FIRE AND SMOKE DAMPERS
LIFE THREATENING FORCES

Fire and smoke – Life Threatening Forces

When fire breaks out in a building the threat is twofold. Firstly, there is the fire itself and the hot smoke generated in the immediate vicinity. Secondly, there is cold smoke which, if unchecked, spreads rapidly, preceding the fire and hot smoke, threatening people and property some distance from the fire.

Design Needs

Every year in the UK alone some 491 people are killed and 14,000 injured in fires, many of the casualties being attributable to breathing the toxic products of combustion from a remote fire. Fire and smoke also cause extensive damage to building fabric and contents. It has been estimated that the total value of fire related losses is some 3.3 billion per annum*. The majority of these deaths, injuries and losses occur in buildings where fire and smoke protection measures have been inadequate.

* source: Department of Communities and Local Government, 2004.

Regulatory Requirements

The Building Regulations require large buildings to be sub-divided into smaller volumes or areas bounded by building elements which resist the spread of fire and smoke. Building a fire resistant wall or floor is a relatively simple task. However, systems of natural and mechanical ventilation require the movement of air through ducts and grilles formed in fire resistant constructions. Ensuring these airways remain open and yet provide protection against fire, hot smoke and cold smoke is a more complex problem.

The Solution

The Grada solution is to fit fire containment air transfer grilles at the point of penetration. Under normal circumstances these allow air to pass freely between compartments. In the event of fire the slats and framing components swell to many times their original thickness, fusing together to form a non-combustible mass which provides fire resistance to match the surrounding construction and prevents the passage of hot smoke and gases. The fire containment air transfer grilles contain no moving parts which results in low maintenance.

The Grada range of intumescent air transfer grilles combined with automatic smoke control systems provides protection against cold smoke. These electrically powered dampers are connected to a standard smoke or fire alarm/detection system which, when triggered, causes the dampers to close thereby preventing the passage of cold smoke. Under normal circumstances the dampers remain open allowing the free passage of air.

The requirements for fire and smoke containment with respect to 'means of escape' are contained in Approved Document B (England and Wales), Technical Booklet E (N. Ireland), Technical Handbook Section 2 (Scotland). It is vital that means of escape are not endangered by fire and smoke transmission through doors or ventilation ducts.

Relevant Standards

There are several British Standards which relate to the products and solutions featured in this brochure. They include:

- BS 476: Pt. 22: 1987: Methods for determination of the fire resistance of non-loadbearing elements of construction
- BS 476: Section 31.1: 1983: Methods for measuring smoke penetration through doorset and shutter assemblies
- BS 5588: Fire precautions in the design and construction of buildings. (An Approved Document for compliance with Building Regulations)
- BS ISO 10294-5:2005: Fire-resistance tests. Fire dampers for air distribution systems. Intumescent fire dampers
- BS EN 1634-1:2000: Fire resistance tests for door and shutter assemblies. Fire doors and shutters

Ventilation with Fire and Smoke Protection

Designers recognise the need for buildings to be well ventilated for the health and comfort of occupants. Frequent changes of air flush out airborne infections, and warm and cool air need to be circulated to maintain comfortable temperatures.

Ventilation through Doors, Walls, Floors & Ceilings

A study of regulatory requirements reveals that nearly all internal fire resistant doors (and, therefore, the walls in which they are located) also need to provide protection against cold smoke. Any steps taken to allow ventilation through such walls and doors must not allow the passage of cold smoke in the event of fire.

The common practice of undercutting the door in the belief that the threshold is a low risk area has now been totally discredited. It creates a major smoke hazard. Similarly, fitting a conventional grille to a wall or door will totally negate other measures taken to prevent the spread of fire, hot smoke and cold smoke.

Grada intumescent air transfer grilles and automatic smoke control systems provide protection against fire, hot smoke and cold smoke.

Ventilation through Ducting

Experience has shown that ducting can, in the event of fire, provide a conduit for fire, hot smoke and cold smoke. An intumescent fire damper, fitted into the duct at the point where it penetrates a fire resistant construction, will prevent the passage of fire and hot smoke. Lorient intumescent fire dampers fitted in conjunction with a Grada automatic smoke control system will also provide protection against cold smoke. They have been shown by specific testing to be equivalent to a conventional damper, not only in fire and smoke barrier properties but also by exhibiting insulation values.

Grada fire resistant dampers / air transfer grilles can be:

- factory fitted in a tested fire resisting doorset
- “retro fit” to an already installed fire door
- fitted in fire resisting walls, partitions, floors and ceilings
- installed in duct work (LVC40, LVH44, LVHC44 and LVH54)

Fire and Smoke Resistant Dampers / Air Transfer Grilles

System benefits include:

- A comprehensive range of dampers / air transfer grilles providing protection against fire and smoke at all temperatures
- Test evidence second to none
- Fire performance ratings from 30 minutes to in excess of 180 minutes
- Fully tested for smoke performance
- Products for all applications - doors, walls, ducts, floors & ceilings
- Low maintenance
- Co-ordinated with other Grada products and ironmongery

FIRE AND SMOKE DAMPERS
PRODUCT RANGE

Product Range

Listed below are the features and attributes of each product in the Grada damper / air transfer grille range. Further information on the products, including sizes, shapes and finishes, can be found on the following pages.

Non-vision Style **LVN20 and LVN25**

- can be used to provide up to 60 minutes resistance to fire and hot smoke
- angled slats ensure complete visual privacy
- supplied in two halves to accommodate different door thicknesses
- complete seal achieved in approximately five minutes when tested in accordance with BS 476: Pts. 20 & 22
- allows bi-directional air flow
- easy to keep clean
- contain no moving parts
- no site testing is necessary

Vision Style **LVV40 and LVC40**

- can be used to provide up to 60 minutes resistance to fire and hot smoke
- excellent airflow characteristics which result in silent efficient operation in normal use
- complete seal achieved in approximately five minutes when tested in accordance with BS 476: Pts. 20 & 22 and BS EN 1634-1: 2000
- allows bi-directional air flow
- simple to install
- no maintenance required
- contain no moving parts
- resistant to clogging

FIRE AND SMOKE DAMPERS
PRODUCT RANGE

High performance Vision Style **LVH44 and LVHC44**

Heavy duty intumescent air transfer grille / fire dampers designed for use in aggressive environments.

- can be used to provide up to 180 minutes resistance to fire and hot smoke
- complete seal achieved in approximately two minutes when tested in accordance with BS 476: Pts. 20 & 22 and BS EN 1634-1: 2000
- exhibit excellent airflow characteristics and give silent efficient operation with normal to high air velocities
- can be used in ducting where the steel and aluminium casing protects the intumescent material from the corrosive effect of hot gases travelling at high velocities
- can be used to provide up to 180 minutes fire resistance
- have a steel frame which contributes to fire resistance by preventing the inward deformation of surrounding structures thus protecting the intumescent materials
- resistant to vibration damage
- suitable for horizontal and vertical applications
- suitable for external applications
- low maintenance
- contain no moving parts

LVH54

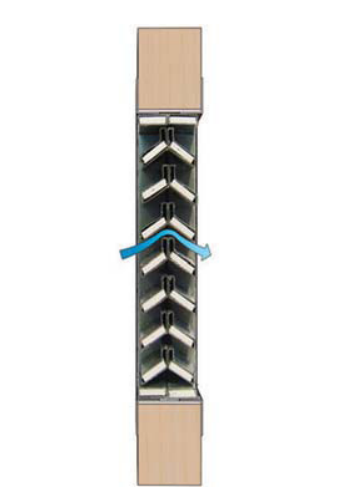
- has been specifically designed to meet the tough requirements of BS ISO 10294 Pt. 5
- forms a complete seal within 2 minutes
- can withstand a 300P pressure differential across the damper
- maintains its fire integrity for a period of four hours
- has a zintec steel frame and stainless steel slat, which is ideal for harsh duct environments, including high humidity
- suitable for vertical applications
- low maintenance

FIRE AND SMOKE DAMPERS
OPERATION

Operation - Vision, Non-vision and High Performance Styles

Grada fire containment air transfer grilles / dampers are made up of either PVC or metal slats with an intumescent core.

A sudden increase in temperature resulting from the presence of flames or hot gases causes the slats and framing components to swell to many times their original thickness, fusing together to provide an effective barrier to the passage of fire and hot smoke.



LVN20 air transfer grille in normal 'cold' condition showing free-air movement

LVN20 air transfer grille operating in hot condition showing intumescent material expanding to fill the space in the door

Grada Smoke Control System

All ducts and airways in doors and walls can be protected against fire and hot smoke using Grada intumescent air transfer grilles. However, these grilles will not prevent the passage of cold smoke which can be equally dangerous.

Damper / Shutter Assembly

To address this problem Grada has developed a smoke damper assembly for use in conjunction with Grada intumescent air transfer grilles.* The assembly comprises three slotted plates - two fixed plates sandwiching a central moving plate. The central plate is operated by a fail-safe motorised actuator. A movement of just 10mm changes the relative positions of the slots from "through flow" to "fully closed".

*Note: 'S' suffix added to product code. Shutter assembly cannot be added to standard air transfer grilles retrospectively.

Talkback damper in "through flow" position

Talkback damper in "fully closed" position

Control Systems for Smoke Damper Assemblies

The Talkback system can control up to sixteen dampers and features a status monitoring display.

Talkback Damper Control System

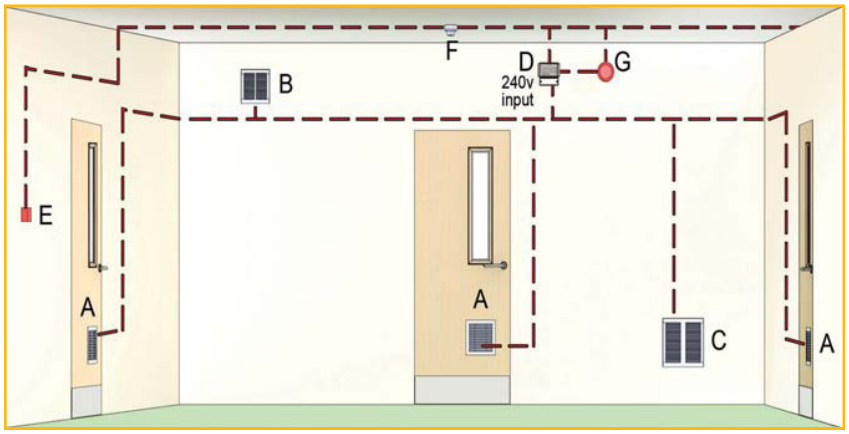
Most large buildings require a significant number of FD30S and FD60S fire doors (30 or 60 minute fire doors which also provide protection against cold smoke) within any one fire zone. These doors may be a considerable distance apart, or even on different floors.

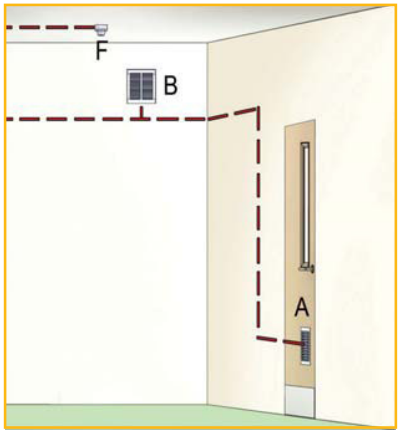
The Talkback system has been designed to control up to sixteen damper assemblies from one centralised status monitoring unit. A unique 2-way communication system operates between the Damper Control and Monitor Unit (DCM) and the damper actuators. This facilitates a rapid assessment of the status of the installation and immediately identifies and locates any defective dampers.

Talkback is designed to give peace of mind to a building's occupants in that it:

- is fail-safe – the dampers will automatically close in the event of an alarm, power failure or damage to the wiring
- resets automatically – when the alarm is cancelled or power restored
- is self-testing – every 24 hours the dampers are automatically closed and opened to check they are working and to dislodge any dust and debris between the moving parts
- continuously monitors the status of each damper and displays this on the DCM
- is easy and quick to install – simple loop wiring is used and the damper units are supplied ready assembled and tested
- uses a safe 12V DC supply to open and close the dampers
- has been successfully tested in accordance with the requirements of the Electro Magnetic Compatibility and Low Voltage Directive and therefore bears the CE mark (copies of the relevant test reports are available on request)

Typical Installation of the Grada Talkback System





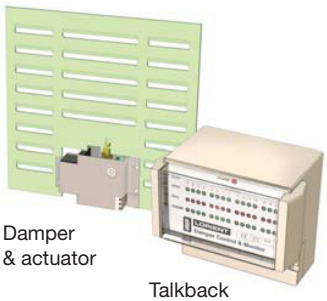
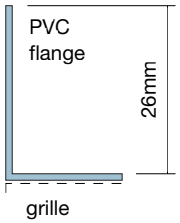
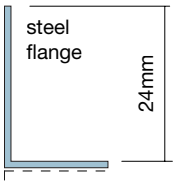
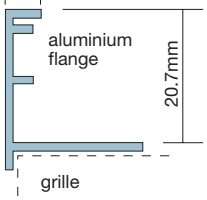
A: Door mounted fire and smoke dampers
B: End of duct fire and smoke dampers
C: Wall mounted fire and smoke damper
D: Power and monitor unit

E: Fire point
F: Smoke sensors
G: Fire alarm

FIRE AND SMOKE DAMPERS
PRODUCT SPECIFICATIONS

Product	LVN20 & LVN25	LVV40 & LVC40	LVH44 & LVHC44	LVH54
				
	two sizes of non-vision intumescent air transfer grille supplied in two halves to accommodate different door thicknesses	standard vision intumescent air transfer grille for walls, doors and rectangular or circular ventilation ducts suitable for use in some horizontal applications. Please refer to Grada's Technical Department	high performance steel vision intumescent air transfer grille for use in doors, walls, floors, ceilings and ventilation ducts	high performance steel intumescent fire damper for use in doors, walls, floors, ceilings and ventilation ducts LVH54 is not currently tested in the horizontal plane
Width:	100mm - 600mm (in 50mm increments)	100mm - 600mm (in 25mm increments)	100mm - 600mm† (any size in between)	100mm - 600mm† (nominal) in 50mm increments. Custom sizes also available
Height:	100mm - 600mm (in 50mm increments)	100mm - 600mm (in 25mm increments)	100mm - 600mm† (any size in between)	100mm - 600mm† (nominal)
Diameter:		up to 600mm diameter (nominal to suit standard PVC pipes or steel ducts)	up to 600mm diameter (nominal to suit standard steel ducts)	
Thickness:	2 pieces x 20mm or 2 pieces x 25mm	40mm	44mm	54mm
Free area:	30% approx.	60% approx. (circular is different)	60% approx.	60% approx.
Can be used with:	integral steel, PVC or aluminium flanges no cover grille required	metal cover grille (optional)	metal cover grille (optional) NB: LVH44 and LVHC44 can be used in external applications	
Fitting:	screwed and bedded in Grada intumescent mastic	screwed and bedded in Grada intumescent mastic	screwed and bedded in Grada intumescent mastic	screwed and bedded in Grada intumescent mastic
Materials and Finish:	PVC, silver as standard also available in white	PVC, silver as standard	zintec steel Note: † Larger apertures possible. Please refer to Grada's Technical Department	zintec steel

FIRE AND SMOKE DAMPERS
PRODUCT SPECIFICATIONS

LVHCTD	Smoke Control System	Cover Grilles	Flanges
			 LV1826  LV2516
duct mounted fire and smoke damper	Talkback	optional cover grilles for walls, doors and ends of ducts pressed steel and aluminium options available weather louvre options available for use on external applications (refer to Grada for details)	
450mm	standard sizes available are: 200mm – 600mm (in 50mm increments) Modular systems are available, please ask for details	sizes to suit standard dampers / air transfer grilles larger sizes available (refer to Grada for details)	5.5mm  LV2221
450mm (maximum)			
30% approx.	30% approx.	NB: will change the free air flow characteristics of the air transfer grille	
LVH44 LVH54		LVV40 LVH44 LVH20S	
refer to Grada's Technical Department	NB: for special applications, the Lorient smoke dampers can be used on their own. Please refer to Grada's Technical Department	screw fixed	screw fixed
zintec steel	DCM off-white	pressed steel, white, silver, primer or mill matching colours are available: aluminium, natural satin anodized / powder coated	refer to Grada for details

FIRE AND SMOKE DAMPERS
PRODUCT SELECTOR TABLE

The following pages show the levels of protection provided by Grada fire resistant dampers / air transfer grilles when used in doors, compartment walls, ducts, floors and ceilings.

Use of symbols

- indicates that the application detail shown provides protection against fire
- indicates that the application detail shown provides protection against cold smoke
- 60 indicates in minutes the fire protection provided by the intumescent air transfer grille / fire damper

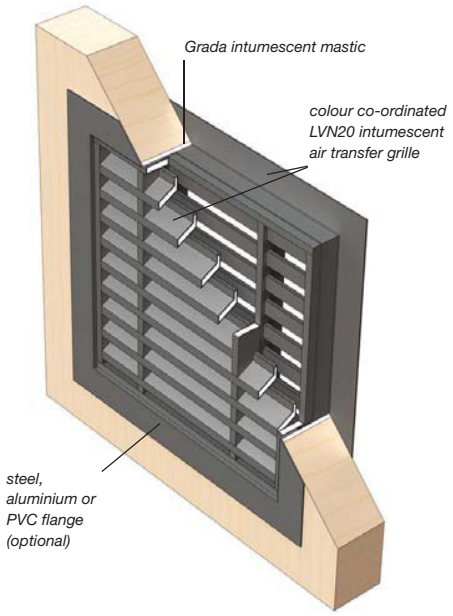
level of protection	type of protection	vertical / horizontal	doors		walls		floors & ceilings		ducts	
30		vertical	LVN20	page 13	n/a	n/a	n/a	n/a	n/a	n/a
		vertical	LVN25	page 13	n/a	n/a	n/a	n/a	n/a	n/a
		vertical	LVV40/LVC40	page 13	n/a	n/a	n/a	n/a	n/a	n/a
		horizontal	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		vertical	LVN20S	page 14	n/a	n/a	n/a	n/a	n/a	n/a
60		vertical	LVN25	page 13	n/a	n/a	n/a	n/a	LVH44	page 17
		vertical	LVV40/LVC40	page 13	LVV40/LVC40	page 15	n/a	n/a	LVC40	page 17
		horizontal	n/a	n/a	n/a	n/a	LVH44/LVHC44	page 16	LVH44/LVHC44	page 18
		vertical	LVN20S	page 14	LVV40S	page 15	n/a	n/a	n/a	n/a
90		vertical	LVH44/LVHC44	page 13	n/a	n/a	n/a	n/a	n/a	n/a
		horizontal	n/a	n/a	n/a	n/a	LVH44/LVHC44	page 16	LVH44/LVHC44	page 18
		vertical	LVH20S	page 14	n/a	n/a	n/a	n/a	n/a	n/a
120		vertical	LVH44/LVHC44	page 13	LVH44/LVHC44	page 15	n/a	n/a	LVH44/LVHC44	page 18
		horizontal	n/a	n/a	n/a	n/a	LVH44/LVHC44	page 16	LVH44/LVHC44	page 18
		vertical	LVH20S	page 14	LVH44S	page 15	n/a	n/a	n/a	n/a
180		vertical	n/a	n/a	LVH44/LVHC44	page 15	n/a	n/a	LVH44	page 18
		horizontal	n/a	n/a	n/a	n/a	LVH44/LVHC44	page 16	n/a	n/a
		vertical	n/a	n/a	LVH44S	page 15	n/a	n/a	n/a	n/a
240		vertical	n/a	n/a	n/a	n/a	n/a	n/a	LVH54	n/a
		vertical	n/a	n/a	n/a	n/a	n/a	n/a	LVHCTD	page 18

FIRE AND SMOKE DAMPERS
DOORS - 30 to 120 Minutes

LVN20 (for 44mm & 54mm)

For installation in lower half of door leaf

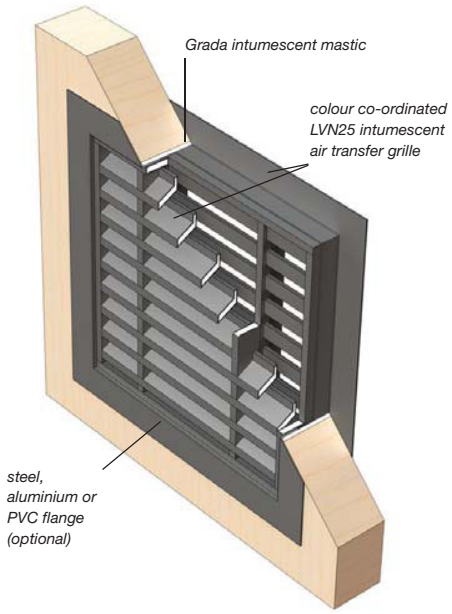
30



LVN25 (for 54mm only)

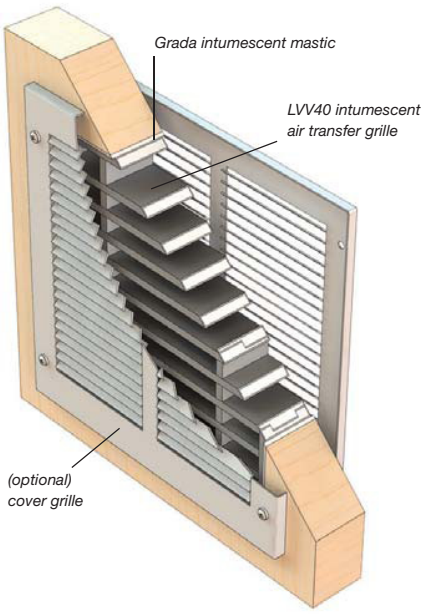
For installation in lower half of door leaf

30 60



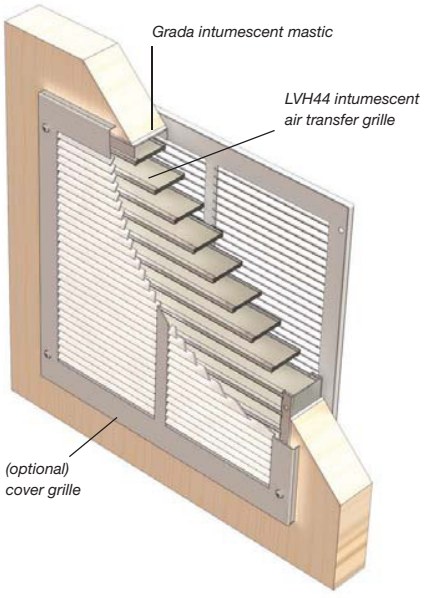
LVV40 & LVC40

30 60



LVH44 & LVHC44

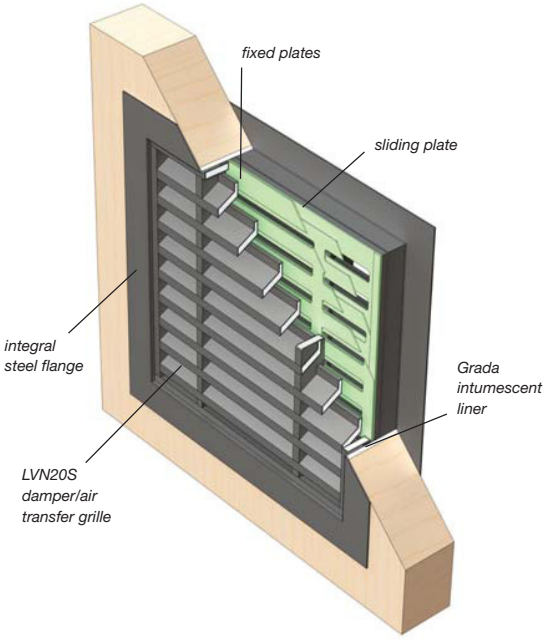
90 120



FIRE AND SMOKE DAMPERS
DOORS - 30 to 120 Minutes

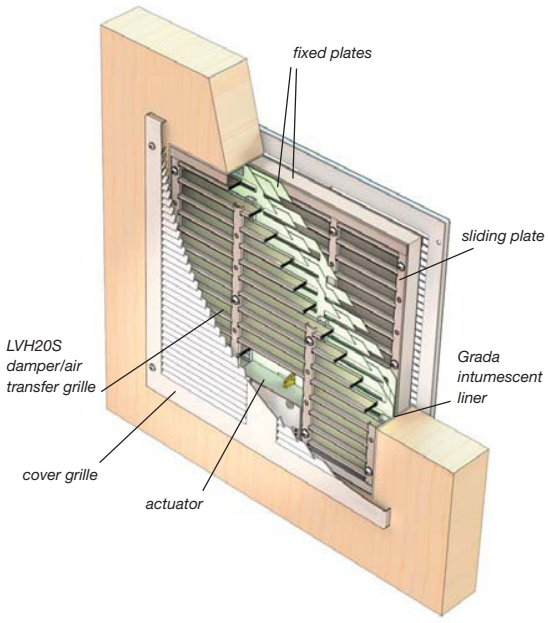
LVN20S – door thickness min. 44mm

30 60



LVH20S – door thickness min. 50mm

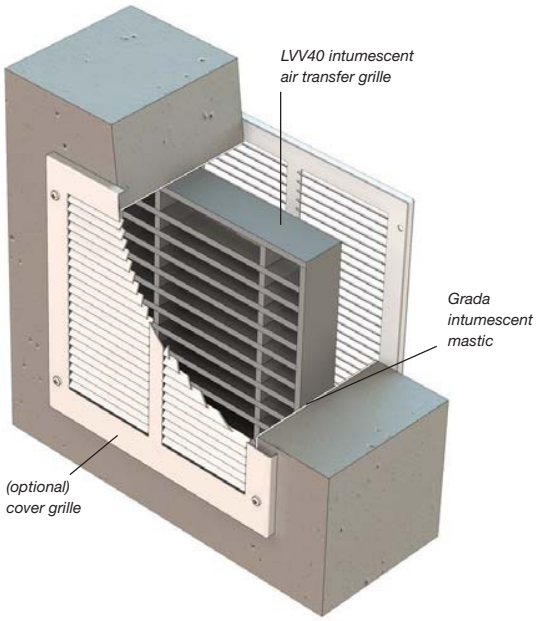
90 120



FIRE AND SMOKE DAMPERS
walls- 60 to 180 Minutes

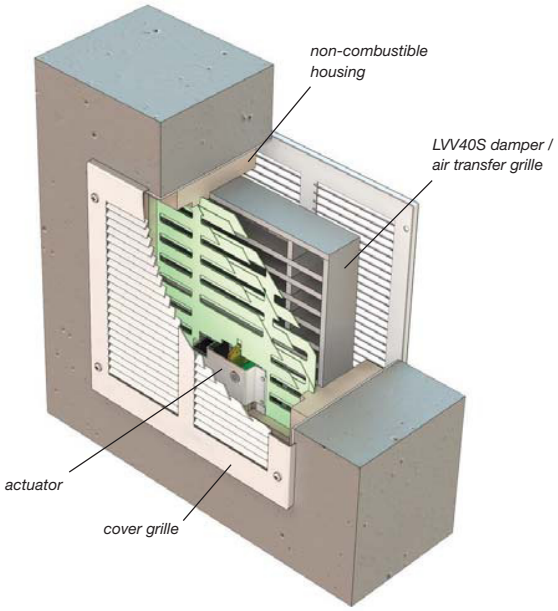
LVV40 & LVC40

60



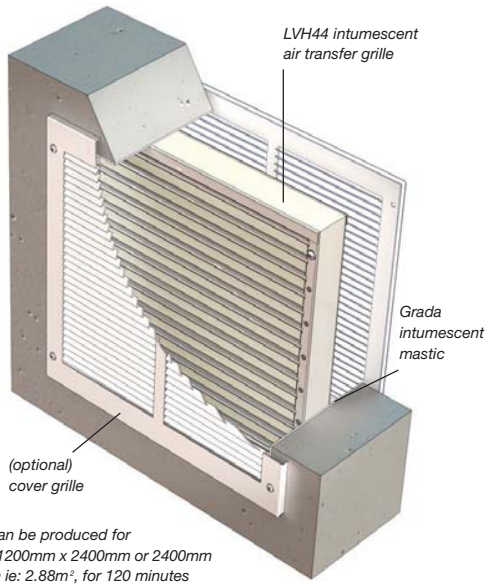
LVV40S – wall thickness min. 80mm

60



LVH44 & LVHC44

120 180

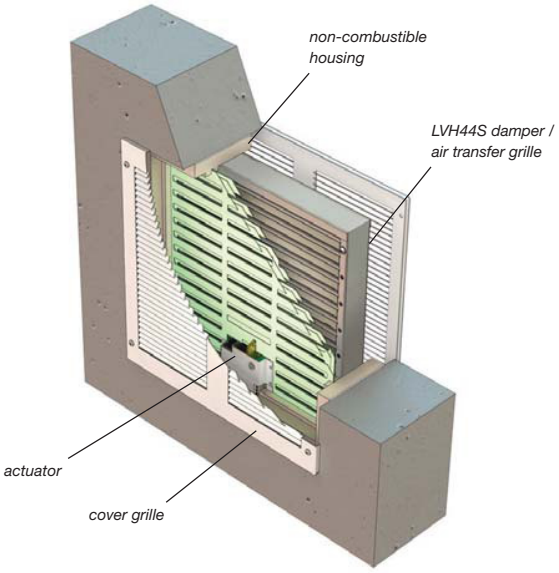


Note:
LVH44's can be produced for apertures 1200mm x 2400mm or 2400mm x 1200mm ie: 2.88m², for 120 minutes

Please refer to Grada's Technical Department

LVH44S – wall thickness min. 80mm

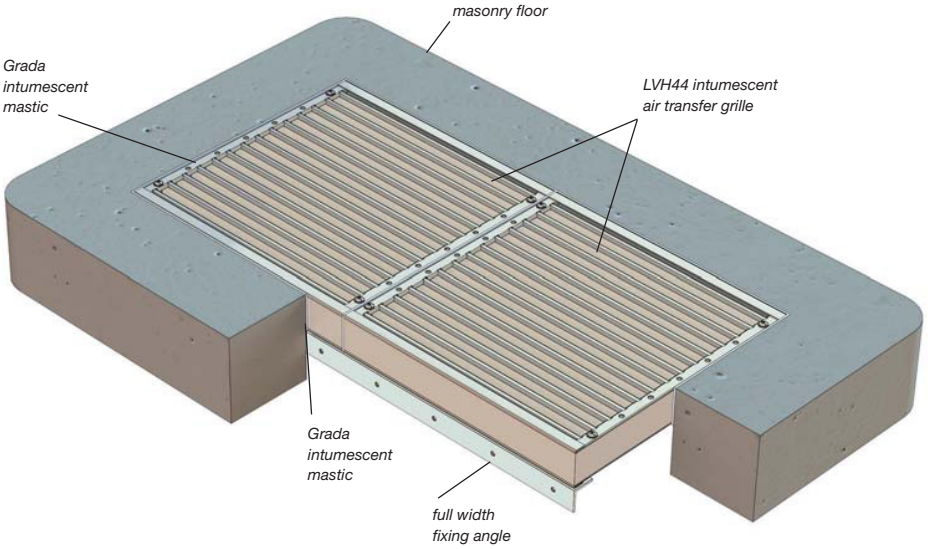
120 180



FIRE AND SMOKE DAMPERS
FLOORS AND CEILINGS - 120 to 180 Minutes

LVH44 & LVHC44 – floor thickness min. 50mm

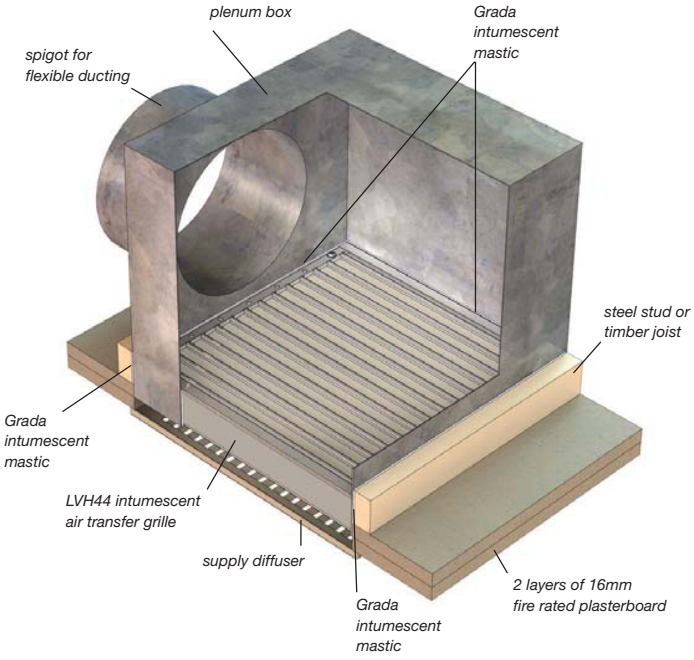
120 180



Note:
Modular installation shown. The maximum size for this method of installation is 1200mm x 600mm. Please consult Lorient for larger sizes

LVH44 & LVHC44 – ceiling thickness min. 50mm

120 180

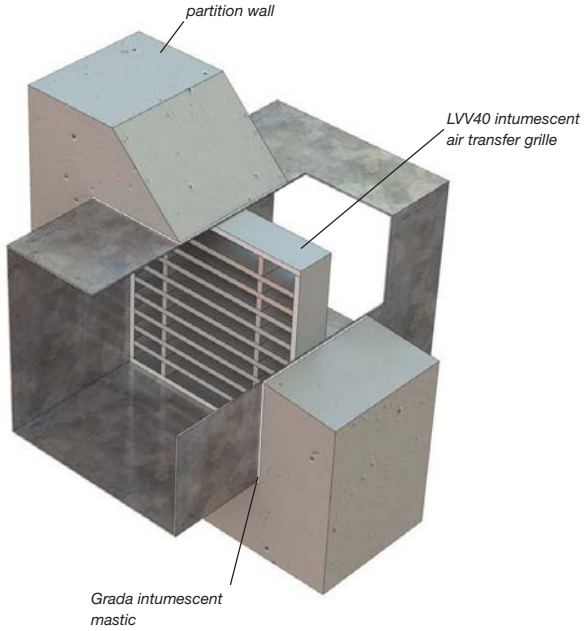


Note: The maximum size for this installation is 600mm x 600mm

FIRE AND SMOKE DAMPERS
DUCTS - 60 Minutes

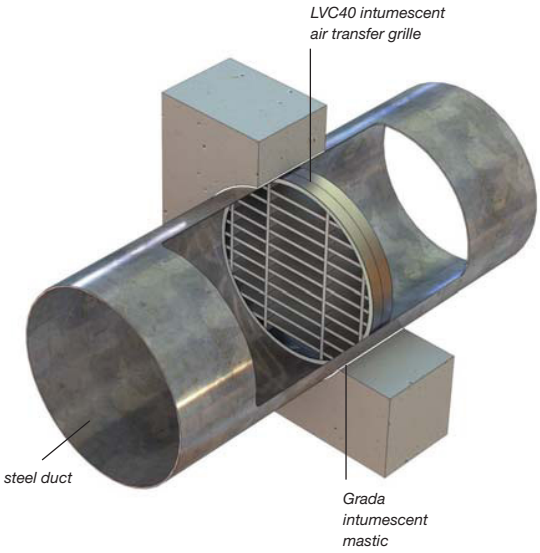
LVV40

60



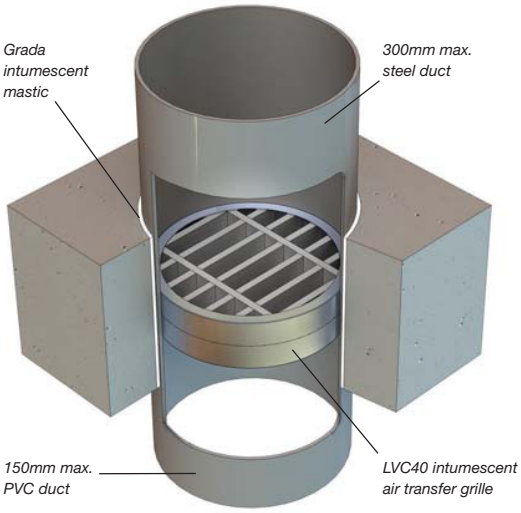
LVC40

60



LVC40

60

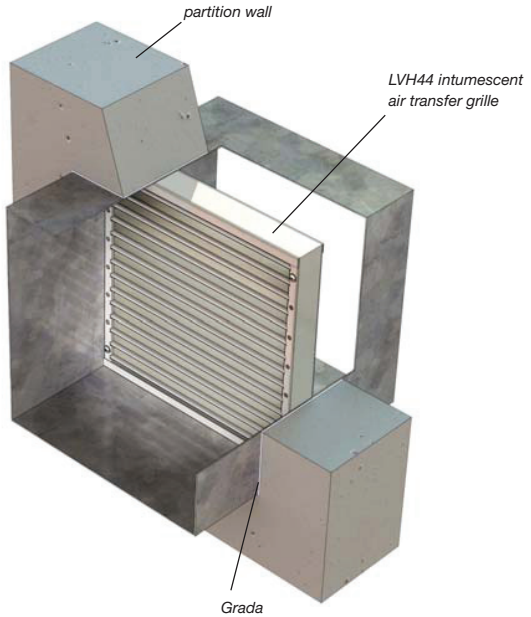


FIRE AND SMOKE DAMPERS

DUCTS - 120 to 240 Minutes

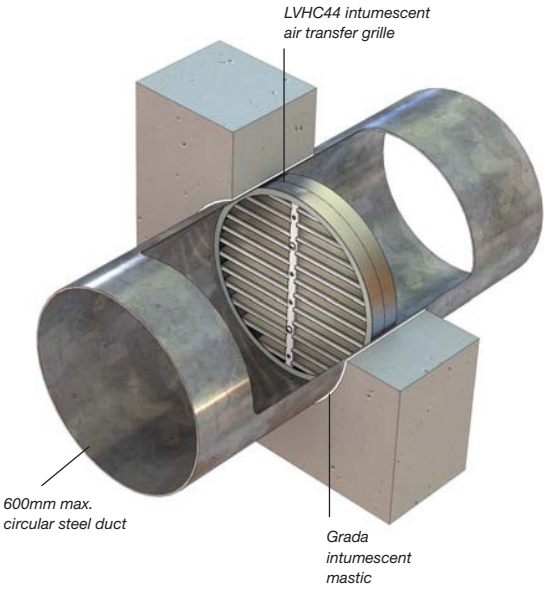
LVH44

120 180



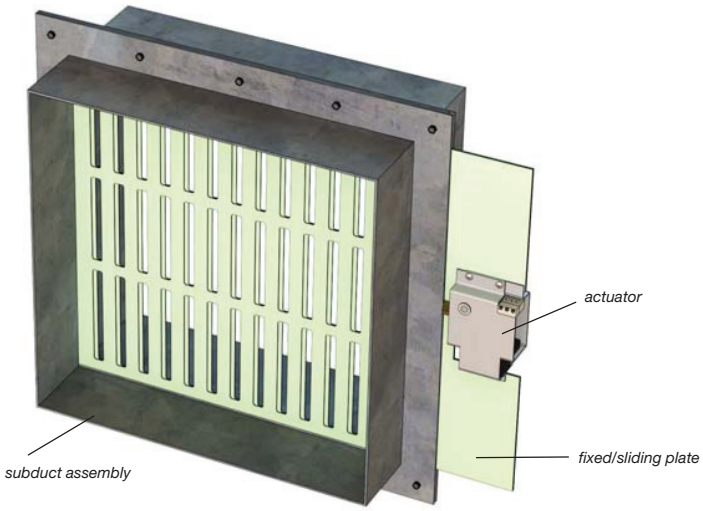
LVHC44

120



LVHCTD

240

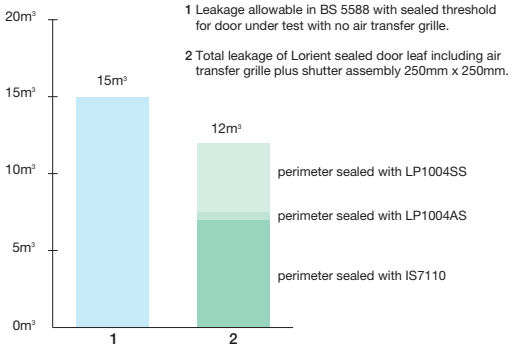


Performance

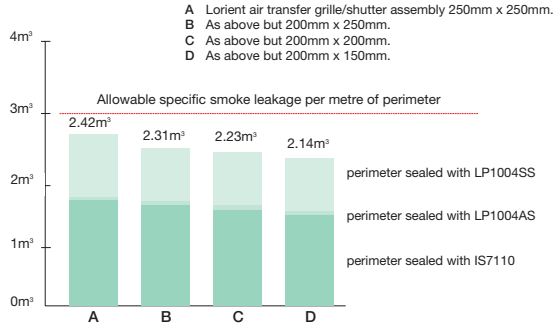
The dampers are supplied factory assembled and tested. When used in conjunction with Grada fire containment intumescent air transfer grilles, tests have shown that they provide an effective barrier to fire and smoke at all temperatures.

It is therefore possible to create airways through fire resistant constructions and still meet the requirements of Building Regulations and the recommendations of BS 5588. The graphs show the estimated smoke leakage rates determined from tests carried out under the conditions of BS 476: Pt 31.1. The results have been interpolated to show the leakage rates using different sizes of damper/shutter assemblies.

Smoke leakage determined under the conditions of BS 476 Part 31.1 at a pressure differential of 25Pa. Door size 2023 x 822mm



Total smoke leakage of door leaf and damper / air transfer grille related to door perimeter



Installation

Grada provides free technical support for the design, specification and installation of its smoke control systems.

Given the importance of the protection provided, it is recommended that Grada is involved in the earliest stages of specification to ensure the most effective and economical system is specified and installed.

A comprehensive technical companion which covers the design and operation of Grada smoke control systems is available; please consult our Technical Department.