Mechanical Ventilation & Firecode

- Interaction of ventilation and fire strategies
- Where and what dampers are required
- Importance of correct installation
- Air transfer grilles
- Plant operation and override facilities
- Maintenance requirements and access

- Not discussing Smoke & Heat Exhaust Ventilation Systems
Ventilation / Fire Guidance

Healthcare ventilation systems should comply with HTM03/01 part A ‘Specialised ventilation for healthcare premises - Design & Validation’ & Part B ‘Operational management and performance verification’ (formerly HTM 2025)

Refers to Firecode HTM05/02 ‘Guidance in support of functional provisions for healthcare premises’

Numerous other HBN guidance e.g. theatres, isolation facilities, pathology etc

Association for Specialist Fire Protection ASFP

Heating and Ventilating Contractors Association HVCA.
Ventilation in Healthcare

Ventilation uses in healthcare:

• minimum fresh air requirements to internal spaces, particularly in deep-plan buildings with limited natural ventilation
• thermal comfort / cooling, from equipment and solar heat gains
• extracting stale air / odours from toilet facilities
• extraction from cooking facilities
• ensuring air quality in critical care areas, reduce infection for patients in operating theatres, or protection to isolation rooms
• ensuring air quality in sensitive manufacturing areas e.g. pharmacy
• protecting staff from harmful toxic substances in laboratories

Very few hospital departments will not have some form of ventilation system.
Basic concepts of Firecode

Primary objective life safety (supplemented with continuity of service delivery, property & environmental protection)

• **Early warning** - AFD and observation
• **Means of escape** - PHE, travel distances
• **Containment** - Compartmentation, sub-compartmentation & local hazard room enclosures
• **Extinguishment** - access & facilities for FRS
• All supported by robust management procedures and adequate staffing levels

The effectiveness of PHE is reliant on the integrity of containment (i.e. fire walls & floors) and the interface of ‘active fire precautions’ such as dampers triggered by the AFD.
Ventilation & Fire Safety

Ventilation systems have the potential to spread smoke to remote parts away from the actual fire.

‘DAMPERS’

Numerous complications
Due in part to ambiguity of Firecode
**Damper Definitions**

**HTM05/02 & AD ‘B’**

**Fire-and-smoke damper (FSD)**

A fire damper which, when tested in accordance with BS EN 1366-2, meets the **ES** classification requirements defined in BS EN 13501-3:2005 and achieves the same fire resistance in relation to integrity as the element of the building construction through which the duct passes.

**Fire damper (FD)**

A mechanical or intumescent device within a duct or ventilation opening which is operated automatically and is designed to prevent the passage of fire and which is capable of achieving an integrity **E** classification and/or an **ES** classification to BS EN 13501-3:2005 when tested to BS EN 1366-2:1999. (Note - Intumescent fire dampers may be tested to ISO 10294-5).

**E = Integrity, ES = Integrity & Leakage**

Generally accepted that Fire-and-Smoke Dampers are actuated by the fire alarm (backed up by thermal link), whereas Fire Dampers are solely thermally actuated (74°C (?)).
Damper Location (Minimum) Requirements (Basic Rules)

Compartment walls, floors & protected shafts FSD

6.16 & 6.81 Fire dampers in ductwork passing through compartment walls should be actuated in accordance with BS 5588-9 and, by the operation of the alarm and detection system in the compartments either side of the compartment wall (Consider C&E).

Sub-compartment walls FD

6.82 In sub-compartment walls, dampers activated by a suitable thermal release device set at 74°C may be used (see Figure 10).

Hazard room enclosures FD

6.37 Ductwork passing through, or over, fire hazard rooms should be provided with fire dampers in accordance with Figure 11. (Note ii - fire dampers operated by fusible links).

Cavity barriers FD

6.38 Ductwork passing through cavity barriers should be provided with fire dampers in accordance with Figure 10.

Protected corridors (dead end corridors) FD?

No specific reference in Firecode but FD would be considered acceptable in most instances (Note. AD B requires FSD).
Figure 10 Fire-and-smoke dampers in compartment walls, subcompartment walls and cavity barriers (paragraphs 6.16, 6.36 and 6.81)

Ductwork passing through compartment walls, sub-compartment walls and cavity barriers should be provided with fire-and-smoke dampers in accordance with Figure 10.

Actuation of fire dampers:
Compartment walls
i. in accordance with BS 5588-9;

ii. by the operation of the alarm detection system in the compartments either side of the compartment wall;

Subcompartment walls
iii. in subcompartment walls, dampers activated by a suitable thermal release device set at 74°C
Openings in sub-compartment walls for ductwork

5.27 Ductwork passing through sub-compartment walls need not be provided with automatic fire shutters provided that:

a. the duct serves only one sub-compartment; and
b. the ductwork and supports have a minimum period of fire resistance of 30 minutes (integrity only) when tested in accordance with the relevant parts of BS 476. (See Figure 11.)

(Figure 11 actually refers to hazard rooms not sub-compartment!)

Specialist Ventilation

Areas of ‘Specialist Ventilation’, where for operational reasons stopping ventilation is not acceptable - fire rated ductwork would be specified instead of dampers (e.g. isolation facilities, fume cupboard extracts & kitchen hood extracts).
Always refer to Approved Fire Strategy Drawings

Reference MUST be made to the Fire Drawings when designing or modifying ductwork.
‘Design out’ the need for dampers

Figure 11: Fire dampers to fire hazard rooms

i. Ductwork passing through but not serving fire hazard room

- 30-minute fire-resisting wall
- Fire stopping
- Fire hazard room

ii. Ductwork passing over fire hazard room fitted with fire-resisting ceiling

- Fire-resisting ceiling
- Fire hazard room

iii. Ductwork serving fire hazard rooms

- Supply ductwork
- Fire damper
- Other room

- Extract ductwork
- Fire damper

- i. duct should not pass through the hazard room if the duct services the fire hazard room and other rooms beyond the fire hazard room
- ii. the fire hazard room should be served by spurs fitted with fire dampers operated by fusible links
- iii. where flexible connections are used, they should comply with BS 5588-9 and not pass through the fire-resisting wall

i. fire dampers not required

ii. ceiling to be non-combustible and have a minimum period of fire resistance of 30 minutes, when tested (complete with any lighting units) from below in accordance with BS 476 Parts 20 and 22

i. fire dampers not required

ii. ductwork in the hazard room to have 30 minutes' fire resistance (integrity and insulation) when tested to the relevant parts of BS 476

iii. ductwork serving fire hazard rooms
HTM05-02 D1 states: -

All fire dampers should be installed so that they maintain their integrity against the passage of fire for the required period of fire resistance.

A fire damper should be adequately fixed into, or to, the construction it is protecting.
A fire damper that is supported only by the ductwork in which it is located, or by timber battens, frames or other methods that do not provide the fire resistance required, is not acceptable.
INSTALLATION DETAIL

AERATED BLOCKWORK WALL
10mm STUD ANCHORS (RECOMMENDED TOP EDGE ONLY)
4:1 SAND : CONCRETE MIX MORTAR
STEEL WIRE SECURING DAMPER BUILDING TIES, TO STUD ANCHORS (RECOMMENDED TOP EDGE ONLY)
INSTALLATION FRAME

VIEW A
(ALL ROUND DETAIL)

IF YOUR PROPOSED INSTALLATION DETAIL DIFFERS FROM THAT SHOWN, PLEASE DISCUSS THIS WITH THE BUILDING CONTROL AUTHORITY (BCA) USING THIS DOCUMENT AND THE ASSOCIATED FIRE TESTS, ASSESSMENTS AND OTHER DOCUMENTS SHOWN BELOW, SO THE BCA CAN DECIDE WHETHER YOUR PROPOSED METHOD DIFFERS SUFFICIENTLY FOR IT TO BE UNACCEPTABLE TO THEM (THE BCA)

PHOTO STORYBOARD
ACTIONAIR INSTALLATIONS
MANUAL APPENDIX A
www.actionair.co.uk

APPLICABLE TEST REPORTS - EN1366-2
TE 94134 (CC225285)

BSEN13501-3 CLASSIFICATION
E120  ES60  E60S

VERTICAL APPLICATION
SMOKE SHIELD & INSTALLATION FRAME
DAMPER SIZE:
1000mm (WIDE) X 1000mm (HIGH)
NHS bodies are encouraged to utilise independent certification schemes
Air Transfer Grilles
HTM05/02 definitions

Air transfer grille (fire and cold smoke): a device that will allow the passage of air in normal use, but when activated will contain both cold smoke and hot gases – usually activated by heat and an electrical interface with the detection and alarm system.

Fire containment air transfer grille: a device that will allow the passage of air in normal use, but when activated will contain the passage of fire and hot smoke.
Air Transfer Grilles

Compartment walls & protected shafts

6.13 Air transfer grilles that do not provide smoke and fire containment should not be provided in any wall, door, floor, ceiling enclosing a protected shaft, or compartment wall.

Sub-compartments

5.28 To reduce the possibility of smoke transfer between sub-compartments, transfer grilles should not be provided in sub-compartment walls unless they are fitted with fire-and-smoke dampers activated by thermal release set to activate at 74°C.
Air Transfer Grilles

Hazard Rooms

6.34 Where there is an operational requirement for ‘make up’ air to be provided to fire hazard rooms, the possibility of fire and smoke spread should be countered by using transfer grilles that incorporate ‘fire and smoke containment’

Fire Doors

B4 Air transfer grilles that are not designed to prevent the spread of fire and cold smoke should not be fitted in fire (and smoke) rated doors

(6.34 - Transfer grilles should not be fitted in fire doors unless accompanied by a test certificate provided by the door manufacturer).
Air Transfer Grilles

HTM03/01A - 5.70
Care needs to be taken to ensure that the positioning of transfer grilles does not interfere with the fire or smoke integrity of the building. **In general, air transfer grilles should not be installed within fire resisting boundaries,** although if this is unavoidable, they should be fitted with fire or smoke dampers

**Best Practice**
Do not install any ATG’s in fire boundaries
If there’s no alternative then only fit fire & cold smoke ATG’s.
Should plant continue to run in a fire emergency?

CONFUSION!

05/02 6.83 The ventilation plant should **not** be automatically shut down on the operation of the automatic fire alarm and detection system

**Generic blanket statement – WRONG!**

**WHY?**

- It depends where the fire is and where the ducts run
- What plant serves what area? – i.e. Single plant serving multiple departments or dedicated plant for each department
- Is the ventilation critical to the function of the department?
Should plant continue to run?

05/02  5.77 & H27 The HVAC systems provided to critical care areas are designed so that the pressure within the department is maintained at a level slightly above that of the adjacent areas. In a fire emergency, the continuing operation of these systems will assist in preventing smoke and other products of combustion entering the critical care area.

05/02  5.78 In critical care areas, the HVAC systems should be designed so that they continue to operate in a fire emergency.

03/01A  6.19 In certain critical care areas, it is preferable to maintain the supply ventilation.

03/01A  6.20 In all critical care areas, the ventilation system should continue to operate unless smoke starts to enter the AHU.

ALSO CONSIDER OTHER SPECIALIST AREAS

Generally, critical care areas and specialist systems should continue to run, but each scheme should be reviewed on its own merits considering the Cause & Effect and fire strategy for the building.
Are manual over-ride facilities required?

Firecode & HTM03/01 recommend facilities for manual over-ride of ventilation plant

05/02 - 6.84 The shut-down of the system should be under the instruction of the fire-and-rescue service and should be controlled from panels located either at department entrances or adjacent to the main fire alarm indicator panels

03/01 - 6.18 A fire control panel should be mounted at the entrance of the area that the ventilation serves. Access to the panel should be restricted to the fire officer and include independent on/off controls and an indication of the supply and extract system

03/01 - 6.20 A notice should be affixed to the fire control panels stressing the need to liaise with departmental staff before switching off the fan units

Consider the Fire Strategy for the specific building
BS9999 Annex W

Arrangements should be made for all fire dampers to be tested by a competent person on completion of the installation and at regular intervals not exceeding 2 years, and to be repaired or replaced immediately if found to be faulty.
BS9999 Annex W

Spring-operated fire dampers should be tested **annually** and fire dampers situated in dust-laden and similar atmospheres should be tested **much more frequently**, at periods suited to the degree of pollution.

HTM03/01B 4.13 Also states

All fire dampers should be tested as part of the annual verification.
Where is access required?

HTM03/01A (refers to DW144)

Para 5.20 An access hatch should be provided adjacent to each fire damper so that its correct operation can be directly observed. The hatch must be suitably sized to permit inspection, testing and maintenance.

Para 5.50 Cleaning and access doors are required to facilitate access to plant items and ductwork components for inspection, maintenance, cleaning and replacement. They must be of sufficient size to permit safe access for the required function.

Para 5.52 Care should be taken when siting cleaning and access doors to ensure that no other services to be installed will prevent reasonable access.

REMEMBER!

Adequate maintenance of fire precautions is a specific requirement under Article 17 of the Regulatory Reform (Fire Safety) Order.
**Damper access**

ALL dampers should maintainable

Problems often encountered: -

- As fitted drawings not provided
- Inadequate identification
- Access panels inaccessible due to ill-considered installation or lack of coordination with other services
- Access panels fitted wrong side of wall
- 100mm dampers often too small to maintain
- Sharp jagged edges left after retro-fitted access panels.
Summary (Points to consider)

**M&E Engineers**
- Always refer to the fire strategy drawings
- Design and install services considering future management and maintenance of the building
- ‘Design out’ the necessity for dampers where possible
- Always adhere to ‘tested’ details
- Utilise 3rd Party accredited fire stopping companies
- Provide as fitted drawings

**Building Managers**
- Know what you’ve got
- Understand interaction of mech-vent system with the fire strategy (C&E)
- Conduct appropriate maintenance
- Maintain records of installation, modifications and maintenance.
Turkey - 8 patients perish in hospital blaze
27 May 2009

“A blaze that is believed to have started due to an electrical fault …… killed eight people in the intensive care unit. The intensive care unit was worst affected by the blaze, which sent thick smoke through a ventilation shaft to the upper floors before it was extinguished ” Source - Local press.