and related control systems, if present)

1. Physical check
 - a. Do the dampers work, are they in satisfactory condition, does the installation look sound with no damage?
2. Do the smoke control dampers reflect their application?
 - a. Use in smoke control systems, fire resisting ducts and shafts, smoke control ducts?
 - b. Other - confirm what is required?
3. Is the installation acceptable?
 - a. Wall/floor/Duct type
 - b. Fire-stopping type
4. Has the building design changed in an way since the last risk assessment? Implications?

INSTALLATION

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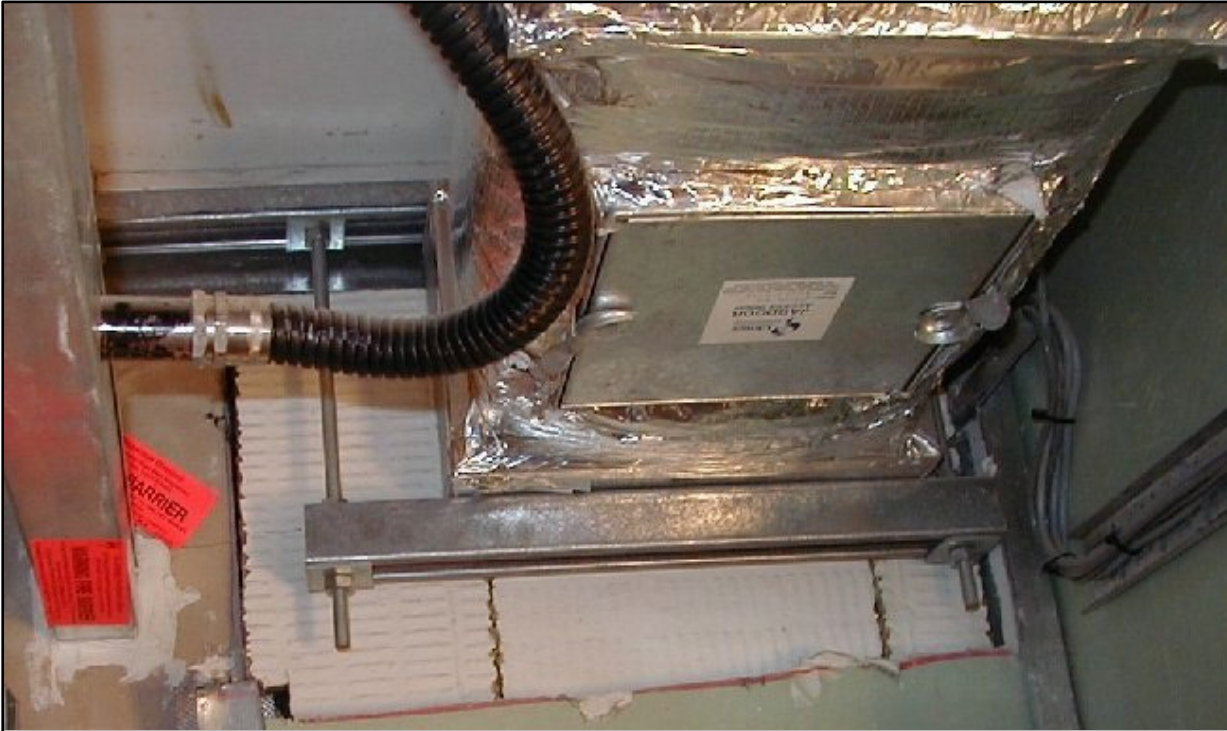
Installation



With installations it is often what is not seen that is important and must be got right during installation, support at the wall is critical for both dampers and ducts, otherwise they might collapse at the wall and lose integrity

Penetration seals only tested with pipes and cables are not proven for use with dampers and ducts, unless they have been tested with dampers and ducts, so duct and damper manufacturers cannot support this type of installation unless they have done specific testing. This situation is often overlooked on site, but may prove an issue if found after the event.

WRONG



The damper is not in the plane of the wall and the duct is not protected. Has the damper been tested in association with batt? If fire resisting, is the duct supported around its outside at its joint with the wall

WRONG



The dampers are not in the plane of the wall, the duct is not protected and it is unlikely that the dampers have been tested passing through a hole in a steel beam

WRONG



!

RIGHT ??



The damper is within the plane of the wall, the installation is complete and without any damage to the seal around the damper.

Note: However, it needs to be checked that damper has been tested in a batt installation, especially for ES requirements

FAULTS

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Faults

Fire Dampers

(and related control systems, if present)

Smoke Control Dampers

(and related control systems, if present)

Faults

Faults are not a maintenance issue, simply to be scheduled

Fix the fault straight away or as soon as possible

This is particularly important if part of a controlled system, as lives may be a risk

Record the fault, the corrective action and action taken to prevent recurrence

Make a considered judgement (in writing) on advising building occupants that systems and dampers are not working correctly - action taken

TESTING AND MAINTENANCE

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Testing and Maintenance - no control systems

Fire Dampers

1. Faults are not a maintenance issue - REPORT AND FIX THEM AS SOON AS POSSIBLE
2. Follow the guidance in BS9999 Annex W, generally as follows
3. Six monthly
 - a. Use a competent person or external competent agency.
 - b. Visit each damper
 - c. Operate the damper and reset it
 - d. Maintain as per the manufacturers instructions. Note any problems, clean and lubricate afterwards with a light oil. Do not simply use a freeing agent, as this will dry out and attract dust and debris, causing more problems
 - e. Make a record of the test and the maintenance
4. This should also be done after duct cleaning which should be done at the prescribed intervals too. It is worth co-ordinating the two - but make sure that you keep the records

Smoke Control Dampers

Smoke Control dampers must be under the control of a system - so if a Smoke Control damper is found not associated with a system, more investigation is needed.

Testing and Maintenance - with control systems - 1

Fire Dampers with control systems

Smoke Control Dampers with control systems

1. Faults are not a maintenance issue - **REPORT AND FIX THEM AS SOON AS POSSIBLE**
2. Use a competent person or external competent agency Recommended for 6 monthly and annual checks.
3. Follow the guidance given in BS9999 Annex I

Testing and Maintenance - with control systems - 2

Fire Dampers with control systems

Smoke Control Dampers with control systems

1. Daily

Check for faults

2. Weekly

- 1) Check that the control system is able to receive the fire alarm inputs and run the system from one alarm input - cycle the alarm inputs weekly- make a record
- 2) Physically check fans, smoke control dampers, vents, smoke curtains, doors windows etc. - make a record

NOTE: On large multi-zone installations it might be acceptable, with agreement from the relevant authorities, to rotate the equipment tested so that a system is tested every week and individual items are operated at intervals of no more than three months

- 3) Check the condition of standby equipment - batteries, generators and fuel, UPS, etc. - make a record

Testing and Maintenance - with control systems - 3

Fire Dampers with control systems

Smoke Control Dampers with control systems

3. Three Monthly
 - 1) Fully run the system, checking each alarm input and confirming that the correct components all work in relation to the system cause and effect as per the weekly test, except fully inclusive - make a record for each component
 - 2) Check for faults - make a record of any faults or no faults
 - 3) Simulate the failure of the normal supply and run the system on the backup supply for at least one hour - make a record of this event
 - 4) After at least one hour, whilst still on the backup supply, simulate an alarm (cycle the alarm on a three-monthly basis), confirm operation of the system and components, as weekly testing above - make a record.
 - 5) Check for faults - make a record of any faults or no faults
 - 6) Return the system to the normal supply.
 - 7) Re-confirm the condition of standby equipment - batteries, generators and fuel, UPS, etc. - make a record

Testing and Maintenance - with control systems - 4

Fire Dampers with control systems

Smoke Control Dampers with control systems

4. Six Monthly (external competent agency)

- 1) Check and review the fault log(s), confirm corrective actions and actions taken to prevent recurrence
- 2) Check the prior test information and records
- 3) Make notes on the acceptability or make any recommendations on (a) and (b) above
- 4) Fully run the PDS, checking each alarm input and confirming that the correct components all work in relation to the system cause and effect as per the weekly test, except fully inclusive - make a record for each component
- 5) Check for faults - make a record of any faults or no faults
- 6) Simulate the failure of the normal supply and run the system on the backup supply for at least 10 minutes - make a record of this event
- 7) After at least ten minutes, whilst still on the backup supply, simulate an alarm (cycle the alarm on a six monthly basis), confirm operation of the system and components, as weekly testing above - make a record.

Testing and Maintenance - with control systems - 5

Fire Dampers with control systems

Smoke Control Dampers with control systems

4. Six Monthly (external competent agency) cont'd

- 8) Check for faults - make a record of any faults or no faults
- 9) Return the system to the normal supply
- 10) Re-confirm the condition of standby equipment - batteries, generators and fuel, UPS, etc. - make a record
- 11) Check for any changes in the building layout to make sure that the system is still providing the required life safety - make a record. If the layout has changed in anyway advise the responsible person that the system needs to be checked and re-designed without delay, making a record of this advice
- 12) Provide a comprehensive report detailing all the work undertaken and the records of all the above

STANDARDS, TESTS AND CLASSIFICATIONS

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Basis of Standardisation

- Construction Products Directive (CPD)
- Construction Products Regulation (CPR) 2011
- Delegated acts
- Mandates for Fire Rated and Smoke Control Products
 - M109 and M117
- Leading to the development of
 - Product standards
 - Furnace based test standards
 - Classification standards
 - Extended field of application (EXAP) standards
- Requirement for such products to have Attestation of Conformity or Assessment and Verification of Constancy of Performance (AVCP) - Class 1
- Products need notified body Initial Type Testing (ITT)
- Manufacturers will need notified third party product certification (and also QA procedures)
- CPR also now requires a Declaration of Performance (DOP)
- Which will allow CE marking for such certificated products

Standards

Fire Dampers

Product standard - CE marking

- ▶ EN 15650: Fire dampers

Test standard

- ▶ EN 1366-2: Fire resistance tests for service installations: Fire dampers

Classification standard

- ▶ EN 13501-3: Fire classification of construction products and building elements - part 3: classification using data from fire resistance tests on components of normal building service installations

Extended field of application standard

- ▶ EN 15882-2: Extended applications of test results for fire resistance tests for service installations : Dampers

Smoke Control Dampers

Product standard - CE Marking

- ▶ EN12101-8: Smoke and heat control systems: Specification for smoke control dampers

Test standard

- ▶ EN 1366-10: Fire resistance tests for service installations: Smoke control dampers

Classification standard

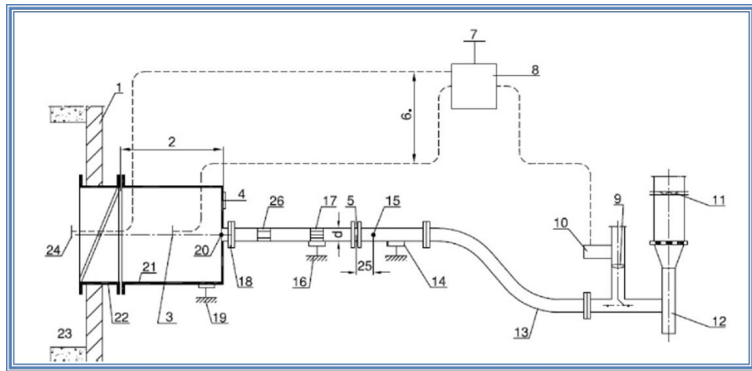
- ▶ EN 13501-4: - Fire classification of construction products and building elements - part 4: classification using data from fire resistance tests on components of smoke control systems

Extended field of application standard

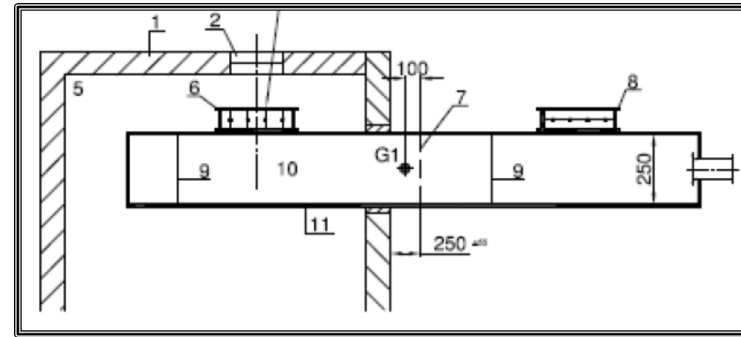
- ▶ Work not be started

Tests

Fire Dampers



Smoke Control Dampers



Classifications

Fire Dampers

EI 90 S v_{ex} h_{ox} i↔o C₁₀₀₀₀

- ▶ E- Integrity - minimum requirement
- ▶ I - Insulation - optional classification
- ▶ 90 - TIME - 60, 90, 120
- ▶ S - Reduced Leakage - optional requirement
 - ▶ Protection of escape routes - ADB requires
 - ▶ Areas with sleeping risk - ADB requires
- ▶ v_e - vertical mounting
- ▶ h_o - horizontal mounting
- ▶ i↔o - tested both ways round - options
- ▶ C₁₀₀₀₀ - number of operations - optional

Smoke Control Dampers

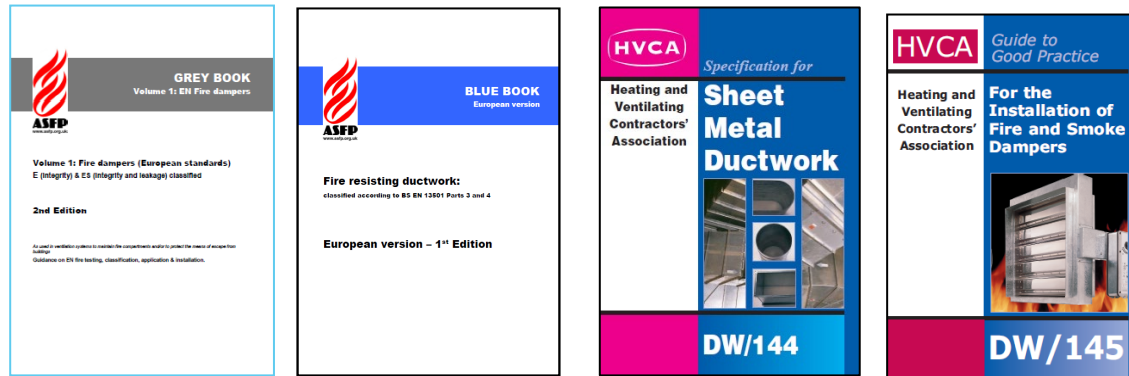
EI 90 S v_{ex} h_{ox} 1000 AA i↔o C₁₀₀₀₀ multi

- ▶ E- Integrity - minimum requirement
- ▶ I - Insulation - optional classification - consider phased evacuation, refuge protection, property protection
- ▶ 90 - TIME - 60, 90, 120
- ▶ S - Reduced Leakage - optional requirement
 - ▶ Protection of escape routes - ADB requires
 - ▶ Areas with sleeping risk - ADB requires
- ▶ v_e - vertical mounting
- ▶ h_o - horizontal mounting
- ▶ 1000 - pressure -1000Pa to +500Pa - options
- ▶ AA - Automatic activation - option MA - manual operation
- ▶ i↔o - tested both ways round - options
- ▶ C₁₀₀₀₀ - number of operations - options
- ▶ Multi - multi compartment

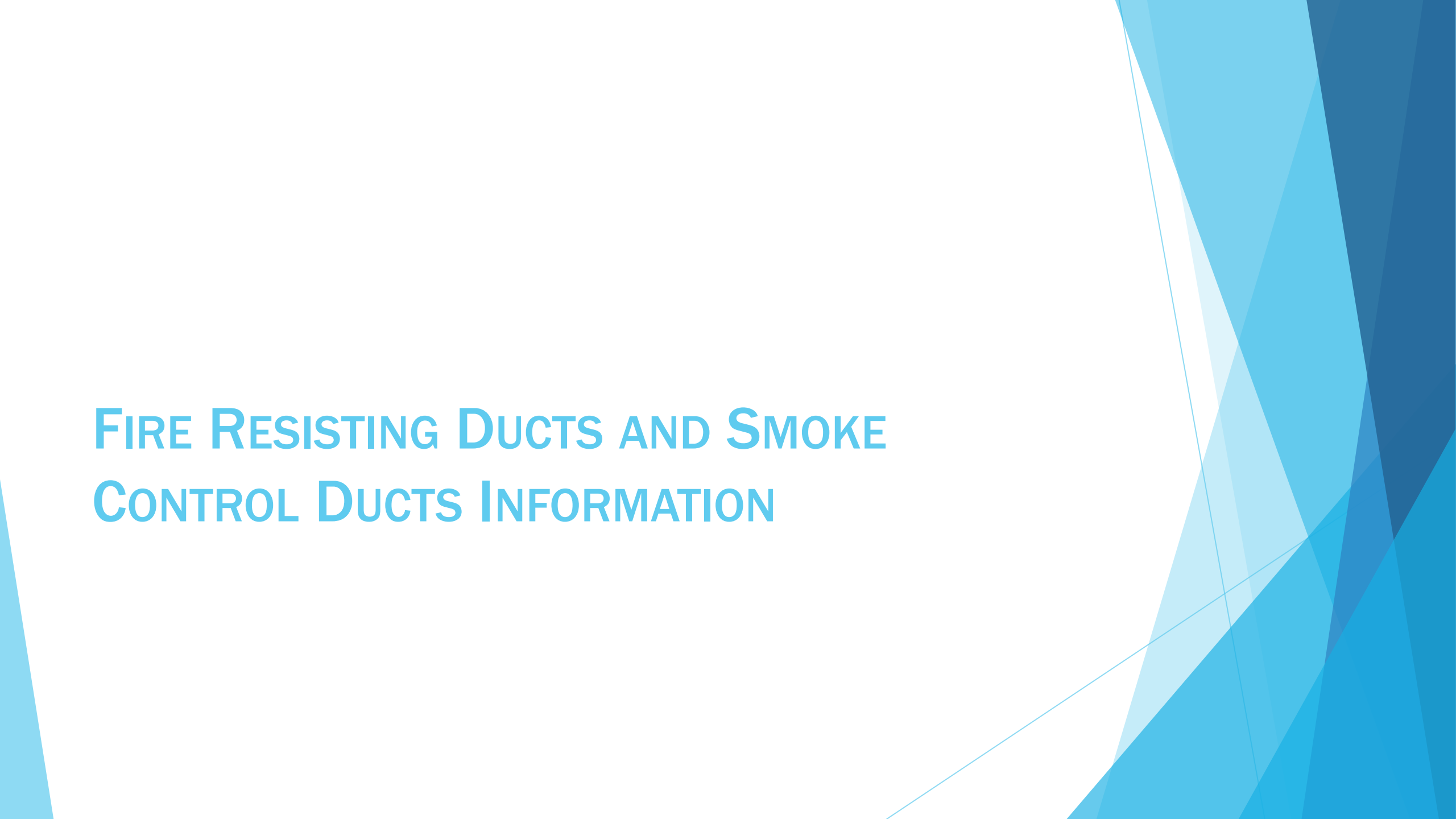
ADDITIONAL GUIDANCE

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Additional Guidance



- ▶ ASFP Grey Book – Fire dampers
- ▶ ASFP Blue Book - Fire Resisting and Smoke Control Ductwork
- ▶ DW/144 - Sheet metal ductwork
- ▶ DW/145 - Fire damper installations
- ▶ HTM05-02 – additional information for hospitals

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FIRE RESISTING DUCTS AND SMOKE CONTROL DUCTS INFORMATION

Test information

- ▶ Fire resisting ducts

- ▶ Fire resisting ducts should be tested to BSEN1366-1 or BS476-24.
- ▶ The latter is still allowed until such products have a standard published that requires CE marking. The standard is well under way, but it is not clear exactly when it will be published.

Test information

- ▶ Smoke control ducts
 - ▶ Smoke control ducts should be tested to BSEN1366-8 for fire resistance for multi compartment installations
 - ▶ Smoke control ducts should be tested to BSEN1366-9 for 600°C performance (and below) for single compartment installations
 - ▶ CE marking is generally required under the requirements of BS EN12101-7

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