(PDH-12)

Second Fire Authority consultation request 05/02/2016

PLANNING AND BOROUGH DEVELOPMENT

DEPARTMENT OF BUILDING CONTROL, TOWN HALL, HORNTON STREET, LONDON W8 7NX

Executive Director Planning and Borough Development **Graham Stallwood**

Building Control Manager John Allen

THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Kensington & Chelsea Fire Safety Team
North West Area
169 Union Street
London
SE1 0LL

Direct Line: [redacted]
Mobile:
Facsimile:
Email: building.control@rbkc.gov.uk
Web: www.rbkc.gov.uk

05 February 2016

My ref: FP/14/03563

Please ask for: John Hoban

Dear Sir(s)

THE REGULATORY REFORM (FIRE SAFETY) ORDER 2005
THE BUILDING REGULATIONS 2010 (as amended)

PREMISES: **Grenfell Tower, Grenfell Road, LONDON, W11 1TH**
APP No: FP/14/03563 Submission 2.

I attach a copy of the LDSA/LFEPA joint consultation form giving details of proposed work under the Building Regulations.

Please inform me whether the proposed work is acceptable to you or state the variations you consider necessary. I would be grateful if this could be done within two weeks from the date of this letter. However, if this is not possible then please inform my assistant John Hoban who can be contacted on [redacted]

Yours faithfully

John Allen
Building Control Manager

Encl.
- B1 Means Of Escape Observations
- Smoke Ventilation Technical submission for Lobby Smoke Control Systems
- Drawing nos: 1309(08)100 rev 06, 1309(08)101 rev 05.

LONDON FIRE & EMERGENCY PLANNING AUTHORITY

PLANNING AND BOROUGH DEVELOPMENT

DEPARTMENT OF BUILDING CONTROL, TOWN HALL, HORNTON STREET, LONDON W8 7NX

THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA

Executive Director Planning and Borough Development **Graham Stallwood**

Head of Building Control John Allen

LDSA/ACAI/LFEPA JOINT CONSULTATION PROCEDURE
(CONSULTATION ON MEANS OF ESCAPE APPLICATION)
The Regulatory Reform (Fire safety) Order 2005 Article 45.

SECTION 1. GENERAL INFORMATION

Premises	**Grenfell Tower, Grenfell Road, LONDON, W11 1TH**
BCB Ref	FP/14/03563
Date received	05/08/2014 16:21:48
Statutory deadline	09/09/2014
BCB Case Officer	John Hoban
Direct Line: [redacted]	Mobile: [redacted]

Proposed work	New floor areas, new overcladding & windows, new heating system, reconfigured podium and entrance.
Use of premises	Residential with new boxing club
Status of building	Existing building

Agent Details
Studio E Architects Ltd
310 Linton House
Union Street
London
SE1 0LH

Applicant details
Claire Williams
KCTMO, Network Hub
First Floor, Kensal Road
London
W10 5BE

SECTION 2. MEANS OF ESCAPE IN CASE OF FIRE

IS THE PROPOSED WORK:

SIMPLE []	**STANDARD [x]**	**COMPLEX []**
(Drawings not enclosed)	(Drawings enclosed)	(Tripartite meeting requested)

ADB/BS 5588 APPLIED? YES/NO	**FIRE ENGINEERED SOLUTION?** YES
DOES THE APPLICATION COMPLY?	YES with conditions
IF NO, WHY NOT	See attached schedule / Marked up plans
DOCUMENTS USED IN ASSESSMENT	Approved Document B / Other

Other Documents used:

IS A RELAXATION BEING CONSIDERED?	**[NO]**
OR	
DOES OTHER LEGISLATION APPLY?	**[NO]**
BUILDING ACT 1984: SECTION 24/SECTION 72 (OUTER LONDON)	**[]**
LONDON BUILDING ACTS (AMEND) ACT 1939: SECTION 20 (INNER LONDON)	**[]**
LONDON BUILDING ACTS (AMEND) ACT 1939: SECTION 35 (INNER LONDON)	**[]**
PLANNING (LISTED BUILDINGS & CONSERVATION AREAS) ACT 1990	**[]**

PROPOSED DECISION UNDER B1 OR OTHER LEGISLATION

APPROVAL **[]** CONDITIONAL APPROVAL **[X]** REFUSAL **[]**

FURTHER DETAILS APPENDED? YES/NO (Not required in case of simple works?)

SECTION 3. ACTIVE FIRE FIGHTING MEASURES PROPOSED

SPRINKLER INSTALLATION	NO
SMOKE CONTROL SYSTEM	YES
AUTOMATIC FIRE DETECTION	YES
OTHER ACTIVE MEASURES Specify:	Residential smoke contol to stair lobbies.

ANY OF THE ABOVE ITEMS "TRADE OFF" MEASURES? NO

SECTION 4. OTHER LEGISLATION APPLICABLE
(BCB surveyors to liaise with appropriate section dealing with these matters)

ENTERTAINMENT LICENSING	
INDOOR SPORTS	[]
MUSIC/DANCING	[]
THEATRES ACT	[]
CINEMAS	[]
SAFETY AT SPORT GROUNDS	
DESIGNATED GROUNDS	[]
REGULATED STANDS	[]
UNDERGROUND RAILWAYS	
SECTION 12 REGS	[]
PLANNING (LISTED BUILDINGS & CONSERVATION AREAS) ACT 1990	**[]**
LOCAL FIRE SAFETY REQUIREMENTS	
Seperate consultation to follow	

SIGNED (Section 1-5) John Hoban	For BC Surveyor	05 February 2016
SIGNED (Section 1-5) Paul Hanson	For MOE Surveyor	05 February 2016

SECTION 5. FIRE BRIGADE COMMENTS

BRIGADE REF. NO
OFFICER'S NAME
TEL. NO

	SATISFACTORY	UNSATISFACTORY
MEANS OF ESCAPE	[]	[]
FIRE FIGHTING ACCESS	[]	[]

Comments:

_____
_____
_____
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_____
_____
_____
_____

OTHER LEGISLATION KNOWN TO BE APPLICABLE
(For which the Brigade has either a consultative or enforcement interest)

GAMING ACTS 1968	YES/NO
PETROLEUM (CONSOLIDATION) ACT 1928	YES/NO
LICENSING ACT 1964	YES/NO
PLANNING (LISTED BUILDINGS & CONSERVATION AREAS) ACT 1990	YES/NO
OTHER (specify)_____	YES/NO

SIGNED _____ (For LFEPA) Date

FORM 53

MEMORANDUM

To: John Hoban
cc:

From: Paul Hanson
Dated: 26/1/2016

B1 - MEANS OF ESCAPE OBSERVATIONS

PREMISES: Grenfell Tower, Grenfell Road
APP No: Submission 2
SUBMISSION No: S2
DRAWING No: 1279 SEA (08) 101 Rev 05 - Fire Strategy, and 1279 SEA (08) 100 Rev 06 - Fire Access
(J S Wright & Co Limited Smoke Ventilation Technical submission PSBUK1143-12 rev 3 12th June 2015 (for submission S1a)

Please also refer to marked up plans RBKC S1 where comments are added to the above plans.

I make the following comments using Approved Document B and, where appropriate, BS 9991.

Fire authority consultation

The scheme has previously been sent for consultation, this was at the stage before the new powered ventilation system was proposed.

Although the details of the powered ventilation system was sent in separately, we have decided to combine that submission with your current revised drawings to the fire authority and will forward any comments received.

Background

The scheme involves an existing building comprising residential flats with a single stairway, protected by common lobbies with a powered ventilation system intended to protect the stairway. The powered vent system appears to be an early hybrid push pull system, which appears to have powered extract. This system is to be removed.

A new powered ventilation system has been proposed (as detailed in J S Wright & Co Limited Smoke Ventilation Technical submission PSBUK1143-12 rev 3 12th June 2015) and is considered satisfactory subject to comments given later (originally covered by RBKC's observations for submission 1a) and is repeated in these observations for completeness.

The proposal involves the rerouting of the final exit from the single stairway and RBKC have negotiated with the design team to ensure the stairway remains with ventilated lobby protection up to the final exit.

Additional residential use at lower levels
The refurbishment involves a floor at a lower level (Walkway +1) with a change of use to residential accommodation and one residential flat at the level below, this known as 'walkway level' although it is a normal enclosed floor). This is protected by the powered ventilation system.

New non residential access to residential stairway
There is also a new Boxing club connecting to the single stairway at 'Walkway level' and small office accommodation at ground level. RBKC have previously agreed with the fire consultants to provide a 0.4m² natural ventilated lobby connections to the single stair and these uses. This submission proposed to use the residential ventilation system for the boxing club. This would be acceptable in principle provided that the fire loading in the boxing club is compatible with a residential type use.

Regulatory Reform Fire safety order
As you are aware, the building regulations deal with the building work proposed in an existing building and are limited to ensuring that no adverse affect takes place to any exiting situation (and that any new work complies with the regulations). Therefore the regulations would not consider whether the existing building would comply with the Regulatory Reform (Fire Safety) Order (RRO).

Comments for Client

The following comments should be read in conjunction with the marked up plans noted as S1.

1. Upper storey powered ventilation system

The proposals outlined in the Smoke Ventilation Technical submission PSBUK1143-12 rev 3 are satisfactory.

1. I note that there is the intention to bring the ventilation system down to also serves the existing ground level lobby adjacent to the lifts and switch room.

2. Final details of the key switch arrangements should be submitted when finalised.

3. Generally the components of the system should conform to the Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Flats and Maisonettes) Revision 1: June 2012 listed in section 11.3.

2. Access to the Boxing club at 'walkway level' and office use at Ground level

No objection is raised in principle to the lobby connection with the non-residential uses via the powered ventilation system provided that the fire loading in the boxing club is compatible with a residential type use.

In the case of the meeting room connecting with the horizontal escape from the residential units at Mezzanine level. It is noted a lobby is provided to separate the room from the horizontal route from the residential use at the same level.

3. Service risers opening in to stairway

Due to the reconfiguration of the stair and lobbies, some riser shafts open directly in to the stairway. This arrangement should be avoided. Is access to the risers necessary at this level (see marked up plans with symbol 'A' for these areas). Access to common lobbies is acceptable as identified by symbol 'B'.

Further to meeting on site it is understood that the riser shafts either side of the lifts are existing and may not be enclosed with fire resisting construction. There are no powers under the building regulations to require the existing shaft to be protected, however consideration should, be given to their suitability under the *Regulatory Reform (Fire Safety) Order (RRO) and it is recommended a fire risk assessor be consulted to ensure this legislation be being complied with.*

4. Marked up plans

For further comments see marked up plans RBKC S2.

Note in the inner halls to the flats, cupboards are not shown to be enclosed with fire resisting construction with FD 20 doors.

5. Further details

Details in respect to the following should be submitted: -

a. Please confirm the extent of the building work at roof level.

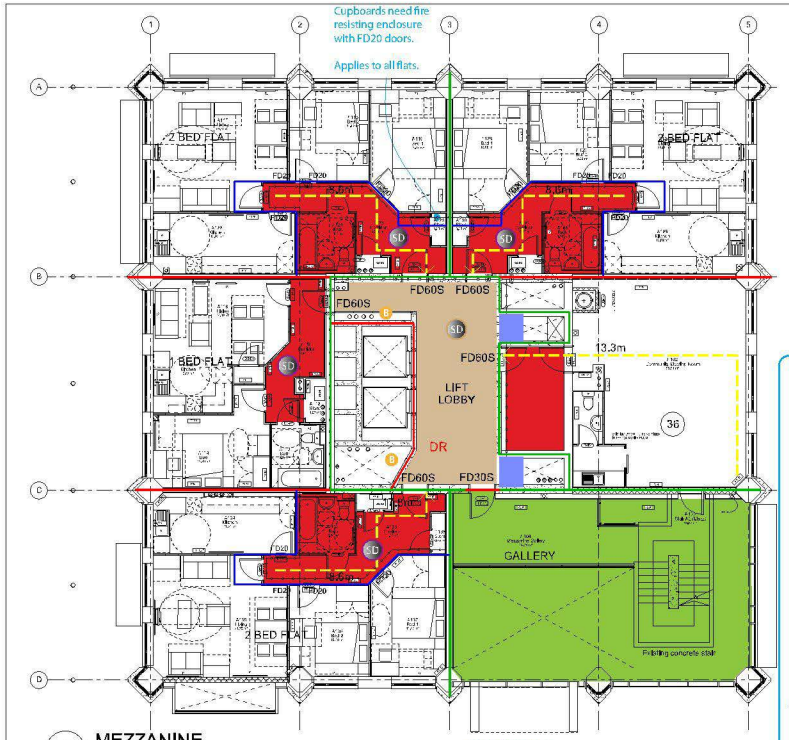
b. Escape lighting showing compliance with BS 5266 Part 1.

c. Fire alarm system showing compliance with BS 5839 Part 1 in respect to the common parts and BS 5839 Part 6 for the fire alarm system within the flats.

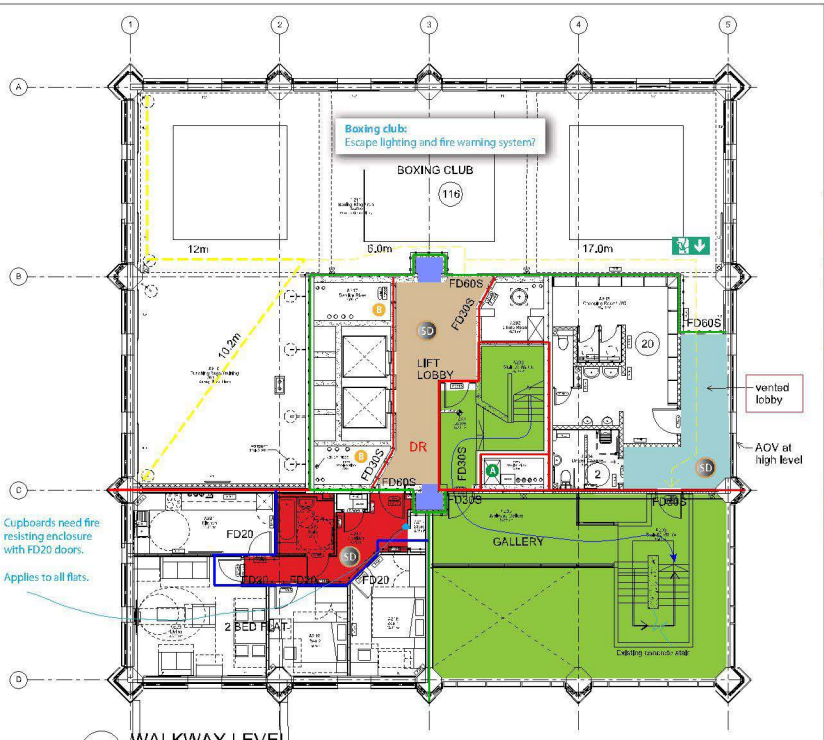
d. Mechanical ventilation showing compliance with BS 5588-9 or BS 9999.

e. Fire signage-showing compliance with BS5499 Part 1 (or BSEN 7010).

f. Confirmation of arrangements for alternative power supplies to life safety systems.

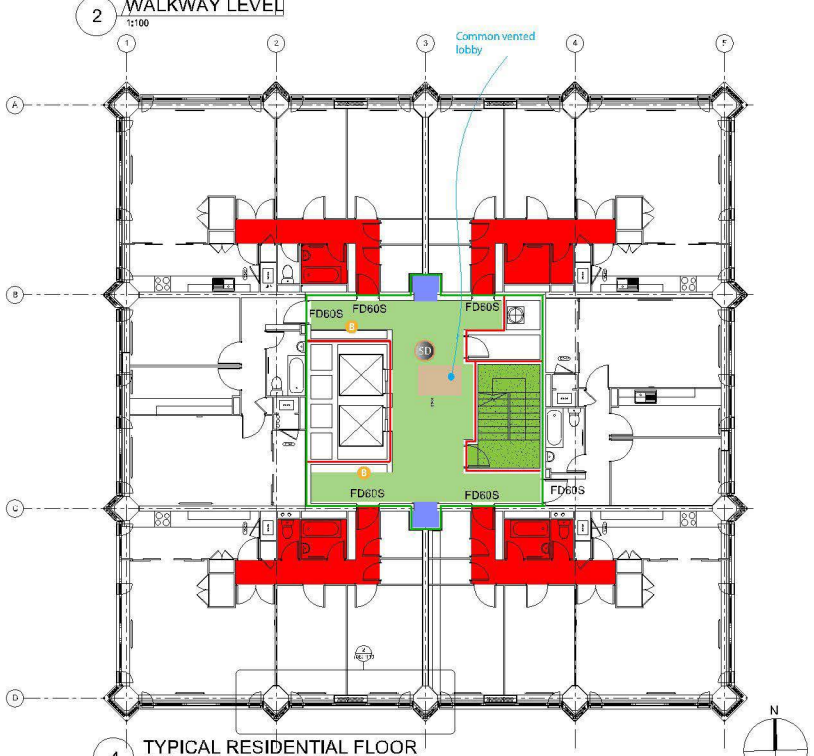


1 MEZZANINE 1:100



2 WALKWAY LEVEL 1:100

3 WALKWAY +1 (new resi) 1:100



4 TYPICAL RESIDENTIAL FLOOR 1:100

Protected Stairway
Fire resisting enclosure with FD30S doors
Doors on escape routes provided with simple fastenings - without the use of a key

Common Lobbies
Fire resisting enclosure with FD60S doors
New Powered ventilation system.
See J S Wright & Co Limited Smoke Ventilation Technical submission PSBUK1143-12 rev 3

Doors on escape routes provided with simple fastenings - without the use of a key

Common Lobbies accessing non residential uses
Fire resisting enclosure with FD60S doors

Natural vent 0.4m².

Doors on escape routes provided with simple fastenings - without the use of a key

Inner Hall
Fire resisting enclosure with FD20 doors
SD provided for flat warning (not interlinked between flats)
System complying with BS 5839-6 Grade D Category LD3

Risers accessed from Stairway (A)
Access should not be provided to services from the single stairway. (Hot and cold water/dry riser services are acceptable in metal pipes with suitable fire stopping). (Note in the existing building these risers were in the lobby). Can these access panels be sealed at this level?

Risers accessed from common Lobbies (B)
Fire resistance should be achieved from the riser side of the enclosure. Access to services from the lobby should be via an FD30S with 'Fire Door Keep Locked Shut' signage.

This affects any new work. Regulatory Reform (Fire Safety) Order should be considered for existing situations.

Smoke Detection
System complying with BS 5839-1 (SD)

To activate powered vent and natural vent systems

Smoke Detection
System complying with BS 5839-6 Grade D Category LD3 (SD)

Exit signs
To BS 5499: Part 1 or BSEN 7010 and sized to BS 5499: Part 4

NOTE

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4. WHERE DISCREPANCIES EXIST BETWEEN REFERENCE OR ASSEMBLY DRAWINGS & DETAIL DRAWINGS, THE LATTER TAKE PRECEDENCE.

KEY

- 30 minute rated construction line
- 60 minute rated construction line
- 120 minute rated construction line
- Final Exit
- Escape route in one direction
- Escape route in multiple directions
- 1hr Fire Curtain
- DR Dry Riser
- 32 Room Occupancy
- AOV vented lobby
- Mech vented lobby (re-used ducts)
- Mech vented lobby (existing ducts extended down)

RBKC MOE - S2
Comments in blue by RBKC Building control

05	11/01/16	Scheme Updated
04	23/02/15	Scheme Updated
03	13/02/15	Scheme Updated
02	10/11/14	Scheme Updated
01	24/10/14	Scheme Updated

jags

FOR CONSTRUCTION

STUDIO E ARCHITECTS LTD

510 Linton House, 164-180 Union Street London SE1 0LH

JAMES ALLEN'S COMMUNITY MUSIC CENTRE
JAMES ALLEN'S GIRLS' SCHOOL
PROJECT

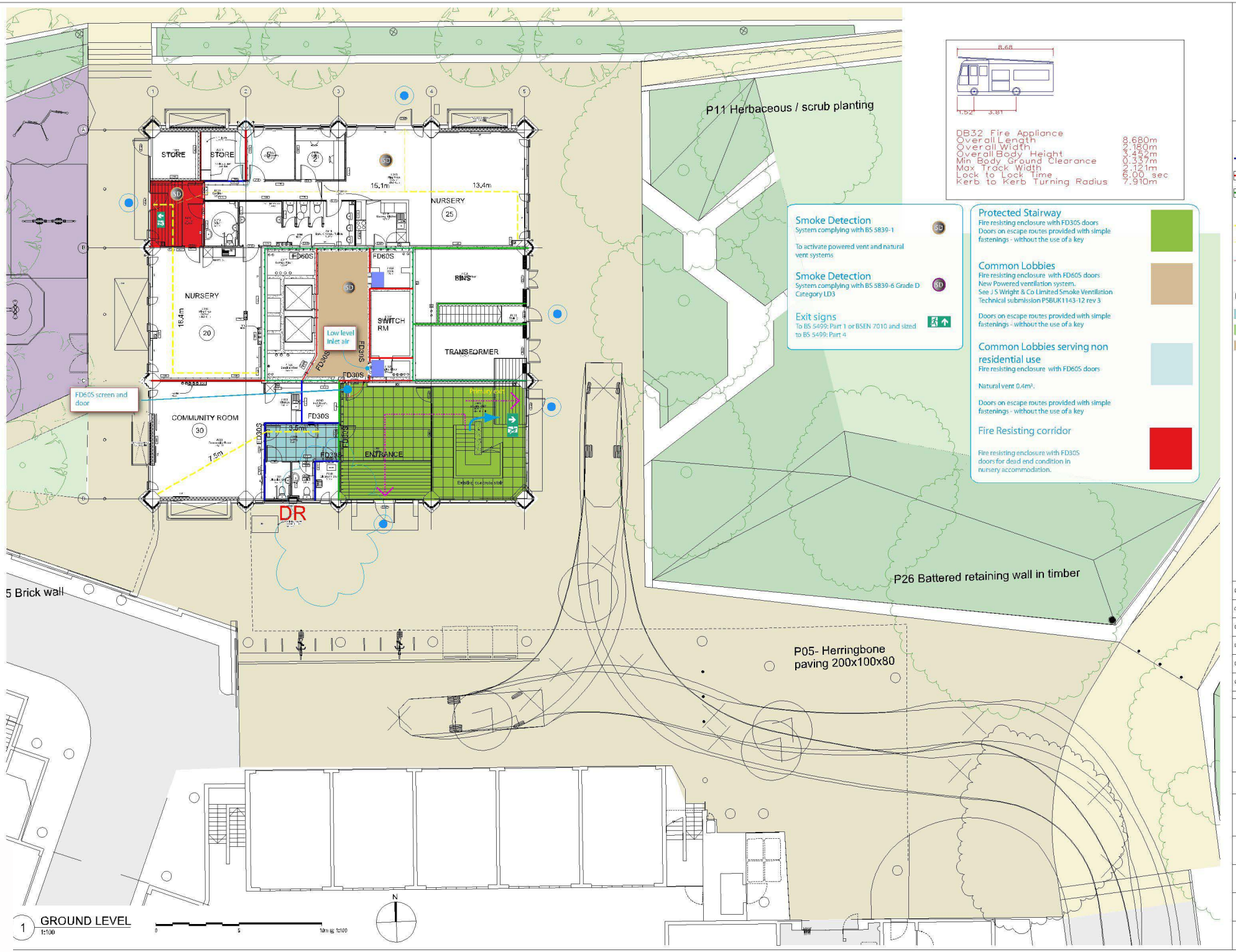
FIRE STRATEGY
DRAWING

1:100@A1 24/10/13
SCALE DATE

1309 (08) 101 05 BS
DWG. NO. REVISION CHECKED

RBK00033897/11

RBK00033897_0011



8.68
1.52
3.81

DB32 Fire Appliance

Overall Length	8.680m
Overall Width	2.150m
Overall Body Height	3.452m
Min Body Ground Clearance	0.337m
Max Track Width	2.121m
Lock to Lock Time	6.00 sec
Kerb to Kerb Turning Radius	7.910m

Smoke Detection
System complying with BS 5839-1

To activate powered vent and natural vent systems

Smoke Detection
System complying with BS 5839-6 Grade D Category LD3

Exit signs
To BS 5499: Part 1 or BSEN 7010 and sized to BS 5499: Part 4

Protected Stairway
Fire resisting enclosure with FD30S doors
Doors on escape routes provided with simple fastenings - without the use of a key

Common Lobbies
Fire resisting enclosure with FD60S doors
New Powered ventilation system.
See J S Wright & Co Limited Smoke Ventilation Technical submission PSBUK1143-12 rev 3

Doors on escape routes provided with simple fastenings - without the use of a key

Common Lobbies serving non residential use
Fire resisting enclosure with FD60S doors

Natural vent 0.4m².

Doors on escape routes provided with simple fastenings - without the use of a key

Fire Resisting corridor

Fire resisting enclosure with FD30S doors for dead end condition in nursery accommodation.

NOTE

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3. WHERE ANY DISCREPANCIES ARE FOUND BETWEEN DIMENSIONS THESE MUST BE BROUGHT TO THE ATTENTION OF THE ARCHITECTS FOR RESOLUTION.
4. WHERE DISCREPANCIES EXIST BETWEEN REFERENCE OR ASSEMBLY DRAWINGS & DETAIL DRAWINGS, THE LATTER TAKE PRECEDENCE.

KEY

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- 60 minute rated construction line
- 120 minute rated construction line
- Final Exit
- Escape route in one direction
- Escape route in multiple directions
- 1hr Fire Curtain
- DR Dry Riser
- 32 Room Occupancy
- AOV vented lobby
- Mech vented lobby (re-used ducts)
- Mech vented lobby (existing ducts extended down)

RBKC MOE - S2
Comments in blue by RBKC Building control

06	11/01/16	Scheme Updated
05	23/02/15	Scheme Updated
04	13/02/15	Scheme Updated
03	10/11/14	Store Area Corrected
02	10/11/14	Scheme Update
01	24/10/14	Scheme Update

jags

FOR CONSTRUCTION

STUDIO E ARCHITECTS LTD
510 Linton House, 164-180 Union Street London SE1 0LH

JAMES ALLEN'S COMMUNITY MUSIC CENTRE
JAMES ALLEN'S GIRLS' SCHOOL
PROJECT

FIRE ACCESS PLAN
DRAWING

1:100@A1 — SCALE
24/10/13 — DATE

1309 (08)100 — DWG. NO.
06 — REVISION
BS — CHECKED

RBK00033897/12

RBK00033897_0012

Smoke Ventilation Technical submission

For

Lobby Smoke Control Systems

at

Grenfell Tower Apartments, London

Revision History

Rev	Details	Author	Date	Appr
0	Issued for Approval	HMM	12/11/2014	HMM
1	Incorporation of Phase 2 details	HMM	1/12/2014	HMM
2	Item Fan Cables to FP600	HMM	14/04/2015	HMM
2	Item 2.2 change to Natural air inlet Ventilator	HMM	14/04/2015	HMM
2	Item 3.1 Fan selection changed	HMM	14/04/2015	HMM
3	Paragraph removed from 1.1.2	HMM	12/06/2015	HMM

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

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RBK00033897/14
RBK00033897_0014

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

1.0 Lobby Smoke Control Systems

1.1 Base Documents

This Technical Submission is based in part upon the following documentation:

- Drawing Numbers
    1. 1279 (04) 101 Revision 05, 1279 (04) 102 Revision 05, 1279 (04) 103 Revision 05, 1279 (04) 105 Revision 01, 11279(08)100, Revision 01 279(08)101Revision 01
- Specification
    1. Max Fordham Employers Requirements for MEP Services Document J4350 dated 16th October 2013.
    2. Max Fordham Grenfell Tower Smoke Ventilation Analysis Rev A dated 6th May 2014

1.1.1 Description of the Project

The building is an existing tower block with 20 storeys of residential accommodation on top of a podium containing new residential accommodation, offices, a nursery and a boxing club.
The general scope of the project is:

- Recladding of the façade
- Reconfiguration of the podium levels to provide additional residential accommodation
- Relocation and refurbishment of the nursery
- Relocation and refurbishment of the boxing club
- Provision of new office space and meeting rooms
- Modifications to the MEP systems.

It is noted that a key factor for this for this project is that the tenants will remain in occupation throughout the installation and it is essential for all basic services to remain functional at all times apart from pre-agreed interruptions.

1.1.2 Smoke Control Proposals

The Final smoke control system has been designed to provide the existing stairwell with protection from the ingress of smoke, from a fire within a dwelling, by means of a mechanical extract system. The system has been designed to provide an average open door velocity, across an open lobby/stairwell door of 2.0m/s. This velocity is in accordance with the recommendation for a Class B pressure differential system as defined in Code of Practice BSEN12101 Part 6: Specification for pressure differential systems — Kits. (BSEN12101-6)

The smoke control measures in the lobby areas will be implemented in two phases. Phase 1 will be to re-instate the natural smoke ventilation system consisting, of two natural smoke extract shafts and two natural air inlet shafts, with new motorised dampers in each lobby complete with a Programmable Logic Control System (PLC)

The PLC control system will have links to the new fire alarm system to provide an initiating signal (one signal per floor). Once a signal is received all the dampers (extract and inlet air) in the smoke affected lobby will open and all dampers on other floors are to remain closed.

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

A human Mechanical Interface Panel (HMI) will be located within the entrance area to provide the fire and rescue service with a central override facility to close all dampers in a single operation.

Each ventilated lobby will be provided with a key override, switch located within the stairwell, at each storey level providing the Fire and Rescue service with a local override facility to open the dampers on any one floor.

Once one switch has been activated to open the dampers on a given floor then all other floor switches will be locked out. Once the activated switch is returned to its original position another floor can be activated.

Phase 2 will include ductwork alterations to connect all the existing supply air and smoke extract ducts into one extract section into which will be incorporate a pair of smoke extract fans mounted, in series, to provide a duty and standby mechanical smoke extract facility.

The control system will also have pressure sensors added into each ventilated lobby to control the speed of the fans to ensure that when the doors on the escape route are closed that the opening force on the door does not exceed 100N as detailed IN BSEN12101-6

- **Phase 1 Natural Smoke**
  The existing fresh air and extract shafts are to be retained and converted to provide a natural low level air inlet and high level natural smoke extract.
  Both the inlet air and smoke extract shafts will utilise the existing dual openings at each storey level. i.e. there will be two high level smoke extract ventilator openings and two low level fresh air ventilators, opening into the respective shafts.
  Each of the four openings will be provided with a motorised damper grille assembly utilising a new damper unit and re-using the existing steel grille.
  Each lobby will have a smoke detector linked back to the control system to provide an automatic initiating signal.
  When smoke is detected within a lobby area only the ventilators within the lobby area are to operate and the ventilators on the other storey levels are all to remain closed.
  Each lobby will have a local key operated two position fire override switch (auto/open) this will be mounted within the stairwell at each storey landing.
  The system will have a PLC driven central control system with an individual control outstation module located at each storey level. All control and power cabling will be taken to and from the outstation to the smoke control system components on the individual floor.
  A data and power cable will be daisy chain linked throughout the height of the building to link all the control modules to form an integrated system.
  An HMI override panel will be installed in a position agreed with the approving authority which will enable the Fire and Rescue service to turn the system off. Once the system has been turned off the individual floor override switches can be used to open the dampers on any one floor. Once the key switch has been activated on one floor it will not be possible to open the dampers on another floor until the first activated switch is returned to the auto position i.e. once one floor is activated all other floors are locked out and all other dampers will remain closed.
  All cables are to be run in fire rated cables.

A battery backup module will provide 72 hours secondary power supply to the system.
The existing smoke extract fans are to be removed and a new section of ductwork installed.
The existing fresh air shaft is to be extended through the plant room to an external wall and an automatic opening smoke ventilator will be fitted as a weathered discharge.
On completion of all works the system will be fully tested, commissioned and left in standby auto-position, ready for operation.

2. Phase 2 Mechanical Smoke Extract

At a pre-determined date phase two will be implemented to convert the system into a fully mechanical extract system with a new smoke extract run and standby fan set and fan starter panel with inverter drives to vary the speed of the extract fans. Pressure sensors will be fitted on each storey level to measure the pressure differential across the stair/lobby door. The system will be designed to provide low speed trickle ventilation when the lobby doors are closed and to provide high speed ventilation when the door is open.
The speed of the fans will be varied in accordance with the pressure readings so that the opening force on the closed lobby door does not exceed 100N and when the door is open air will be drawn through the open door at an average rate of 2.0m/s to provide smoke control protection of the stairwell.
A by-pass damper arrangement to allow a separate environmental fan system to be linked to the smoke shafts to provided day to day ventilation of the lobbies.
The method for testing the open door velocity and the opening forces on the door will be as detailed in BSEN12101-6 code of practice for pressure differential systems.
The new mechanical system will incorporate the phase 1 dampers and controls and the PLC control will be re-programmed to work as an integrated part of the mechanical system.
All of the works associated with the mechanical system will be completed, tested and proven prior to the final link being made to the natural smoke shaft so that the building is left unprotected for the minimum time period.
Once the final link has been made the fully integrated system will be commissioned, including re-testing of the original damper assemblies.
It should be noted that the mechanical systems will operate as follows:

- Smoke Extract mode: the by-pass damper assembly will shut off the connection to the environmental fan system and all four dampers in the lobby open, to extract air from the lobby through all four openings. Make up air will be provided via the open lobby door.
- Environmental Mode: the by-pass damper assembly will open and shut off the smoke extract fan set and isolate the two shafts. One shaft will act as an environmental extract shaft and the other will act as a fresh air make up shaft.

The newly installed vertical fresh air make up inlet ventilator within the plant room wall will be removed and the ductwork opening blanked off. The existing fresh air riser and smoke extract builderswork risers will be connected together using galvanised smoke ductwork and fed to a single extract fan set as described above. i.e. all four existing builderswork shafts will all be used as part of the smoke control extraction system.

A separate technical submission will be provided for phase 2 environmental systems which are linked to the smoke control system.

2.0 Phase 1 Equipment and Controls

2.1 Automatic Lobby Ventilators

Product: Gilberts Series 54 Damper

Location: Existing Lobbies

QTY	CODE	CONSTRUCTION	FLANGE LENGTH	FLANGE WIDTH	OPENING LENGTH	OPENING WIDTH	FLANGE TYPE	CONTROLS	
80	SSE	GALVANISED STEEL	637	337	600MM (L)	300MM (W)	SELF	24V	

Damper

Type:	SSE 300 X 600
Number of Blades:	N/A
Construction of Blades:	Galvanisd steel
Opening Height:	600
Opening width:	300
Flange length:	637
Flange width:	337
Flange Type:	Self
Base Type:	N/A
Controls:	MS Control 24v

Grille	Existing
Type	Punched
Construction	Steel

Colour:	Existing
Certification:	Damper section tested to EN1366 Pt2 Fire resistance test for service

	installtions Part 2 Fire Dampers	

Note: the damper motor is accessed for maintenance by removing the grille.

2.2 Natural Air Inlet Ventilator

Product: Existing Penthouse Louvre.

Location: Roof Opening Over Stairwell.

The existing penthouse louvre is to be checked to ensure it has a minimum measured free area of 1.0m^2 and if area requirement is met the unit is to be retained. Retained.

Should the existing unit not have sufficient free area it is to be replaced with a new unit with a minimum free area of 1.0m^2.

2.3 Control System

2.3.1 Control System Philosophy Statement

The control system will be an intelligent PLC based modular control system using a network for operation of filed hardware and Ethernet communications network for the HMI user interfaces.
The control system will consist of the following components:

- Master smoke control panel with PLC
- HMI override panel
- Outstation module panels (one per ventilated lobby)
- Smoke detector (one per ventilated lobby)
- Override switch, configured auto/open (one per ventilated lobby, located within the stairwell)

The control philosophy is as follows:-
Upon smoke being detected in any of a firefighting lobby the following events shall occur:-

- The AOV's into the natural extract shafts serving the lobby in which the smoke was detected shall open.
- The AOV's into the natural air supply shafts serving the lobby in which the smoke was detected shall open.
- The wall mounted fresh air damper in the external wall opens.
- All other floors will be electrically isolated to prevent them from being opened to maintain separation and smoke contamination of the other floors.
- In the event of failure of the primary supply the battery backup panel will provide a power secondary supply.
- Indication on the mimic repeater panel and main control panels shall indicate the core & floor on which the alarm has been triggered.
- If the HMI override is activated i.e. shut system down all open dampers will close. The dampers on any given floor can be then opened using the local key override switch. Once a single switch has been turned to open all other switches, on the other floors, will be locked out.
- The above sequence shall also be executed if the manual overrides are operated on any level or by the master control panel.

Upon reset of the fire alarm or by override selection:-

- The AOV's into the builders work extract shaft serving the lobby shall close automatically.
- The AOV's into the builders work inlet air shaft serving the lobby shall close automatically
- The status on the indication panels shall return to normal.

2.3.2 Activation Mechanism

The system is triggered by smoke detectors supplied and installed by PSB. Detection within the lobby shall be provided by ceiling mounted smoke detectors. Signals from the smoke detectors will be relayed direct to the relevant smoke control systems via the local floor outstation.

2.3.3 Control Panels

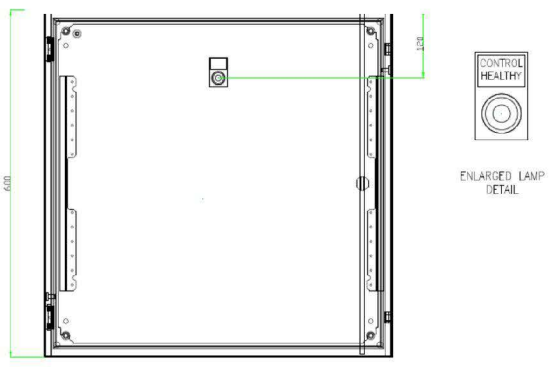
2.3.3.1 Master Smoke Control Panel

Product: PSB Right Choice Control panel size 600mm wide x 600mm high x 400mm deep

Location: Service Riser Level 1 Existing Lobby

QTY	CODE	CONSTRUCTION	HEIGHT	WIDTH	DEPTH			CONTROLS	
1	MCP	STEEL BOX	600	600	400			240VAC IN 24VDC OUT	

Type:	SMCP Master smoke control panel incorporating PLC Control system
Construction:	Steel cabinet
Height:	600
width:	600
Mounting Type:	Surface wall mounted



The master smoke control panel will be a steel wall mounted unit. The dimension of the panel will be 600mm High x 600mm Wide x 400 Deep with full PLC driven control system. The panel will be wall mounted in the electrical riser on the first floor.
The panel will have control interface wiring to the:

- Mimic HMI panel on the ground floor
- Outstation panels in electrical riser located in the lobby on each level served by the smoke control system.
- Battery backup panel one on every fifth floor

2.3.3.2 HMI Mimic Override Control Panel

Product: PSB Right Choice mimic HMI panels

Location: Local To Fire Alarm Panel (Final Location to be Agreed)

QTY	CODE	CONSTRUCTION	LENGTH	HEIGHT				CONTROLS	
1	MIMIC	PLASTIC BOX	400	300				24V	

Type:	HMI Mimic / Override panel
Construction:	Plastic cabinet with HMI Screen
width:	400
Height:	300
Mounting Type:	SURFACE

The smoke mimic control panel will be a HMI Touch screen and shall comprise of an operator dialogue terminal housed in a plastic wall mounted enclosure. The dimension of the repeater panel will be 400mm Wide x 300mm High x 150 Deep. User facilities will allow the operator to access system configuration, maintenance and testing functions and provide Fireman's override facilities through the menu driven touch screen control interface. The master mimic will communicate with each core master control panel over an Ethernet TCP/IP protocol displaying in full graphical representation status of each core with event recording accessed through the menu system.

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

RBK00033897/23
RBK00033897_0023

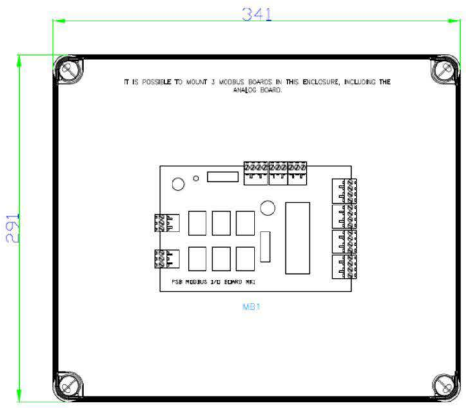
2.3.3.3 Outstation Modular Control Panel

Product: PSB Right Choice Outstation Panel

Location: Service Riser Existing Lobbies

QTY	CODE	CONSTRUCTION	LENGTH	HEIGHT				CONTROLS	
20	OUTSTATION	PLASTIC BOX	400	300				24V	

Type:	Otstation Control Module
Construction:	Plastic cabinet
width:	400
Height:	300
Mounting Type:	SURFACE



The outstation modular smoke control panel will be a steel wall mounted unit. The dimension of the panel will be 300mm High x 400mm Wide x 200 Deep. The panel will be wall mounted in the electrical riser in each of the ventilated lobbies.

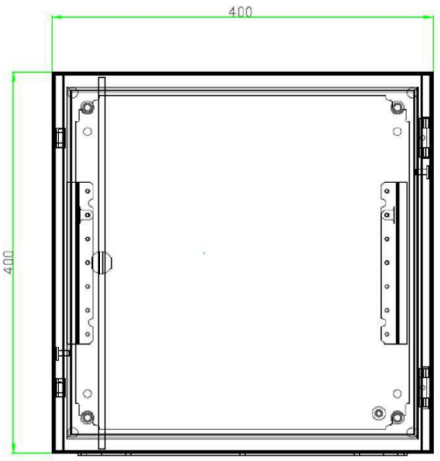
2.3.3.4 Modular Battery Backup Panel

Product: PSB Right Choice Battery Backup Panel

Location: Service Riser Existing Lobbies every 5th Floor

QTY	CODE	CONSTRUCTION	LENGTH	HEIGHT				CONTROLS	
5	BATTERY BACKUP MODULE	STEEL BOX	400	400				240VAC IN 24V DC OUT	

Type:	Otstation Control Module
Construction:	steel cabinet with H
width:	400
Height:	400
Mounting Type:	SURFACE



The battery backup smoke control panel will be a plastic wall mounted unit. The dimension of the panel will be 400mm High x 400mm Wide x 300 Deep. The panel will be wall mounted in the electrical riser on every fifth floor level within the ventilated lobbies.

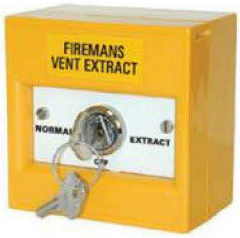
2.3.3.5 Floor Override Switches

Product: KAC Ltd Right Choice Control Override Switches

Location: Stairwell at each storey level served by the ventilation system

QTY	CODE	CONSTRUCTION						CONTROLS	
80	FOC FIRE OVERRIDE SWITCH	PLASTIC						VIA INTERFACE MODULE	

Type:	FOC
Construction :	Plastic
Mounting Flange Type:	Base fixing
Base Type:	Plastic
Colour:	Yellow



A Key operated fire override switch will be located within the stairwell for each ventilated lobby, local to the automatic lobby ventilator, these switches will be in a normal auto position allowing the ventilator to be opened when the system operates. Once the fire override switch on the mimic override panel has been activated the floor override switch will allow the fire and rescue service the facility to open the dampers.

2.3.3.6 Smoke Detector Heads

Product: Apollo Right Choice smoke detector heads

Location: Existing Lobbies

QTY	CODE	CONSTRUCTION						CONTROLS	
20	XP95	PLASTIC						VIA INTERFACE MODULE	

Type:	Apollo Optical with relay base
Construction :	Plastic
Mounting Flange Type:	Base fixing
Base Type:	Plastic
Colour:	white

2.4 Power Supplies Electrical & Control Wiring

2.4.1: Power and Control

The master control panel incorporates a facility to connect the incoming 230v Ac incoming mains supply to power the smoke control systems. (Supplied and installed as part of the electrical contractors contract).
Should the mains power fail there is provision for 72 hour power supply via battery a battery backup system.

2.4.2: Power and Control cables

The electrical wiring for the system shall be provided in fireproof cable with a CWZ classification.
Power/Controls wiring – FP200 Enhanced or equivalent.
ASI Network – FP200 Enhanced or Equivalent.
Fan Cables - FP600 Enhanced or equivalent.
COMMS - Firetuf or Equivalent.
And installed in accordance with the Electrical Wiring Regulations and BS8519.

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

3.0 Phase 2 Equipment and Controls

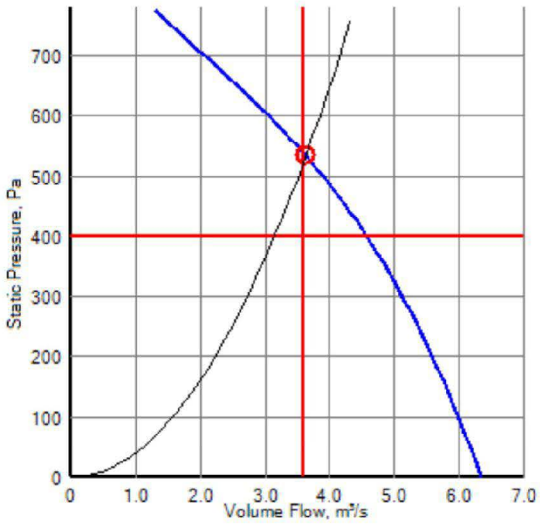
3.1. Run & Standby Extract Fan Arrangement

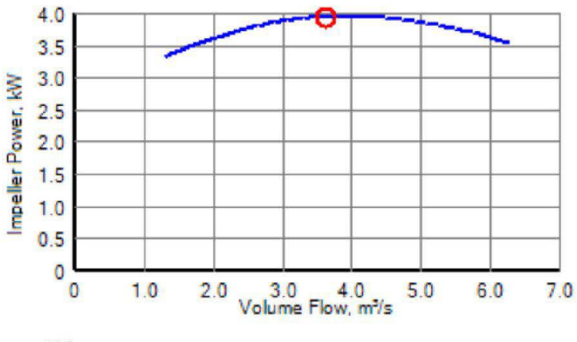
Product: **Elta Fan Type LCS063K2-A5/17RS**

Location: **Roof above Plant Room**

One set of smoke extract fans will be mounted in series on the roof of the plantroom and connect via ductwork to one of the two builders work shafts. Motorised shut off dampers will be installed in the ductwork to provide a positive shut off of the system. All dampers will be fitted 24v DC motors.
An additional fan set will be mounted on walkway level and connect to the other builderswork shaft via a run of galvanised ductwork . Motorised shut off dampers will be installed in the ductwork to provide a positive shut off of the system. All dampers will be fitted 24v DC motors.
All fans are tested to the latest internationally recognised standard IS05801 Part 1, installation category D for aerodynamic performance and BS848 Part 2 (1985) for acoustic performance. The adjustable pitch Aerofoil impeller gives the exact performance required, with a non overloading fan characteristic.
The impellers are all high pressure die cast to offer thin aerofoil sections for low generation of noise. The maximum pitch angles allow for speed control by frequency inverter. The motors are suitable for inverter speed control down to 20% of full speed. Fans are tested in compliance with high temperature test standard directive 89/106/EEC to EN 12101-3 and are rated to one off emergency operation at 300°C for 2 hour.

Fan Performance Data: **Elta Fan Type LCS063K2-A5/17RS**





Sound Data

Spectrum (Hz):	63	125	250	500	1K	2K	4K	8K	dBW	dB(A) @ 3m
Inlet (dB):	97	99	100	99	98	92	89	83	106	81
Outlet (dB):	93	97	99	97	98	94	92	85	105	81

Sound levels are quoted as in-duct values. dB(A) values are average spherical free-field for comparative use only.

RBK00033897_0028

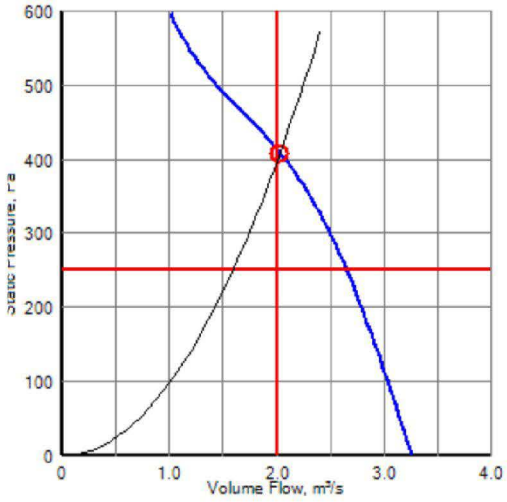
Technical Specification for PSB Lobby Smoke Control

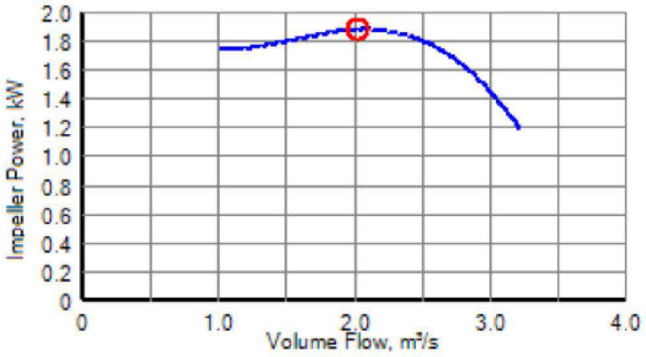
Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

Product: **Elta Fan Type LCS063K2-A5/17RS**

Location: **Walkway Level**

Fan Performance Data: **Elta Fan Type LCS050J2-A6/17RS**





Sound Data

Spectrum (Hz):	63	125	250	500	1K	2K	4K	8K	dBW	dB(A) @ 3m
Inlet (dB):	79	81	84	97	94	89	82	78	100	77
Outlet (dB):	80	81	84	96	94	89	83	79	99	77

Sound levels are quoted as in-duct values. dB(A) values are average spherical free-field for comparative use only.

RBK00033897_0029

3.1. Run & Standby Extract Fan Arrangement (cont.)

Fan Performance Data: **Elta Fan Type LCS063K2-A5/17RS**

QTY	CODE	CONSTRUCTION	FLANGE LENGTH	FLANGE WIDTH	OPENING LENGTH	OPENING WIDTH	FLANGE TYPE	CONTROLS	WINDSHIELD
2	AS BELOW	STEEL/ALUMINIUM	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Description of product / remarks:

Fan Type	**LCS630K2-A5/17RS**
Fan diameter:	630mm
Electrical Supply:	380-420volts 50Hz 3 phase
Rated Motor Power:	4.0kW
Full Load Current:	10.21 A
Starting Current:	Invertor soft start
Start type:	Invertor
Absorbed Power:	4.47kW
Peak Power:	4.52 kW
Certification:	BSEN12101-3 specification For powered heat and Smoke exhuast ventilators

Fan Performance Data: **Elta Fan Type LCS050J2-A6/17RS**

QTY	CODE	CONSTRUCTION	FLANGE LENGTH	FLANGE WIDTH	OPENING LENGTH	OPENING WIDTH	FLANGE TYPE	CONTROLS	WINDSHIELD
2	AS BELOW	STEEL/ALUMINIUM	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Description of product / remarks:

Fan Type	**LCS050J2-A6/17RS**
Fan diameter:	500mm
Electrical Supply:	380-420volts 50Hz 3 phase
Rated Motor Power:	2.0 kW
Full Load Current:	6.43 A
Starting Current:	Invertor soft start
Start type:	Invertor
Absorbed Power:	2.20 kW
Peak Power:	2.64 kW
Certification:	BSEN12101-3 specification For powered heat and Smoke exhuast ventilators

Technical Specification for PSB Lobby Smoke Control

Relation : J S Wright & Co Limited
Date : 12th June 2015
Reference : PSBUK1143-12 rev 3
Project : Grenfell Tower Appertments

3.2 Automatic Lobby Ventilators

Product: Gilberts Series 54

Location: Lobbies to Ground Floor, Walkway & Walkway Mezzanine

QTY	CODE	CONSTRUCTION	FLANGE LENGTH	FLANGE WIDTH	OPENING LENGTH	OPENING WIDTH	FLANGE TYPE	CONTROLS	
6		GALVANISED STEEL	837	637	800MM (L)	600MM (W)	SELF	24V	

Damper

Type:	SSE 600 X 800
Number of Blades:	N/A
Construction of Blades:	Galvanisd steel(black)
Opening Height:	800
Opening width:	600
Flange length:	837
Flange width:	637
Flange Type:	Self
Base Type:	N/A
Controls:	MS Control 24v
Grille Type	Gilberts K15
Construction	Extruded Aluminium
Colour:	RAL9010
Certification:	Damper section tested to EN1366 Pt2 Fire resistance test for service installtions Part 2 Fire Dampers

3.3 Mechanical Control System

The mechanical fan set will be provided with a fan starter panel incorporating inverter speed drives to control the speed of the fans between low speed (all doors closed) and high speed (door on fire floor open). The open/closed door condition will be monitored by as pressure sensor (see details below) which will measure the pressure differential between the lobby and the stairwell. The system is designed to maintain -25Pa in the lobby with all doors closed and will maintain the fans at low speed setting. Once a door to the smoke affected lobby, and only the smoke affected lobby, the pressure differential will be lost and the fans will automatically ramp up to full speed to extract air from the lobby at a rate which will pride an average face velocity of 2m/s across the open lobby / stairwell door.

The master control panel will be provided with a primary and secondary power supply in accordance with BS8519 and the power supplies are to include an auto changeover panel and by pass switch arrangement with a single mains feed connection to the fan control panel.

The panel will be linked to the master PLC control panel via a data cable taken from the top floor outstation module in the service riser within the lobby area and will therefore seamlessly link into the existing natural smoke ventilation system installed in phase 1.

The pressure sensors will be fitted at each storey level and will monitor the pressure differential between the stairwell and lobby.

The pressure sensor will have a link to the control outstations fitted at each storey level and will link back to the master control panel via the data link between each outstation.

Once the system has been initiated by the smoke detection system only the smoke affected floor will operate and all floors will be linked out. Only the pressure sensor within the smoke affected lobby can operate the system.

As the smoke shafts are to be used to provide a route for fresh air and extract air for the environmental system a set of by-pass dampers will be incorporated into the ductwork system.

During normal environmental activities the system damper to the smoke ventilation fan set will be closed and the dampers to the environmental fan sets will be open.

On receipt of a fire alarm signal the environmental system dampers will close and the damper to the smoke ventilation system will open.

On receipt of a signal from the fire alarm system all environmental controls will be overridden by the smoke control system.

The mechanical system will operate as described above for the natural system as follows:

- On alarm signal all dampers in the smoke affected lobby open (four dampers per lobby on the existing twenty floors and two dampers on the ground floor, walkway and walkway mezzanine areas)
- All other floor are locked out
- Environmental controls are locked out
- By pass dampers to environmental systems close

3.3 Mechanical Control System (cont.)

- By pass damper to the smoke extract fan set opens
- Smoke Ventilator in the stairwell opens to provide make up air path
- Smoke Extract Fans are initiated.
- Pressure sensor in smoke affected lobby active to regulate fan speed
- HMI override available
- If HMI override activated the Fan system shuts down and all dampers and stairwell ventilator will close
- If floor Override switch, in the stairwell, is turned to the on position, (when the HMI override has been activated) then the dampers on that floor will open, the stairwell ventilator will open and the fans will be initiated. Note: the override switch can be used on any one floor once the HMI override is initiated. However only one floor at a time can be activated via the override switches located in the stairwell.

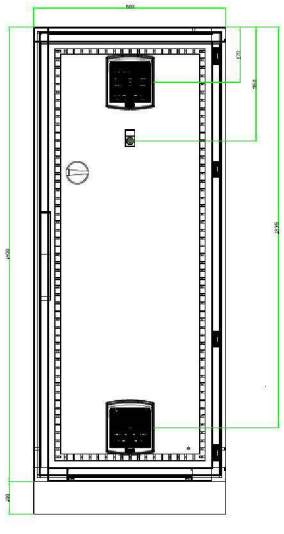
3.3.1 Fan Starter Control Panel

Product: PSB Right Choice Smart Control panel size 600mm wide x 1400mm high x 600mm deep

Location: Roof top plant room local to fan set

QTY	CODE	CONSTRUCTION	HEIGHT	WIDTH	DEPTH				
1	FSP	STEEL BOX	1400	600	600				

Type:	FSP Fan starter control panel incorporating inverter fan drives
Construction:	Steel cabinet
Height:	1400
width:	600
Mounting Type:	Surface wall mounted



The fan starter control panel will be a steel wall mounted. The dimension of the panel will be 600mm High x 1400mm Wide x 600 Deep with Macon MR5 invertor drives.
The panel will be provided with a 3 phase power supply (supplied and installed by others).

3.3.2 Pressure Sensor

Product: Control Pressure Transmitter

Location: Stairwell at every floor level piped into lobby

QTY	CODE	CONSTRUCTION						CONTROLS	
83	PA-DPS-8X	PLASTIC						VIA INTERFACE MODULE	

Type:	PA-DPS-8x Sontay Pressure sensor
Construction :	Plastic
Mounting Flange Type:	Base fixing
Base Type:	Plastic

A Pressure transmitter will be fitted within the stairwell, at high level on each storey level, and will measure the pressure differential between the stair and the smoke affected lobby. If the pre-set pressure differential is maintain the fan will run at low speed (doors closed) Should a lobby door open then pre-set pressure differential will not be able to be maintained and the fan will ramp up to full speed via inverter drive in the master control panel (open door condition) to extract a higher volumetric rate from the lobby.

3.4 By-pass Dampers

Product: BSB SC Series

Location: Walkway Environmental Fan Set and Plant Room Smoke Extract Fan Set

QTY	CODE	CONSTRUCTION	FLANGE LENGTH	FLANGE WIDTH	OPENING LENGTH	OPENING WIDTH	FLANGE TYPE	CONTROLS	
3		GALVANISED STEEL	TBA	TBA	TBA	TBA	TBA	24V	

Damper

Type:	SC TBA
Number of Blades:	TBA
Construction of Blades:	Galvanisd
Opening Height:	TBA
Opening width:	TBA
Flange length:	TBA
Flange width:	TBA
Flange Type:	Self
Base Type:	N/A
Controls:	MS Control 24v

The environmental fan sets and the smoke extract fan sets will each have a shut off/ bypass damper fitted to isolate the fan sets. The damper sizes will be provided once the final ductwork sizing and arrangement has been agreed.

4.0 Testing and Maintenance Schedule

4.1 Maintenance Statement

It is a requirement under the Regulatory Reform Order of 2005 that a person shall be responsible for the maintenance of the smoke control system and this has to be tested and maintained in accordance with the schedules contained in BS9999 as detailed below in the extracts for the mechanical smoke control system and associated smoke detection. It is also necessary to carry out maintenance in accordance with manufacturers recommendations for each component.

4.2 Testing and Maintenance Schedule From BS9999

BRITISH STANDARD BS 9999:2008

Annex V (normative) Routine inspection and maintenance of fire safety installations

V.1 General

NOTE Fire safety installations comprise the items and elements of which examples are listed in Annex J.

It is essential for the safety of the occupants of a building that fire safety equipment (including passive fire protection provisions) is inspected frequently. Although much of the inspection can be undertaken by suitably trained personnel, a formal agreement should be made with the installer or the installer's representative to provide the regular inspection and testing described in the relevant British Standards for individual fire safety installations. Unless temporary alternative fire safety systems can be put in place, it might be appropriate for certain of the inspections carried out at three-monthly or longer intervals to be done outside normal working hours.

V.2 Daily inspections

V.2.1 General

The checks described in **V.2.2** to **V.2.6** should be undertaken daily. For premises with defined opening times such as shops, theatres and cinemas, these checks should be undertaken prior to members of the public entering the building.

V.2.2 Fire detection and alarm systems

All fire detection and alarm systems should be inspected daily. In particular, it should be ensured that:

a) the control panel indicates normal operation or, if any fault is indicated, that it has been logged and the appropriate action(s) taken;

b) any fault recorded the previous day has received attention.

V.3 Weekly

V.3.1 General

In addition to the checks recommended in **V.2**, the checks described in **V.3.3** to **V.3.7** should be undertaken once a week.

V.3.2 Fire detection and alarm systems

All fire detection and alarm systems should be inspected weekly. In particular, it should be ensured that:

a) the control equipment is able to receive a fire signal and to initiate the evacuation procedure, recording which trigger device has been used, in accordance with BS 5839-1;

b) any standby batteries are in good condition and the fuel, oil and coolant levels of any standby

generators are correct, topping up as necessary;

c) the reserves of paper and ink or ribbon for any printer are adequate for two weeks' normal usage.

f) the mode monitoring system for stop valves in life safety installations is operating correctly;

g) there is continuity of connection between the alarm switch and the control unit and between the control unit and the fire and rescue service (usually via a remote manned centre) for automatically monitored connections;

h) trace heating systems provided to prevent freezing in the sprinkler system are functioning correctly.

V.3.5 Smoke control systems for means of escape

Actuation of the system should be simulated once a week. It should be ensured that any fans and powered exhaust ventilators operate correctly, smoke dampers close (or open in some systems), natural exhaust ventilators open, automatic smoke curtains move into position, etc.

V.4 Monthly

V.4.1 General

In addition to the checks recommended in **V.2** and **V.3**, the checks described in **V.4.2** to **V.4.9** should be undertaken once a month.

V.4.2 Fire detection and alarm systems

Any standby generator should be started up once a month by simulating failure of the normal power supply, and allowed to energize the system for at least 1 h, while the system is monitored for any malfunctioning caused by the use of the generator. After restoring the normal supply, the charging arrangements for the generator starting battery should be tested, and the appropriate action should be taken if they are found not to be functioning correctly. In addition, the oil and coolant levels should be topped up and the fuel tanks filled.

V.5 Three-monthly

In addition to the checks recommended in **V.2**, **V.3** and **V.4**, the actuation of all smoke control systems should be simulated once every three months. All zones should be

separately tested and it should be ensured that any fans and powered exhaust ventilators operate correctly, smoke dampers close (or open in some systems), etc.

V.6 Six-monthly

V.6.1 General

In addition to the checks recommended in **V.2**, **V.3**, **V.4** and **V.5**, the checks described in **V.6.2** and **V.6.3** should be undertaken once every six months. Arrangements should be made for six-monthly inspections and tests to be carried out by competent persons on the fire detection and alarm systems, the sprinkler systems, any extinguishing systems, the emergency and escape lighting systems and the fire-fighting lift, for any defects found to be logged and the necessary action taken, and for certificates of testing to be obtained.

V.7 Yearly

NOTE Attention is drawn to the testing and inspection requirements of BS 7671.

In addition to the checks recommended in **V.2**, **V.3**, **V.4**, **V.5** and **V.6**, arrangements should be made for annual inspections and tests of the following to be carried out by competent persons, for any defects to be logged and the necessary action taken, and for certificates of testing to be obtained:

a) fire detection and alarm systems;
b) self-contained luminaires with sealed batteries, if more than 3 years old;
c) sprinkler and drencher systems;
d) smoke ventilators and smoke control systems;
e) evacuation lifts;
f) fire-fighting lift installations;
g) fire hydrants;
h) fire mains;
i) portable fire extinguishers;
j) hose reels.

Stocks of foam concentrate or solution should be checked annually and replenished as necessary.

5.0 Appendices

5.1 Product data sheets

- Gilberts Series 54 Data Sheet
- Powrmatic OSR Data Sheet
- KAC Override Switch Data Sheet
- Apollo Smoke Detectors
- Pressure sensors
- Elta Smoke Extract Fans
- BSB Bypass dampers

osr

louvred smoke ventilators

powrmatic

expectmore

The osr range has been fully tested to BS EN 12101 Part 2: 2003 Specification for natural smoke and heat exhaust ventilators. This standard involves a series of tests determining aerodynamic free area, reliability of operation, performance under load, low temperature operation and exposure to heat.

The results of the tests on the osr range are as follows:

Test	Classification	Mode of operation
Reliability class	RE 1000	All
Snow load class	SL 500	Pneumatic
	SL 125	Electric
Low ambient temperature	T (00)	All
Wind load class	WL 1500	All
Heat exposure temperature class	B 300	All

CE

osw wall mounted version

Construction

Base assembly

- Press formed and welded 1.5mm mill finish aluminium
- Option: cladding with 0.7mm HP200 Plastisol

Sides and ends

- 1.5mm mill finish aluminium
- Option: cladding with HP200 Plastisol

Louvre blade options

- 1.5mm mill finish aluminium
- 2mm translucent double-skin polycarbonate
- Double-skin 1.5mm aluminium with 25mm polyurethane insulation
- Option: cladding with HP200 Plastisol

Louvre blade pivots

- 6mm diameter solid aluminium bearing in shouldered nylon66 bushes for maintenance-free operation

Louvre blade seals

- Polypropylene brush & pile seals

Finish options

- Mill finish aluminium
- Polyester powder paint to any British Standard or RAL colour
- Plastisol available to any standard colour

Optional accessories

- Birdguards: 1.2mm diameter galvanized wire mesh
- Security Guards: 16mm diameter mild steel bars PPC finished
- Insect Mesh: Woven aluminium
- Fusible Link Shields
- Internal Closure Pieces

Control options

- Electric: 24V DC or 230V AC
- Pneumatic
- Manual
- Thermal Release Devices: bi-metal and manual reset bimetallic switch

Note

Plastisol cladded units should not be used in smoke control applications.

Energy Saving Features

Insulation

The osr range can be supplied with both insulated louvres and insulated bodies. The comparative U-Values for the available louvre specifications are shown below:

U-Values

Louvre Specification	U-Value (W/m²/°K)
1.5mm mill finish aluminium or 0.7mm Plastisol	6.00
Double-skin aluminium with 25mm polyurethane insulation	0.56
2mm double-skin translucent polycarbonate	1.75

In addition, louvre blade edges and sides are fitted with pile weather seals to reduce heat loss.

Natural Lighting

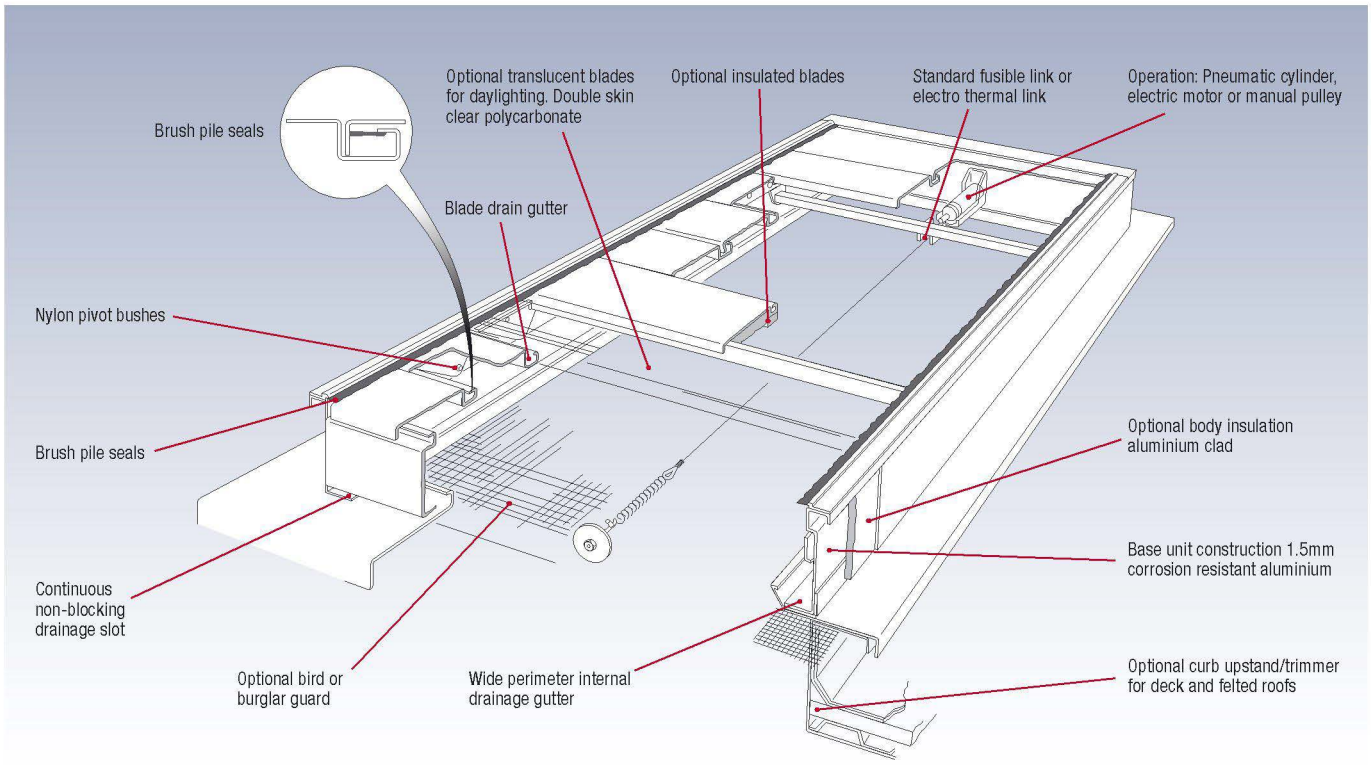
The polycarbonate louvre option provides excellent daylighting using a durable UV stabilised material.

When closed, the osr provides an average diffused light transmission in excess of 80%, enabling savings on artificial lighting.

Image courtesy of Gradwood Ltd

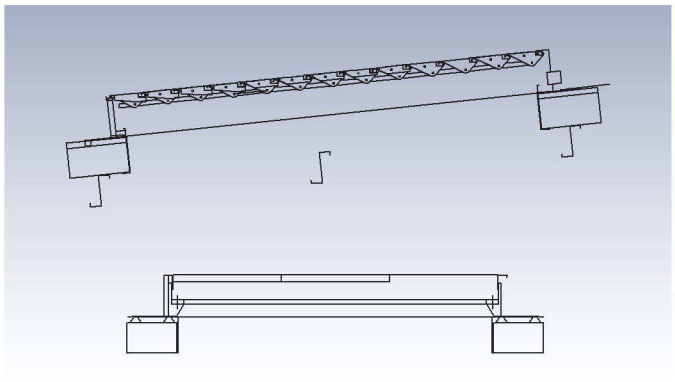
osw ventilators at Airbus, Broughton, Chester

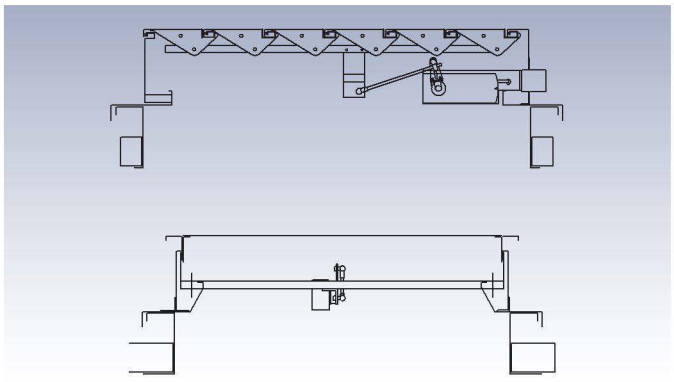
osr features and applications



Roof sheet

Roof upstand





Installation

The osr is suitable for fixing into a variety of applications. The unit is supplied in two parts to facilitate the installation procedure; the base flange and the louvre box assembly.

The ventilator can be installed:

- onto weathered roof upstands
- direct onto roof sheeting
- into roof glazing

The osw, the wall-mounted version, can be supplied without a base flange for fitting in a recessed arrangement to enable installation flush with the building line. Fixing flanges and glazing adaptors can be supplied if required.

Fixing Details

Typical fixing details are shown above for:

- Sheeted roof construction with 1800mm purlin spacing
- Roof upstand fixing

Fixing details can be provided for a variety of applications, including wall openings.

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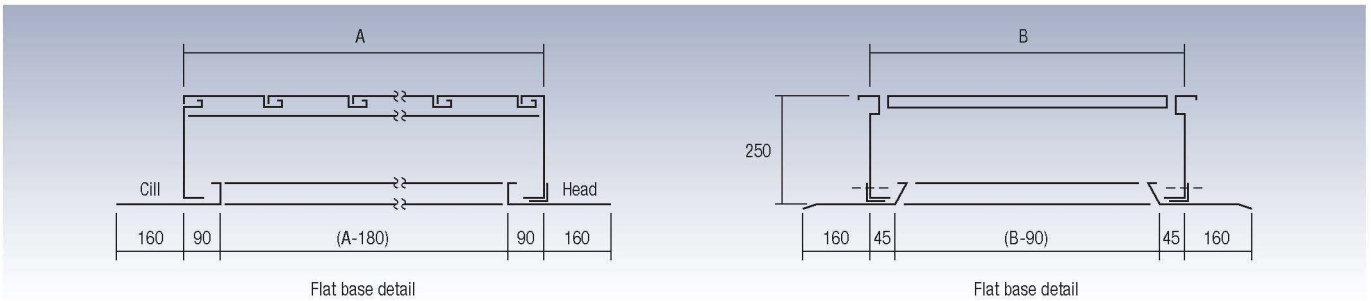
osr dimensions and weights

Free area dimensions in m²

	Width Code	05		06		07		08		09		10		11		12	
	Vent Width B (mm)	500		600		700		800		900		1000		1100		1200	
Length Code	Vent Length A (mm)	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv
04	870	0.28	0.23	0.35	0.28	0.42	0.33	0.49	0.38	0.56	0.42	0.63	0.47	0.70	0.52	0.77	0.57
05	1070	0.36	0.29	0.45	0.35	0.54	0.41	0.63	0.47	0.72	0.53	0.81	0.59	0.90	0.65	0.99	0.72
06	1270	0.45	0.35	0.56	0.42	0.66	0.49	0.77	0.56	0.88	0.63	0.99	0.70	1.10	0.77	1.21	0.85
07	1470	0.53	0.40	0.66	0.49	0.79	0.58	0.92	0.66	1.04	0.74	1.17	0.82	1.30	0.91	1.43	1.01
08	1670	0.61	0.48	0.76	0.57	0.91	0.67	1.06	0.76	1.21	0.86	1.36	0.95	1.50	1.05	1.65	1.14
09	1870	0.69	0.53	0.86	0.64	1.03	0.76	1.20	0.87	1.37	0.98	1.54	1.07	1.71	1.19	1.88	1.30
10	2070	0.77	0.60	0.96	0.72	1.15	0.84	1.34	0.96	1.53	1.08	1.72	1.20	1.91	1.32	2.01	1.47
11	2270	0.86	0.67	1.07	0.80	1.27	0.94	1.48	1.07	1.69	1.21	1.90	1.34	2.11	1.47	2.32	1.63
12	2470	0.94	0.73	1.17	0.87	1.40	1.04	1.63	1.19	1.85	1.33	2.08	1.48	2.31	1.63	2.54	1.81
13	2670	1.02	0.80	1.27	0.96	1.52	1.14	1.77	1.30	2.02	1.47	2.27	1.63	2.51	1.79	2.76	1.99
14	2870	1.10	0.88	1.37	1.05	1.64	1.23	1.91	1.40	2.18	1.58	2.45	1.78	2.72	1.96	2.99	2.14
15	3070	1.19	0.94	1.47	1.12	1.76	1.31	2.05	1.50	2.34	1.71	2.63	1.90	2.92	2.09	3.21	2.28
16	3270	1.27	1.00	1.58	1.20	1.88	1.40	2.19	1.62	2.50	1.82	2.81	2.03	3.12	2.23	3.43	2.43
17	3470	1.35	1.06	1.68	1.27	2.01	1.51	2.34	1.72	2.66	1.94	2.99	2.15	3.32	2.37	3.65	2.58

	Width Code	13		14		15		16		17		18		19		20	
	Vent Width B (mm)	1300		1400		1500		1600		1700		1800		1900		2000	
Length Code	Vent Length A (mm)	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv
04	870	0.83	0.62	0.90	0.67	0.97	0.73	1.04	0.78	1.11	0.84	1.18	0.89	1.25	0.94	1.32	0.99
05	1070	1.08	0.78	1.17	0.84	1.25	0.91	1.34	0.98	1.43	1.04	1.52	1.12	1.61	1.18	1.70	1.24
06	1270	1.32	0.92	1.43	1.00	1.54	1.09	1.65	1.16	1.76	1.23	1.86	1.33	1.97	1.40	2.08	1.47
07	1470	1.56	1.09	1.69	1.17	1.82	1.26	1.95	1.36	2.08	1.45	2.21	1.53	2.33	1.65	2.46	1.73
08	1670	1.80	1.26	1.95	1.36	2.10	1.45	2.25	1.55	2.40	1.68	2.55	1.77	2.70	1.87	2.85	2.00
09	1870	2.04	1.41	2.21	1.54	2.38	1.65	2.55	1.77	2.72	1.91	2.89	2.02	3.06	2.13	3.23	2.24
10	2070	2.29	1.59	2.48	1.71	2.66	1.86	2.85	1.99	3.04	2.11	3.23	2.27	3.42	2.40	3.61	2.53
11	2270	2.53	1.77	2.74	1.91	2.95	2.04	3.16	2.22	3.37	2.35	3.57	2.49	3.78	2.63	3.99	2.77
12	2470	2.77	1.96	3.00	2.11	3.23	2.26	3.46	2.45	3.69	2.60	3.92	2.76	4.14	2.91	4.37	3.06
13	2670	3.01	2.15	3.26	2.32	3.51	2.48	3.76	2.65	4.01	2.81	4.26	2.98	4.51	3.15	4.76	3.31
14	2870	3.25	2.31	3.52	2.49	3.79	2.67	4.06	2.85	4.33	3.02	4.60	3.20	4.87	3.38	5.14	3.56
15	3070	3.50	2.47	3.79	2.66	4.07	2.86	4.36	3.05	4.65	3.24	4.94	3.43	5.23	3.62	5.52	3.81
16	3270	3.74	2.64	4.05	2.84	4.36	3.04	4.67	3.24	4.97	3.45	5.28	3.65	5.59	3.85	5.90	4.05
17	3470	3.98	2.80	4.31	3.01	4.64	3.23	4.97	3.44	5.30	3.66	5.63	3.87	5.95	4.09	6.28	4.30

Av = Measured Free Area (m²), AvCv = Aerodynamic Free Area (m²)



Throat dimensions = (A - 180) x (B - 90)

Weights in kg

Width Code	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Length Code																
04	17.50	18.50	19.50	20.50	21.50	22.50	23.50	24.50	25.75	27.00	28.00	29.25	30.25	31.25	32.50	34.00
05	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.50	30.00	31.00	32.75	33.50	35.00	36.50	38.00
06	22.50	23.50	24.50	25.50	26.50	27.50	29.25	30.00	31.50	33.00	34.50	36.50	38.50	40.00	41.75	43.00
07	25.00	26.00	27.00	28.00	29.00	30.00	31.50	33.00	35.00	36.50	38.00	39.25	40.50	42.25	44.25	45.50
08	27.50	28.50	29.50	30.50	31.50	32.50	34.25	36.00	38.00	39.50	41.00	42.75	44.50	46.50	48.00	49.50
09	30.00	31.00	32.00	33.00	34.00	35.00	37.00	39.00	41.25	43.00	44.50	46.25	48.00	50.00	51.75	53.50
10	32.50	33.50	34.50	36.00	37.00	38.00	40.00	42.00	44.00	46.00	48.00	49.75	51.50	53.75	55.50	57.50
11	35.00	36.00	37.25	38.50	39.25	40.50	42.75	45.00	47.50	49.25	51.00	53.00	55.00	56.75	58.25	59.50
12	38.00	39.00	40.00	41.00	42.00	43.00	45.25	47.50	50.00	52.50	54.50	56.75	59.00	62.00	63.75	65.50
13	40.50	41.50	42.25	43.25	44.50	46.00	48.25	50.50	53.50	56.00	57.50	60.00	62.50	64.50	66.00	67.50
14	43.00	44.25	45.50	46.25	47.25	48.50	51.00	53.50	57.00	59.50	61.00	63.50	66.00	69.00	71.25	73.50
15	46.00	47.00	48.00	49.00	50.00	51.00	53.75	56.50	59.50	62.00	64.50	67.00	69.50	72.50	74.50	76.50
16	48.50	50.00	51.00	52.00	53.00	54.00	56.75	59.50	63.00	66.00	68.00	70.50	73.00	76.00	77.75	79.50
17	51.00	52.25	54.00	55.50	56.75	58.50	60.25	62.00	64.25	67.00	71.00	74.00	77.00	79.50	81.00	82.50

Weights are approximate and subject to type of control, louvre and vent body specification.

RBK00033897_0043

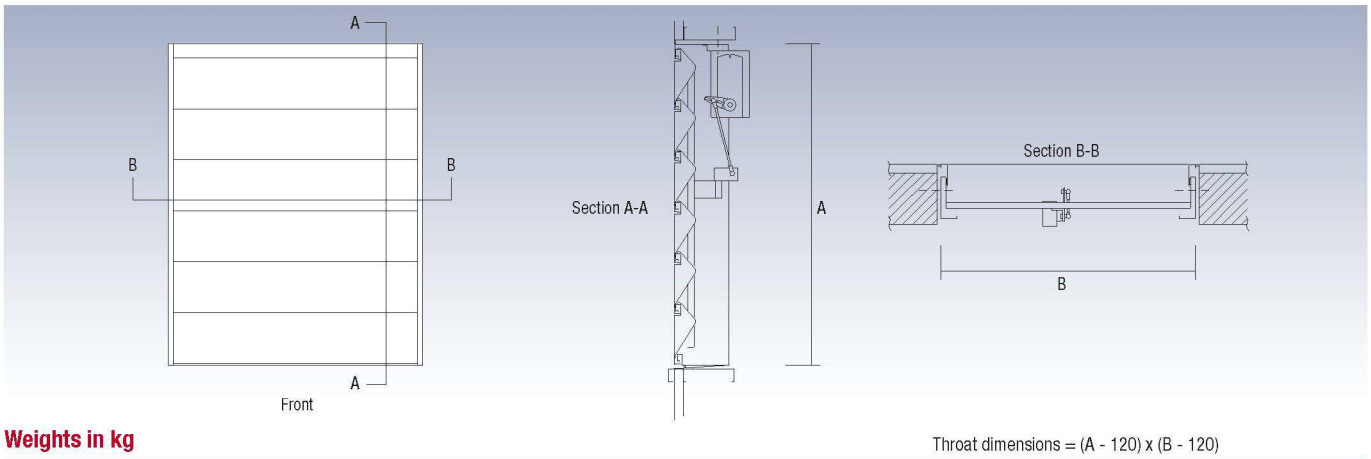
OSW dimensions and weights

Free area dimensions in m²

	Width Code	06		07		08		09		10		11		12	
	Vent Width B (mm)	600		700		800		900		1000		1100		1200	
Length Code	Vent Length A (mm)	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv
04	865	0.36	0.22	0.43	0.26	0.51	0.31	0.58	0.36	0.66	0.41	0.73	0.45	0.80	0.51
05	1065	0.45	0.28	0.55	0.33	0.64	0.40	0.74	0.46	0.83	0.52	0.93	0.58	1.02	0.64
06	1265	0.55	0.34	0.66	0.41	0.78	0.48	0.89	0.55	1.01	0.63	1.12	0.71	1.24	0.79
07	1465	0.65	0.40	0.78	0.48	0.91	0.57	1.05	0.66	1.18	0.75	1.32	0.84	1.45	0.93
08	1665	0.74	0.46	0.90	0.56	1.05	0.66	1.21	0.76	1.36	0.87	1.51	0.97	1.67	1.08
09	1865	0.84	0.52	1.01	0.63	1.19	0.75	1.36	0.86	1.54	0.98	1.71	1.11	1.88	1.22
10	2065	0.93	0.58	1.13	0.71	1.32	0.83	1.52	0.97	1.71	1.01	1.91	1.24	2.10	1.37
11	2265	1.03	0.65	1.24	0.78	1.46	0.93	1.67	1.07	1.89	1.23	2.10	1.37	2.32	1.51
12	2465	1.13	0.71	1.36	0.86	1.59	1.02	1.83	1.17	2.06	1.34	2.30	1.49	2.53	1.67
13	2665	1.22	0.77	1.48	0.94	1.73	1.11	1.99	1.29	2.24	1.46	2.49	1.65	2.75	1.81
14	2865	1.32	0.84	1.59	1.02	1.87	1.21	2.14	1.39	2.42	1.59	2.69	1.78	2.96	1.96
15	3065	1.41	0.90	1.71	1.09	2.00	1.30	2.30	1.52	2.59	1.71	2.89	1.90	3.18	2.10
16	3265	1.51	0.97	1.82	1.19	2.14	1.41	2.45	1.62	2.77	1.83	3.08	2.03	3.40	2.24
17	3465	1.61	1.03	1.94	1.26	2.27	1.50	2.61	1.72	2.94	1.94	3.28	2.16	3.61	2.38

	Width Code	13		14		15		16		17		18		19		20	
	Vent Width B (mm)	1300		1400		1500		1600		1700		1800		1900		2000	
Length Code	Vent Length A (mm)	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv	Av	AvCv
04	865	0.88	0.55	0.95	0.61	1.03	0.66	1.10	0.72	1.18	0.77	1.25	0.81	1.33	0.86	1.40	0.91
05	1065	1.12	0.71	1.21	0.77	1.30	0.85	1.40	0.91	1.49	0.97	1.59	1.05	1.68	1.11	1.78	1.17
06	1265	1.35	0.86	1.47	0.95	1.58	1.03	1.69	1.10	1.81	1.19	1.92	1.27	2.04	1.35	2.15	1.44
07	1465	1.59	1.02	1.72	1.12	1.86	1.21	1.99	1.31	2.13	1.40	2.26	1.49	2.39	1.60	2.53	1.69
08	1665	1.82	1.19	1.98	1.29	2.13	1.41	2.29	1.51	2.44	1.64	2.60	1.74	2.75	1.84	2.90	1.95
09	1865	2.06	1.34	2.23	1.47	2.41	1.59	2.58	1.73	2.76	1.85	2.93	1.96	3.11	2.08	3.28	2.23
10	2065	2.30	1.49	2.49	1.64	2.68	1.80	2.88	1.93	3.07	2.06	3.27	2.19	3.46	2.35	3.66	2.49
11	2265	2.53	1.67	2.75	1.84	2.96	1.98	3.17	2.13	3.39	2.30	3.60	2.45	3.82	2.60	4.03	2.74
12	2465	2.77	1.83	3.00	2.01	3.24	2.17	3.47	2.36	3.71	2.52	3.94	2.68	4.17	2.84	4.41	3.04
13	2665	3.00	1.98	3.26	2.18	3.51	2.39	3.77	2.56	4.02	2.73	4.28	2.91	4.53	3.13	4.78	3.30
14	2865	3.24	2.14	3.51	2.39	3.79	2.58	4.06	2.76	4.34	2.99	4.61	3.18	4.89	3.37	5.16	3.56
15	3065	3.48	2.33	3.77	2.56	4.06	2.76	4.36	3.01	4.65	3.21	4.95	3.41	5.24	3.62	5.54	3.88
16	3265	3.71	2.49	4.03	2.74	4.34	2.95	4.65	3.21	4.97	3.43	5.28	3.65	5.60	3.92	5.91	4.14
17	3465	3.95	2.64	4.28	2.91	4.62	3.14	4.95	3.42	5.29	3.65	5.62	3.93	5.95	4.17	6.29	4.40

Av = Measured Free Area (m²), AvCv = Aerodynamic Free Area (m²)



Weights in kg

Throat dimensions = (A - 120) x (B - 120)

Width Code	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Length Code																
04	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00
05	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.50	23.25	24.25	25.50	26.50	27.50	29.00	30.25	31.00
06	17.50	18.50	19.50	20.50	21.50	22.50	23.75	25.00	26.25	27.25	28.50	30.25	32.00	33.50	34.50	35.50
07	18.75	19.50	21.25	22.50	23.75	25.00	26.25	27.00	28.25	29.50	31.00	32.25	33.50	35.00	36.25	37.50
08	20.25	21.50	23.25	24.50	25.75	27.00	28.50	30.00	31.25	32.50	34.00	35.25	36.50	38.00	39.50	41.00
09	21.75	23.00	24.50	26.00	27.75	29.00	30.50	32.00	33.50	35.00	36.50	38.00	39.50	41.00	42.50	44.00
10	23.50	25.00	27.00	28.50	30.00	31.50	33.00	34.50	36.00	37.50	39.50	41.00	42.50	44.00	45.75	47.50
11	25.25	27.50	29.50	30.75	32.00	33.50	35.25	37.00	38.50	40.00	42.00	43.75	45.50	47.00	48.00	49.00
12	27.00	29.25	30.50	32.00	33.75	35.50	37.25	39.25	41.00	43.00	45.00	46.75	48.50	51.00	52.75	54.00
13	28.50	30.00	32.00	34.00	36.00	38.00	40.00	42.00	43.50	45.00	47.50	49.50	51.50	53.00	54.00	56.00
14	31.50	33.50	35.50	37.50	39.00	40.50	42.25	44.00	45.50	47.25	49.50	51.00	53.00	55.00	56.00	59.00
15	34.50	36.25	37.75	39.25	40.75	42.25	43.50	45.00	47.50	49.50	51.50	53.25	55.00	56.50	58.00	61.50
16	37.25	39.50	41.25	42.75	44.25	45.75	47.00	48.25	49.75	51.50	53.50	55.50	57.00	58.00	60.50	63.75
17	40.50	42.00	43.25	44.75	46.25	47.75	49.00	50.25	51.75	53.50	55.50	57.00	58.50	60.50	62.25	67.00

Weights are approximate and subject to type of control, louvre and vent body specification.

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Whatever your heating and ventilation requirements, powrmatic can provide a total solution from a single source.

Our experienced sales engineers provide expert advice on all aspects of design and application, with after sales service and spares availability guaranteed by our network of regional service engineers and spares stockists strategically located throughout the UK.

powrmatic offers customers the most comprehensive range of heating and ventilation solutions available in Europe. Whatever your requirements, powrmatic has the capability to provide a total solution from a single source with products proven in some of the world's most prestigious and demanding applications.

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Glass louvred ventilator. Both functional and attractive. Specifically designed for modern building requirements.

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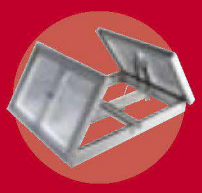
Twin flap natural ventilator. Suitable for smoke venting & featuring very low air leakage when closed.



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Indirect gas or oil fired floor standing air heaters for multiple use.

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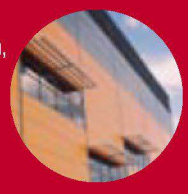

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A quality range of suspended gas fired unit heaters.

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Flue systems for domestic, commercial and industrial applications.

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Hort Bridge, Ilminster, Somerset, TA19 9PS United Kingdom
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www.powrmatic.co.uk

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Designed and produced by **Lionheart** www.lionheart.co.uk

ISO 9001 25574

Indoor Specialist Activation Devices

Keyswitch model

> Product Benefits

- Variety of keyswitch devices avaialable
- Suitable for Fire, Security & Other Specialist Applications
- Variety of colours and markings

Product Overview

The KAC Class 9000 range of devices provides you with the most comprehensive range of switching product solutions for fire, security and other specialist applications.

All products comprise a main housing and escutcheon plate. The switching device is fitted to the plate, which simply snaps into the main housing and is permanently located in place by fixing screws.

As with our market leading range of call points, all switching devices can be supplied in our core colours of red, green, white, yellow and blue. There are also numerous function marking options available to meet your specific requirements.

The keyswitch family forms part of the Class 9000 range and can be supplied in three principle versions: -

- Two position keyswitch (marked '1' and '0', with the key trapped in either position 1 or position 0 (customer choice at point of order, see figure 1 for contact arrangement)
- Two position keyswitch (marked '1' and '0', with the key removable in one position and trapped in the other position (see figure 1 for contact arrangement).
- Three position keyswitch (Fireman's Keyswitch) removable in all positions. This type has two pairs of electrically separated contacts; both open in the central position, one closes in each of the other positions (see figure 2 for contact arrangement).

KAC

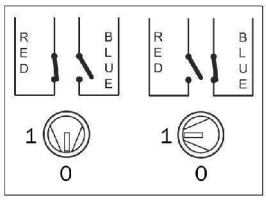
KEY-1

Rev. No. 2

Electrical Specification

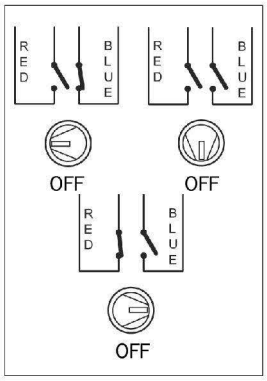
Connection Details:	See figures 1 & 2
Cable Terminals:	See figure 3
Maximum Voltage:	240VAC or 24VDC
Current Rating:	2 Amps @ 240VAC, 6 Amps @ 24VDC

Fig. 1



ABOVE: *Contact arrangement on Types 101 and 102.*
BELOW: *Contact arrangement on Type 103.*

Fig. 2



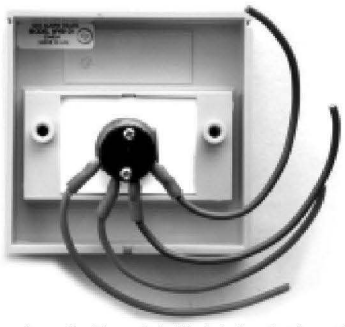
Environmental Specification

Humidity:	0-95% non-condensing
Operating Temperature:	-30°C to +70°C
Storage Temperature:	-30°C to +70°C
Ingress Protection (IP) Rating:	IP24D

Mechanical Specification

Material:	ABS
Weight:	110g Flush, 160g Surface
Colour:	Red, Green, White, Yellow, Blue

Fig. 3



Rear view of a Keyswitch Model showing how the connections are brought out on 32/0.2mm² flying leads.
The installer is required to make the required connections and remove the unwanted conductors.

Dimensioned side view of a keyswitch model

Ordering Information

Model	Description	Mounting
W*9101	Two position keyswitch, removeable in both positions	Flush
W*9101/S*	Two position keyswitch, removeable in both positions	Surface
W*9102	Two position keyswitch, removeable in 1 position	Flush
W*9102/S*	Two position keyswitch, removeable in 1 position	Surface
W*9103	Three position keyswitch, removeable in both positions	Flush
W*9103/S*	Three position keyswitch, removeable in both positions	Surface

* - defines colour, R=red, G=green, W=white, Y=yellow, B=blue

To identify the function label please attach word to the end of the above part codes.
For example WR9103/SR-F222 = Three position keyswitch, red, "house Flame" label
For available function labels please refer to our data sheets "FM-RED" and "FM-COL".

Accessories

Code	Description
PS200	Plain Hinged Cover

KAC Alarm Company Limited
15 - 19 Trescott Road,
Smallwood, Redditch,
Worcestershire B98 7AH.
England.
Telephone: [redacted]
Fax: [redacted]
e-mail: marketing@kac.co.uk

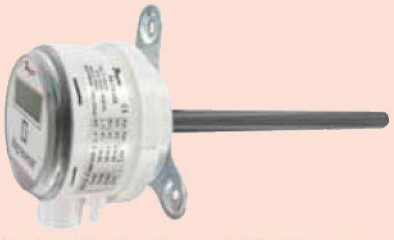
Series MS

Magnesense® Differential Pressure Transmitter

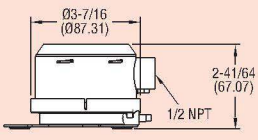
Monitors Pressure & Air Velocity

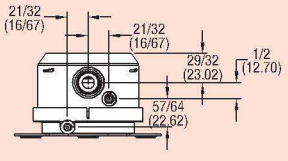
CE

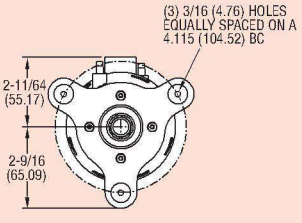
Standard MS with optional LCD

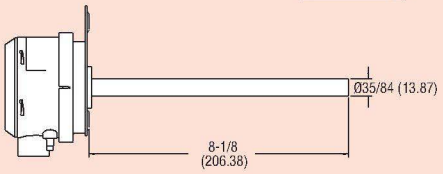


Standard MS with optional and LCD static probe









The Series MS Magnesense® Differential Pressure Transmitter is an extremely versatile transmitter for monitoring pressure and air velocity. This compact package is loaded with features such as:

- Field Selectable English or Metric Ranges
- Field Upgradeable LCD Display
- Adjustable Dampening of Output Signal (with Optional Display)
- Ability to Select a Square Root Output for Use with Pitot Tubes and Other Similar Flow Sensors

Along with these features, the patented magnetic sensing technology provides exceptional long term performance and enables the Magnesense® Differential Pressure Transmitter to be the single solution for your pressure and flow applications.

Model	Output	Selectable Ranges
MS-121*	4-20 mA	0.1″, 0.25″, 0.5″ w.c. (25, 50, 100 Pa)
MS-321*	0-10 V	0.1″, 0.25″, 0.5″ w.c. (25, 50, 100 Pa)
MS-111*	4-20 mA	1″, 2″, 5″ w.c. (250, 500, 1250 Pa)
MS-311*	0-10 V	1″, 2″, 5″ w.c. (250, 500, 1250 Pa)
MS-131	4-20 mA	10″ w.c. (2 KPa)
MS-141	4-20 mA	15″ w.c. (3 KPa)
MS-151	4-20 mA	25″ w.c. (5 KPa)
MS-331	0-10 V	10″ w.c. (2 KPa)
MS-341	0-10 V	15″ w.c. (3 KPa)
MS-351	0-10 V	25″ w.c. (5 KPa)
MS-021	4-20 mA	±0.1″, 0.25″,0.5″ w.c. (±25, 50, 100 Pa)
MS-221	0-10 V	±0.1″, 0.25″,0.5″ w.c. (±25, 50, 100 Pa)

Note: Add -LCD to end of model for units with display.
*Models available with duct mount static pressure probe. Change last digit from 1 to 2. Ex. MS-122

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Accuracy: ±1% for 0.25″ (50 Pa), 0.5″ (100 Pa), 2″ (500 Pa), 5″ (1250 Pa), 10″ (2 kPa), 15″ (3 kPa), 25″ (5 kPa) ±2% for 0.1″ (25 Pa), 1″ (250 Pa) and all bi-directional ranges.
Stability: ±1% / year F.S.O.
Temperature Limits: 0 to 150°F (-18 to 66°C).
Pressure Limits: 1 psi maximum, operation; 10 psi, burst.
Power Requirements: 10 to 35 VDC (2-wire); 17 to 36 VDC or isolated 21.6 to 33 VAC (3-wire).
Output Signals: 4 to 20 mA (2-wire); 0 to 5 V, 0 to 10 V (3-wire).
Response Time: Adjustable 0.5 to 15 sec. time constant. Provides a 95% response time of 1.5 to 45 seconds.
Zero & Span Adjustments: Digital push button.
Loop Resistance: Current Output: 0-1250 Ω max; Voltage Output: min. load resistance 1 kΩ.
Current Consumption: 40 mA max.
Display (optional): 4 digit LCD.
Electrical Connections:
4-20 mA, 2-Wire: European Style Terminal Block for 16 to 26 AWG.
0-10 V, 3-Wire: European Style Terminal Block for 16 to 22 AWG.
Electrical Entry: 1/2″ NPS Thread
Accessory (A-151): Cable Gland for 5 to 10 mm diameter cable.
Process Connections: 3/16″ ID tubing (5 mm ID). Maximum OD 9 mm.
Enclosure Rating: NEMA 4X (IP65).
Mounting Orientation: Diaphragm in vertical position.
Weight: 8.0 oz (230 g).
Agency Approvals: CE.

ACCESSORIES

A-435, Field Upgradeable LCD
A-480, Plastic Static Pressure Tip

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RBK00033897/48
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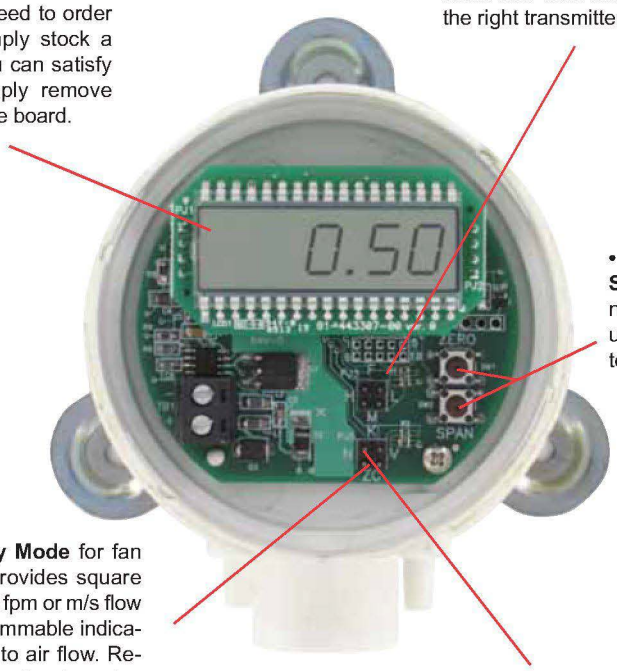
p49:Layout 7 7/8/09 2:31 PM Page 1

One Unit for all your Building Pressure Applications

The Industry Standard for Building Automation

• **Field Upgradable LCD**. No need to order two seperate transmitters. Simply stock a transmitter and display and you can satisfy any customer's requests. Simply remove cover and snap the LCD onto the board.

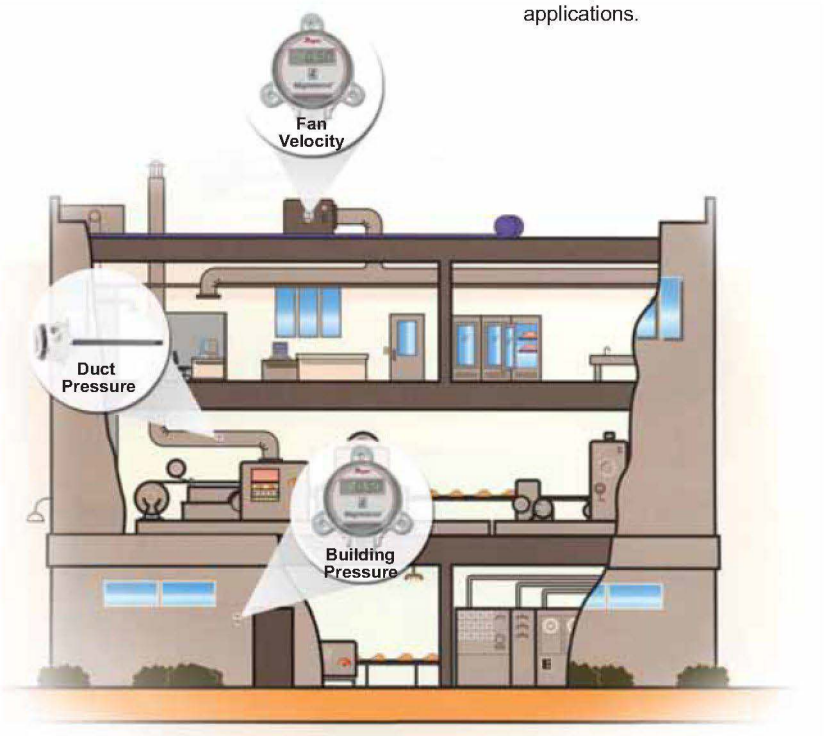
• **Field Selectable Ranges** in metric or English. Lowers stock and inventory requirements. You'll always have the right transmitter for every job.



• **Digital Push Button Zero and Span.** Reduces calibration time significantly over other transmitters that utilize potentiometers. Lowers maintenance time and costs.

• **Field Selectable Air Velocity Mode** for fan and blower applications. Unit provides square root output that accurately tracks fpm or m/s flow rate. No need for a smart programmable indicator or PLC to convert pressure to air flow. Reduces components and installation time lowering overall costs.

• **Adjustable Digital Dampening** smooths out unstable pressure fluctuations common in air flow applications.



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RBK00033897_0049

Smoke Control Damper

SC Series

Elevated Temperature
Smoke Control Damper

SC Series

elevated temperature smoke control

Introduction

The SC Series Smoke/Control Damper has been designed for installation primarily into Fire-Rated Ventilation Ducts to control low-medium air velocities.

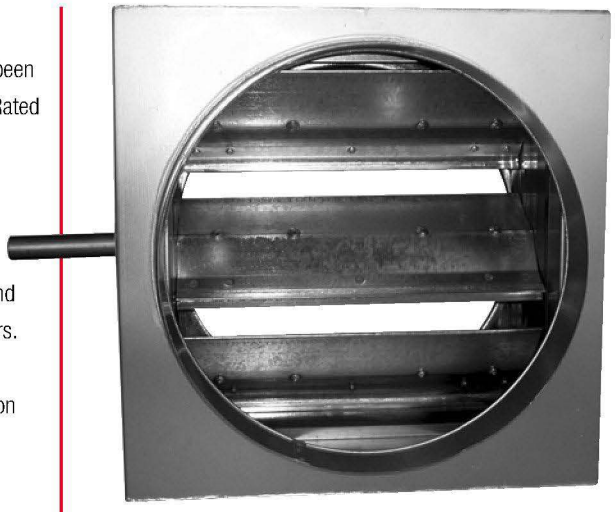
Its all steel construction is robust, with detail to its application, performance and size as required by specifiers and contractors.

Its design, construction and material selection have been specific so as to ensure a high quality, low-maintenance product is manufactured, supplied and installed.

Single section units are available from 100mm^2 to 1200mm^2.

Specifications and Testing

- Unless stated otherwise, flange models are suitable for classes A & B of DW144, with spigot models suitable for classes A, B & C of DW144
- Conformance to DW144 and Eurovent 2/2 classes A - C, as relevant
- Blade construction has been fire tested to BS476 part 20, 1987 for integrity and leakage
- Elevated temperature tests, reports 231297, 234486 and 27438 refer
- Resistance tested by BSRIA, report 15633/1 refers
- Leakage tested by BSRIA, report 15633/1refers
- 28 day salt corrosion tested. Chatfield report RLR3 refers



Features

- Standard blade and case construction is galvanised mild steel, with grade 302S stainless steel side seals
- Unique one-piece double-skin interlocking airfoil blades
- Four casing options
- Linkage out of airflow
- Optional blades and case in grades 316 or 430 stainless steel
- Grade 316 stainless steel side seals available to order
- Infinite sizing capability from 100mm square to 1200mm square
- Variable flange dimensions and casing widths

Blades

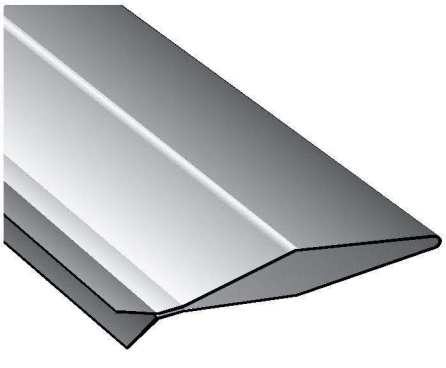
The 100mm wide steel airfoil inter-locking blades are fitted to 19mm diameter spindles for robust, low-friction rotation.

Galvanised blades are offered as standard, with Stainless Steel Grade 430 and 316 options available to order. Where stainless steel blade option is requested, Grade 430 will be supplied unless otherwise stated.

Fitted as standard, is grade 302S stainless steel blade end-seals.

Opposed blade operation only.

Special Note: For applications which necessitate the blades to be installed vertically, BSB's Sales Office must be informed so that thrust bearings are fitted to eliminate blade friction.



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SC Series
dimensions

Model SC Flangefit

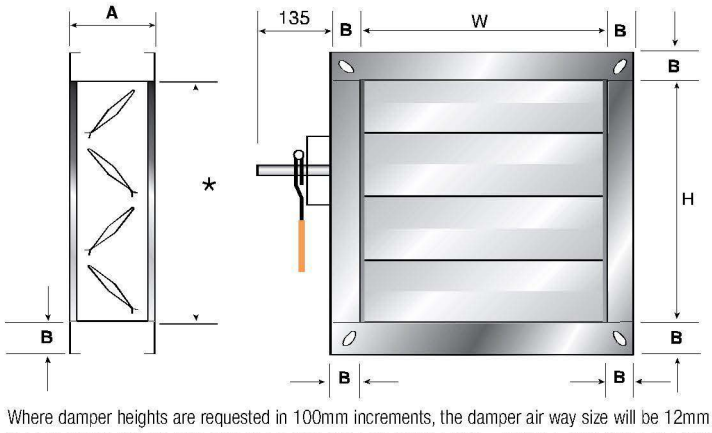
Width x Height = 100mm to 1200mm

Standard Dimensions

A = 160mm as standard. 140mm and 200mm available to order.

B = 40mm as standard. 30mm, 35mm and 50mm available as detailed below:

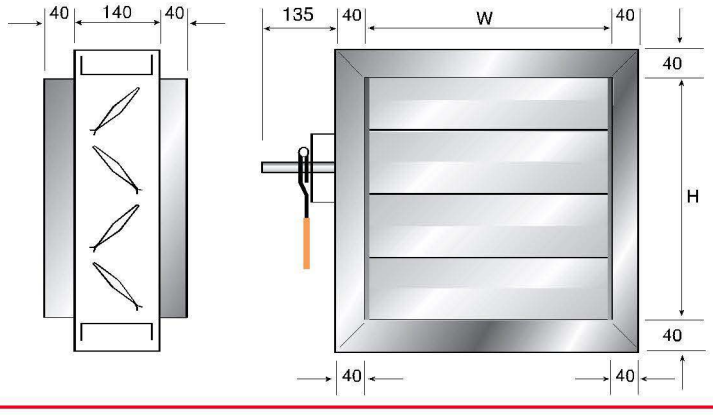
Flange Size	Case Width
30mm	160mm or 200mm
35mm	160mm or 200mm
40mm	all width variants
50mm	all width variants



* Where damper heights are requested in 100mm increments, the damper air way size will be 12mm greater with top and bottom flanges amended to accommodate the blade profile, with the overall flange size being unaffected.

Model SC Spigotfit

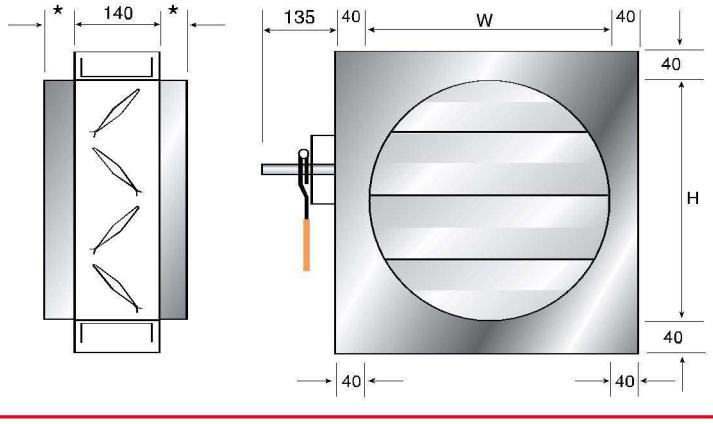
Width x Height = 100mm to 1200mm



Model SC Circular

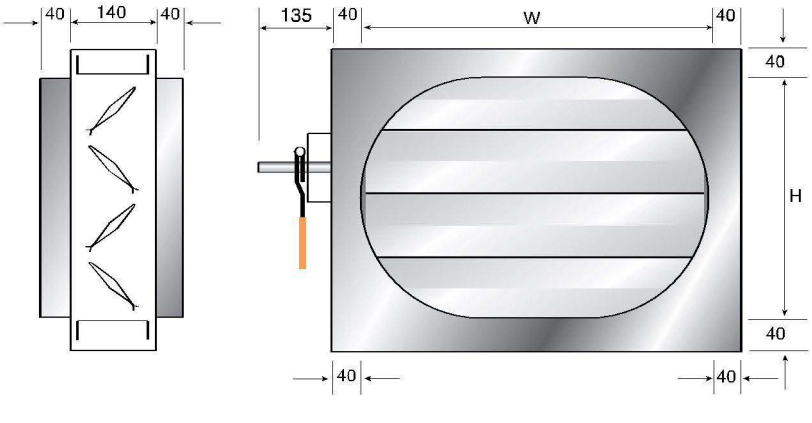
Width x Height = 100mm to 1200mm

* = 40mm (100 – 354mm diameter)
55mm (355 – 1200mm diameter)



Model SC Flat Oval

Width x Height = 100mm to 1200mm



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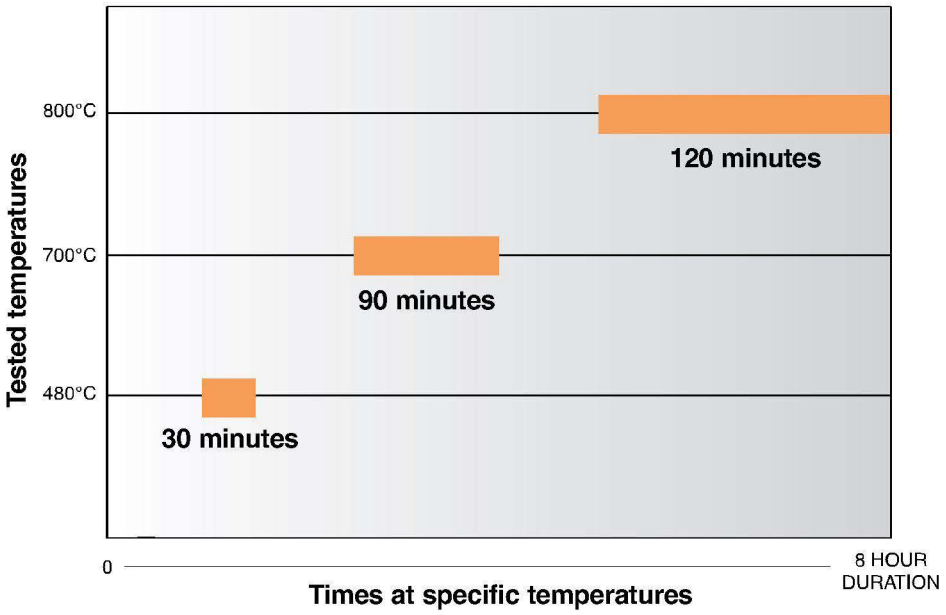
SC Series
temperature testing and weight chart

Elevated Temperature Test applied to a manually operated damper

A damper was placed into a furnace at ambient temperature (22°C), the furnace was ignited with the temperature being raised uniformly to 480°C and held for 30 minutes. The temperature was then raised to 700°C and held for a further 90 minutes. The temperature was then finally raised to 800°C for a further 120 minutes.

The damper was then removed and whilst still "cherry red" was inspected and operated. The blades and linkage rotated freely with all rivets, welds and components remaining intact.

The scope of the test was to test the damper's operation at an elevated temperature, in addition to establishing its integrity and distortion.



The conclusion of this test is that the design, construction and engineering tolerances permitted this product to be tested and operated at an "elevated temperature" successfuly.

Special Note: When motors and/or other ancilliaries are used in elevated temperatures, please consult with the manufacturers for suitability to the application.

BSB have concluded other tests at specific temperatures in addition to this test, all with satisfactory results.

Weight Chart (Kg) Flanged Model

Damper Height (mm)	Damper Width (mm)											
	100	200	300	400	500	600	700	800	900	1000	1100	1200
100	4	4	5	6	6	8	8	9	10	10	12	13
200	5	6	7	8	9	10	11	12	13	14	15	16
300	6	8	9	10	11	13	14	15	16	17	18	19
400	8	9	10	11	13	14	15	16	18	19	20	21
500	10	11	13	14	15	16	18	19	21	23	24	25
600	12	13	14	16	18	19	21	23	25	27	28	29
700	14	15	16	18	19	21	23	25	27	29	31	32
800	15	16	18	19	21	23	25	27	29	31	33	35
900	16	18	19	21	24	26	28	30	32	34	36	38
1000	17	19	21	23	26	28	30	32	34	36	39	41
1100	18	21	23	25	28	30	33	35	37	40	43	45
1200	20	22	25	28	30	33	35	38	40	43	45	48

Please note that these values have been rounded up or down to whole values and are therefore illustrated for estimation purposes only.

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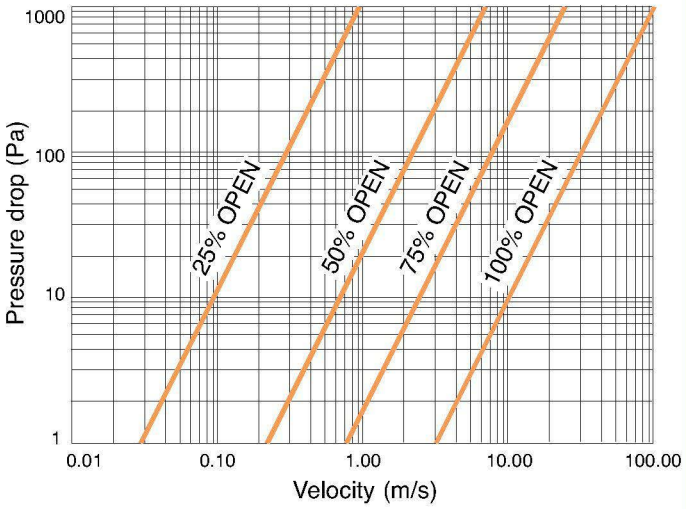
SC Series

performance characteristics and torque chart

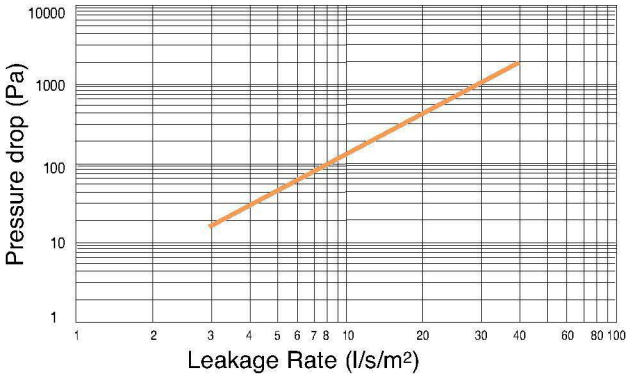
Pressure Drop BSRIA Report 15633/1



Calculated performance at various damper settings.

Individual data sheets are available for each blade setting.

Leakage BSRIA Report 15633/1

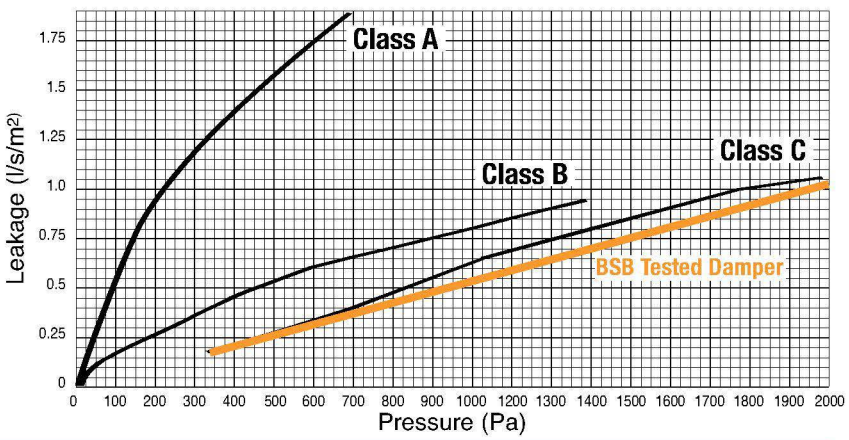


Static Pressure Pascals	Leakage per m^2 l/s/m^2	Leakage l/s
15.6	2.970	0.891
29.4	4.239	1.272
74.8	7.035	2.111
162.2	10.636	3.191
225.4	12.604	3.781
380.0	16.230	4.869
660.0	21.583	6.475
955.0	25.511	7.653
2020.0	40.428	12.128

Permitted Case Leakage at Various Pressures

The Graph from HVCA's Publication DW144 illustrates the Flange Models Casing Leakage to Classes A & B.

For conformance to Class C Leakage, the fully welded Spigot Model should be supplied.



Torque Chart (Nm)

Duct Pressure (Pa)	Damper Size (Width x Height in mm)		
	200 x 200	600 x 600	1200 x 1200
250	3	7	12
500	4	8	13
750	5	9	14
1000	6	10	15

Please note that these values have been rounded up or down at blade inter-action, with actual blade rotation being at reduced torque levels.

SC Series
product specification and multiple assemblies

Product Specification

Case
Material is 1.2mm galvanised coated mild steel to BS EN 10142 1991, coating class FE P02b Z275 Na.

Spindle covers are of "Top Hat" design to allow the use of clamps onto the flanges.

Blades
Nominal 100mm wide one-piece double skin airfoil interlocking blades.

Material is 0.7mm galvanised coated mild steel to BS EN 10142 1991, coating class FE P02b Z275 Na.

Stainless steel blades (0.7mm) to grades 430 or 316 to BS 1449 Part2 1983 S172B are available.

Blade Spindles
Manufactured from 19mm steel tube, extending the full length of blade into and through the "blow through" bushes.

Material is 1.2mm galvanised coated mild steel to BS EN 10142 1991, coating class FE P02b Z275 Na.

Optional is grade 316-S11 to BS 1449 Part 2 1983 S172B.

Blade End-Seals
Manufactured from grade 302S stainless steel to BS 5770 Part 4 1981. Radius profile 170mm.

Linkage
Operation via drive bars 3.2mm x 20mm in size, manufactured from bright mild steel to BS EN 10142 1991. drive bars are positioned out of airflow, connected to blade spindles via crank arms.

Opposed blade operation is standard.

Installed on both sides of the flange case are cover plates to protect the linkage from dust or damage, in addition to minimising casing leakage to requirements of DW144 as standard.

Bushes
Standard are "blow-through" bushes pre-formed into the galvanised steel flange casing, allowing the spindles to rotate freely.

Size Range
100mm x 100mm to 1200mm x 1200mm as a single section.

Damper Operating Temperature Range
BSB has tested the SC Series Smoke Control Damper at elevated temperatures for 8 hours. Our test reports 231297,234486 and 27438 refer.

Test Specification
Conformance to DW144 as relevant.
Salt corrosion tested for 28 days.

Resistance Test
Tested by BSRIA, report 15633/1 refers.

Leakage Test
Tested by BSRIA, report 15633/1 refers.

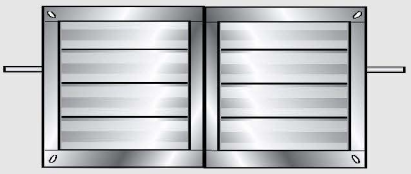
(See Page 5 for illustrations)

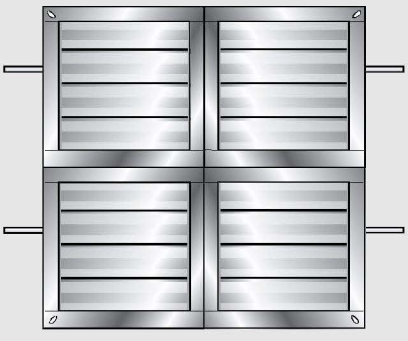
Multiple Assemblies

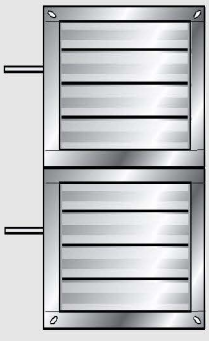
Illustrated opposite are several variants to multiple section units. Where sizes exceed 1200mm x 1200mm square, multi-section units will be supplied.
When there are transportation restrictions, large multiple units will be broken down and shipped as individual sections for site assembly. Unless requested, joining strips would not normally be supplied drilled.

Note:
For applications which necessitate the blades to be installed vertically, BSB's Sales Office must be informed so that thrust bearings are fitted to eliminate blade friction.

Special Note:
BSB can manufacture to individual specifications and applications. Illustrated are standard variants only, with other variants to order.







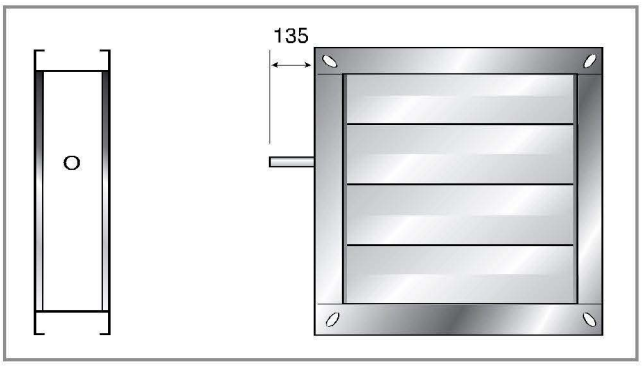
RBK00033897/55
RBK00033897_0055

SC Series
control options

Option E Extended Spindle

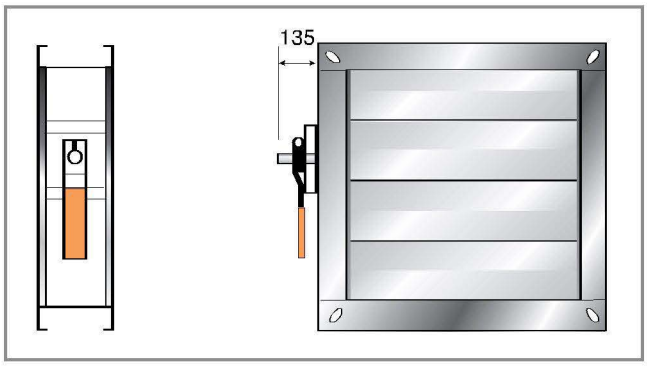
For motorisation by others.

Supplied with 19mm spindle. 135mm in length.
12mm square spindle available to order.



Option H Hand Control

BSB's unique hand lockable quadrant is supplied complete from the factory.
Option H Manual Quadrant Control is easily converted to Option E for motorisation by others without the need for specialist tools on site.

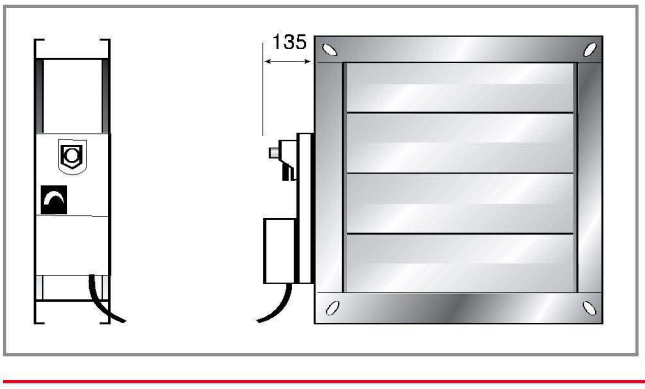


Option M Electric Motor

Can be supplied with the following control motors fitted:

- Open/Close Operation
- Spring Return Operation
- Or as specified

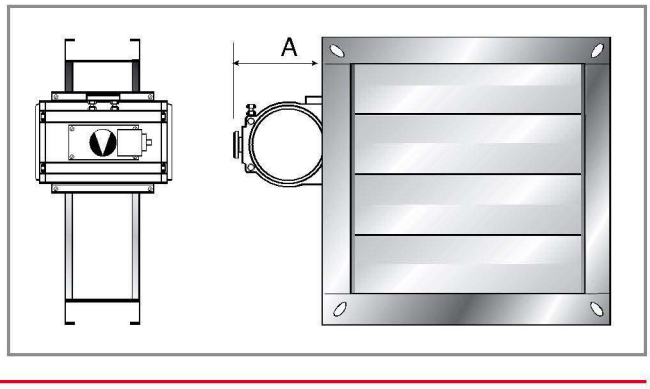
12mm square spindle available to order



Option P Pneumatic Actuator

Operates between 20psi/1.4bar and 100psi/7bar. Supplied fitted to the damper complete with integral threaded airports to pressurise and vent the actuator. Accessories available.

A = 100mm or 150mm dependant on actuator model supplied.



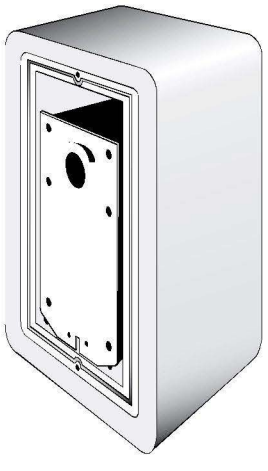
Thermal Housing

The thermal motor enclosure consists of an advanced phenolic composite resin.
The enclosure uses a mould which has been specifically designed to encase Damper Actuators.

The thermal housing has been independently fire tested at 300°C by the Warrington Fire Research Establishment and results show that the surface temperature of the actuator inside the enclosure did not exceed 78°C during the 60-minute test.

The use of a thermal enclosure provides a tested and proven method to ensure operation of sensitive equipment when subjected to the extremities of fire.

Enclosure size: 438mm length - 215mm width and 142mm depth.



RBK00033897/56
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SC Series
ordering codes

Ordering Codes Example

SC	F	G	E

SC Series Smoke Control Damper

Case
- F Flangefit
- S Spigotfit
- C Circular
- O Flat Oval

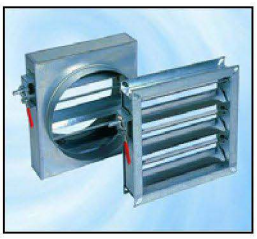
Blade Material
- G Galvanised Mild Steel
- S Stainless Steel (specify grade)

Options
- E Extended Spindle
- H Hand Control
- M Electric Motor
- P Pneumatic Motor
- T Thermal Housing

Air, Fire and Smoke Control

Air Balance Control

BD Series
Backdraught Regulating Dampers



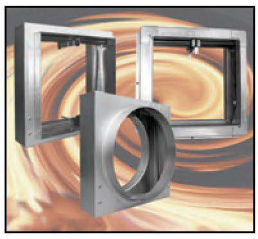
DD Series
Duct Regulating Dampers

HD Series
Heavy Duty Regulating Dampers

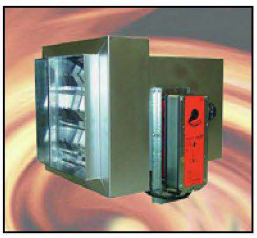
SB Series
Single Blade Regulating Dampers

SF Series
Slimfit Regulating Dampers

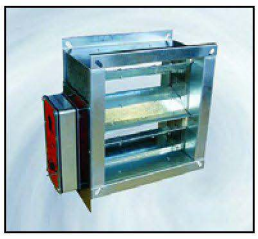
Fire and Smoke Control



FD Series
Fire Control

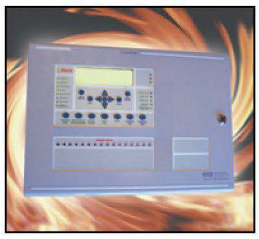


FSD Series
Fire and Smoke Control



SC Series
Smoke Control

Control Systems
Electro Mechanical



Control Systems
Fully Addressable

BSB Engineering Limited
Unit E, Tribune Drive, Trinity Trading Estate, Sittingbourne, Kent ME10 2PD
Tel: [redacted] • Fax: [redacted]
E-mail: sales@bsb-dampers.co.uk Website: www.bsb-dampers.co.uk

MAICO
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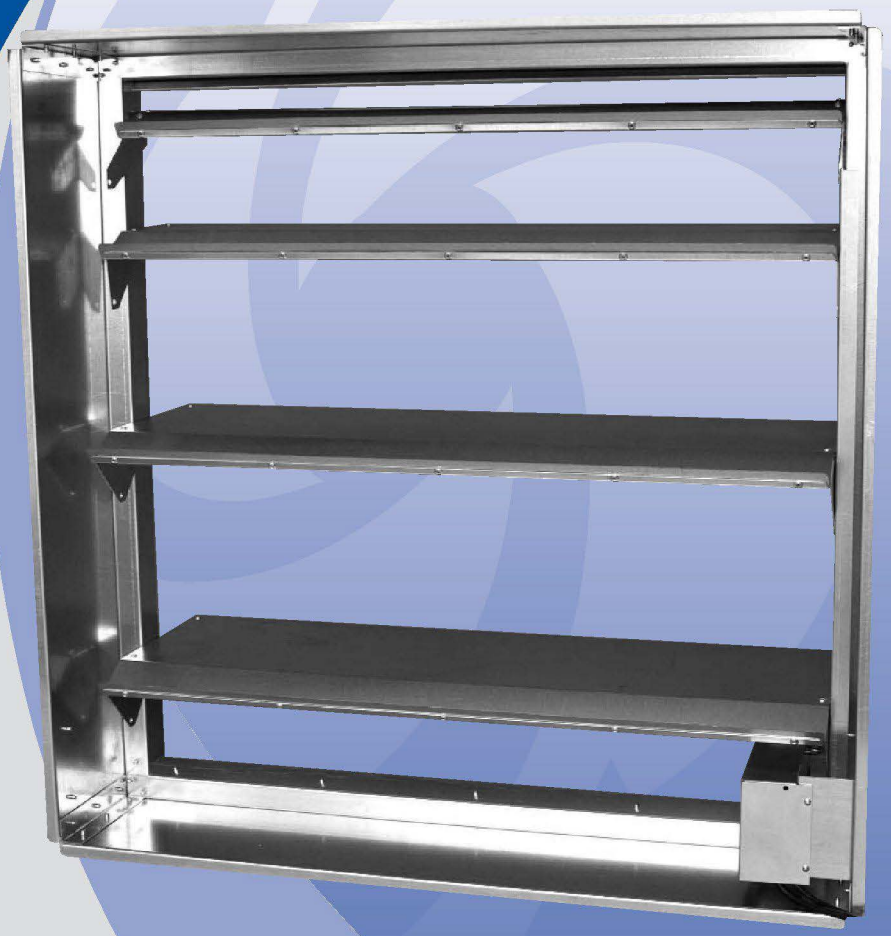
BSB Engineering Services Ltd. reserves the right to modify or withdraw any specification without prior notice that may result from continuous product development. The information contained within this brochure is correct at the time of going to press.

SERIES 54
Smoke Evacuation Damper

PUBLICATION
DAMPERS 10
OCTOBER 2011



Features

- 1.5 mm Galvanised steel construction
- Motor open or motor closed operation
- Fire tested to EN1366 Pt 2
- Low leakage rate
- High Free area design
- Optional Decorative Fascia grilles

GILBERTS

RBK00033897_0058

SERIES 54

Introduction

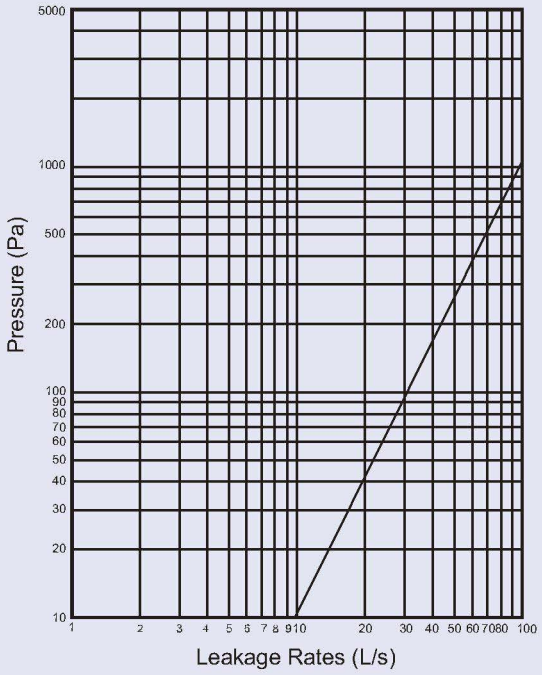
The Series 54 smoke damper range has been designed to satisfy smoke ventilation applications and is particularly suited for smoke evacuation shafts and risers in multi storey buildings.
A multi, parallel linked blade smoke damper the Series 54 is manufactured from robust 1.5 mm galvanised steel and is fully tested to the requirements of EN1366 Pt 2 for 1 hour. Usefully the damper combines both a low leakage rate, when closed, with a high free area, when open, to support high smoke evacuation rates.
All Series 54 dampers are fitted with a Belimo actuator to offer either a powered motor open/close or failsafe spring return open/closed actuation according to requirements.
Series 54 has been designed to provide both a practical and aesthetic solution. It is available in a wide range of sizes ranging from 400 x 400 to 1000 x 2000 with sizes based on the structural opening (aperture) dimensions. Effectively this means the largest size damper can provide
up to 1.5m^2 of free area.
For aesthetic finishing, where required, the damper face can simply be powder coated to a stock RAL colour with an optional cover plate also fitted to disguise the motor. Alternatively dampers can be masked with fixed blade type cover grille (Gilberts Series K40 or K15) with blades angled at 40°, for virtual full damper masking, or 15° for a partial masking effect. These cover grilles can be face screw fixed or concealed fixed according to preference.

Features

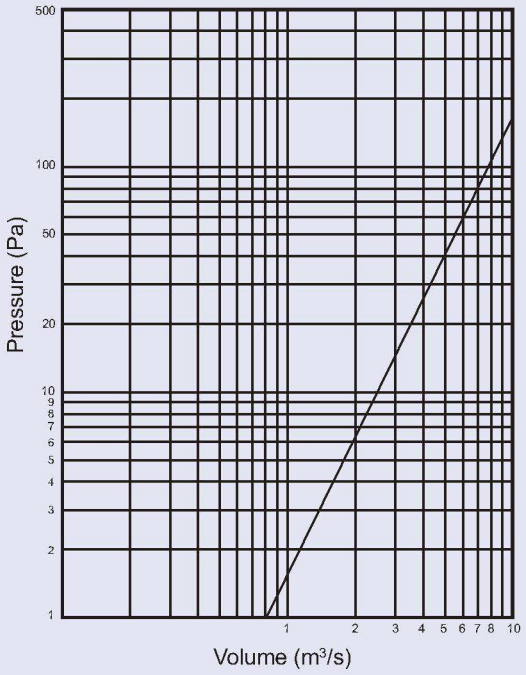
- 1.5 mm Galvanised steel construction
- Motor open or motor closed operation
- Fire tested to EN1366 Pt 2
- Low leakage rate
- High Free area design
- Optional Decorative Fascia grilles

Pressure Graphs

Pressure Drop / Leakage Graph
(1000x1000 unit closed)



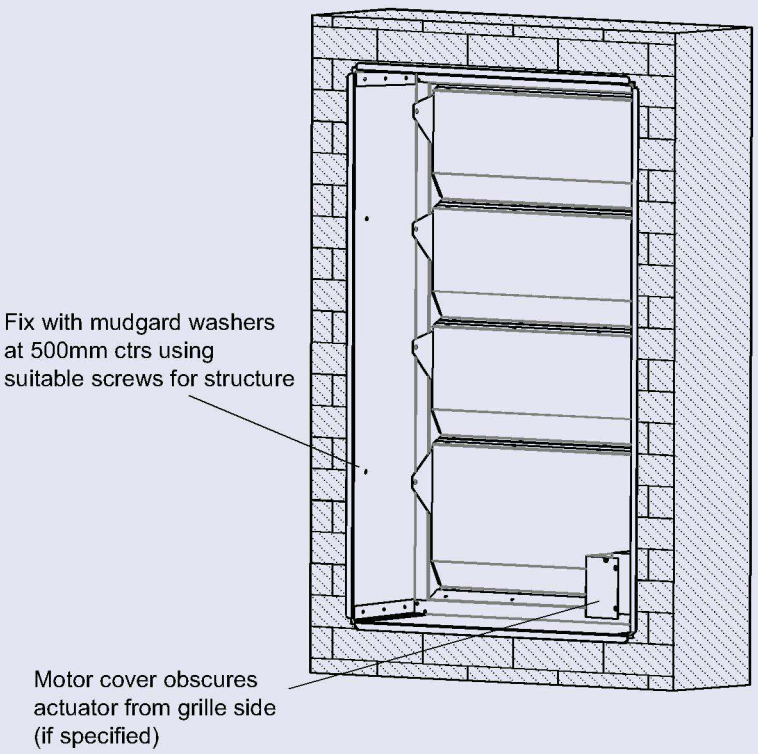
Pressure Drop / Volume Graph
(1000x1000 unit open)

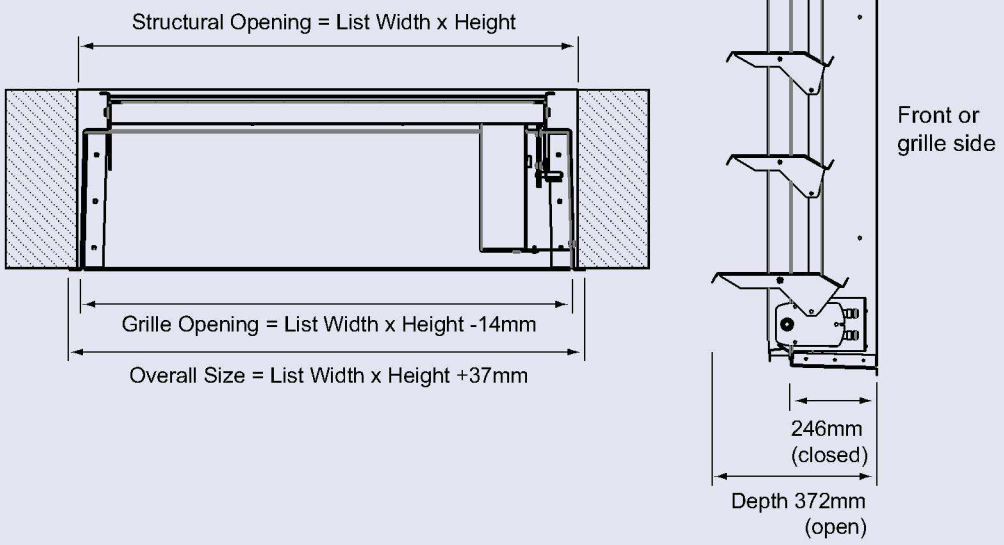


During non-operational conditions the damper blades would normally be in the closed position.

SERIES 54

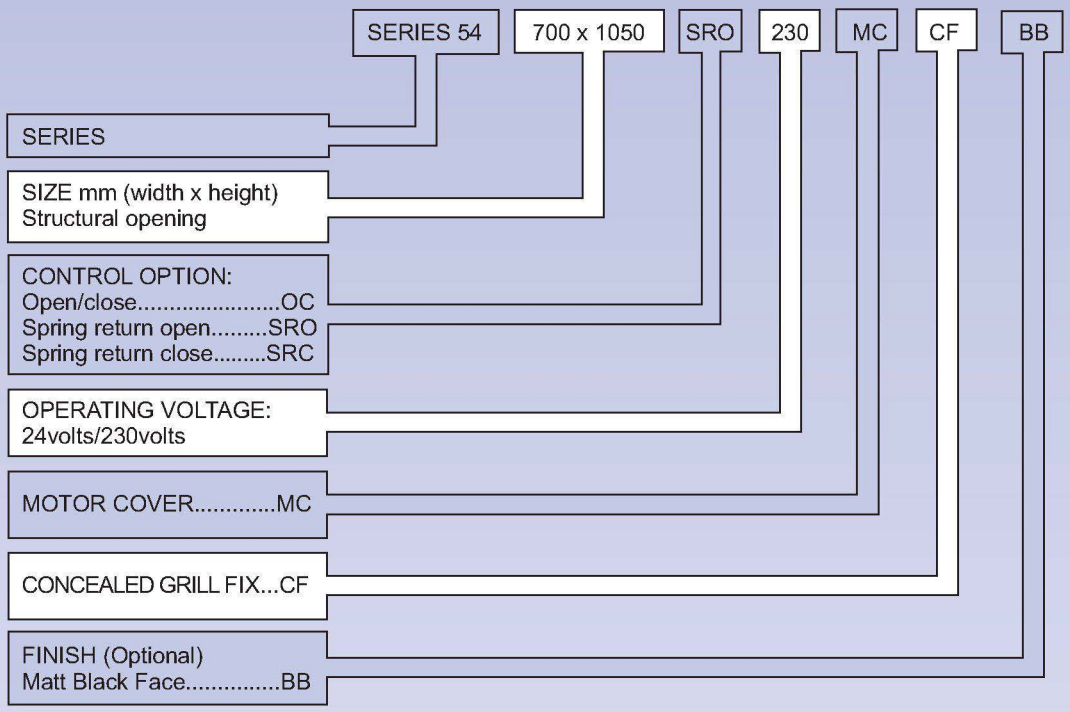
Dimensional Data





SERIES 54

Ordering Specification



Free Area

Approximate free area with damper in the open position:

Size	Damper Only	With K40 Fascia Grille
1000 x 2000 -	1.51m²	1.4m²
1000 x 1500 -	1.1m²	1.0m²
800 x 1000 -	0.55m²	0.56m²

Weight

Damper weight approx 39Kg per SQ/M

Fascia Cover Grilles

For Fascia Grille options please refer to Gilberts Air Distribution Catalogue "Grilles" section

Engineering Specification

Damper & Mounting Frame

Damper with horizontal blades for air passage and 15mm returned edge all round for fixing to structure. Damper body formed in flanged Z sections 52 x 35 x 196. All manufactured from 1.5mm cold reduced galvanised steel to BS.EN.10142: 1991. The frame corners are joined using 6 No 4.8mm dia. sealed steel rivets on slotted holes to allow for expansion.

Blades

Parallel blade assembly constructed from 1.0mm thick x 100mm to 300mm wide cold reduced galvanised steel to BS.EN.10142: 1991 set at a 100mm to 300mm pitch selected to suit structure opening height. Each blade is connected to the link bar (1.5mm thick galv m/s) with 4.8 dia steel rivets.

Motor Drive

Belimo BLE drive motor (open/closed) fitted as standard, spring return options available.

Contact

GILBERTS
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Blackpool.
Lancashire FY4 4QT.
Telephone: [redacted]
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e-mail: sales@gilbertsblackpool.com
Web: www.gilbertsblackpool.com

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SMOKE VENT

ELTA FANS

Emergency Ventilation

RBK00033897/62

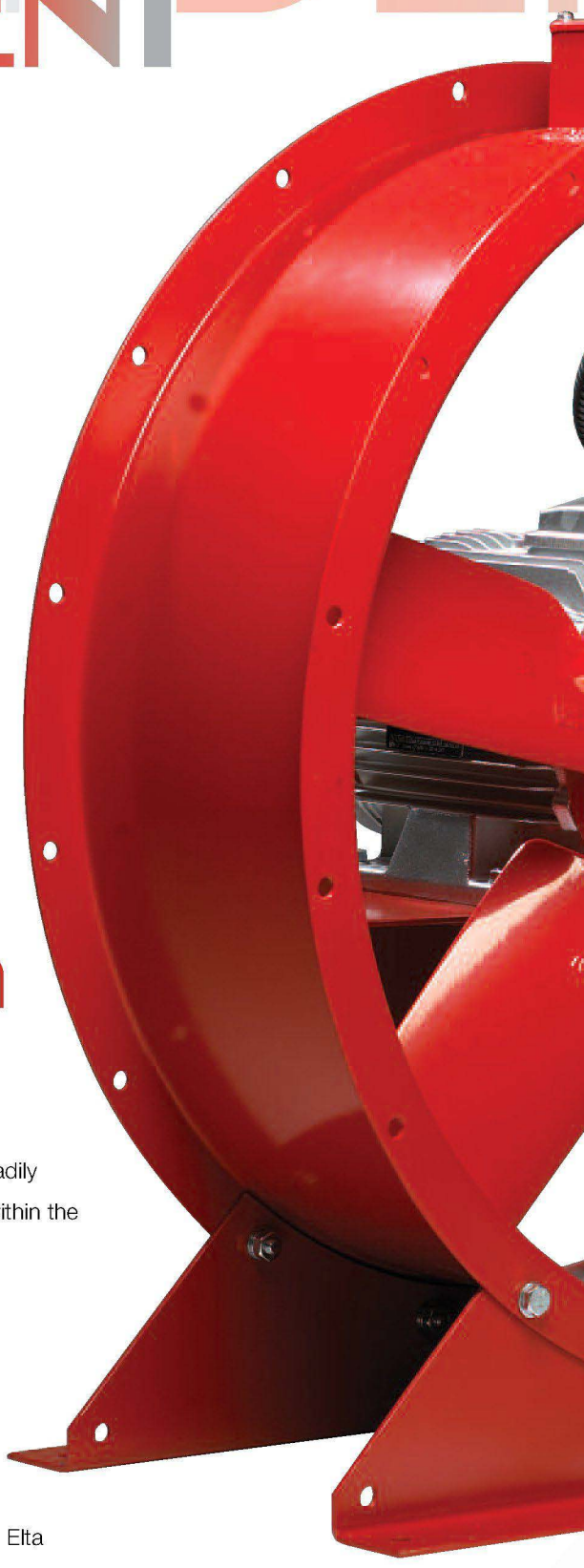
RBK00033897_0062

SMOKE VENT

introduction

Elta Fans are a major supplier of axial flow fans for smoke ventilation, with the SmokeVent range specifically developed for emergency smoke spill extract systems that may operate as part of the main extract system as dedicated fans for emergency clearance only, to overcome hazardous fire, smoke and fume conditions.

Technology will set its own limits, and at Elta we take special pride in exceeding them. Sometimes the solution is straight forward, sometimes it can be a tiresome, testing process. Nevertheless, Elta's development in Smoke Ventilation, by working to exacting standards, continues to set us apart through excellence in fan engineering and design.



emergency ventilation

In today's environment, if allowed to spread, Fire, Smoke and other noxious fumes can endanger safe means of escape, whilst causing widespread damage to buildings.
By removing these and other harmful fumes, SmokeVent assists fire fighters in more readily identifying the fire source, enabling location of potential casualties and occupants still within the building for prompt escape, whilst also minimising smoke and fume accumulation.

With extensive experience in the design and application of Smoke Ventilation fans, SmokeVent products must immediately create understanding of their performance and characteristics, but above all, the benefits they provide for the demanding conditions in which they operate.

As customers, you must be able to see what it is and what SmokeVent can do for you, Elta continue to apply its understanding of fan engineering principles for smoke ventilation applications, enabling us to provide you with fans that assist in the protection of buildings and their occupants.

design & performance

Elta Fans has a wealth of experience and knowledge in the design and manufacture of axial flow fans for fresh air supply and extract as well as for emergency smoke ventilation systems.

The SmokeVent range is specifically developed for general ventilation plus emergency smoke extract at 200ºC or 300ºC for 2 hours up to 2000mm in diameter, and 400ºC for 2 hours up to 1250mm in diameter.

It is a mandatory requirement in the European Union that all smoke extract fans are independently tested to EN12101-3:2002 Smoke and Heat Control Systems - Specification for powered smoke and heat exhaust ventilators. This standard covers the testing, design and production controls that are required before the manufacturer can obtain product certification from the appropriate notified body.

Elta Fans has extended its EC Certification for smoke related fan units with BSI, with both its UK production facilities manufacturing the SmokeVent range, making it one of the largest certified standard product ranges available within Europe.

Certificate

EC-CERTIFICATE OF CONFORMITY

0086-CPD-493001

Powered Smoke and Heat Exhaust Ventilators for use in Construction Works

as detailed on the Supplementary Information Sheet
placed on the market by

Elta Fans Limited
17 Barnes Wallis Road, Segensworth East, Fareham, Hampshire, PO15 5ST

and produced at the sites detailed on the supplementary information sheets.

EN 12101-3: 2002

raising standards worldwide

Page 1 of 5

BSI Product Services

All Elta emergency smoke extract fans are inluded on EC Certificate of Conformity 0086-CPD-493001.

In addition, SmokeVent units are tested to ISO 5801:1997 (Airside performance) and BS 848 Part 2:1985 (Sound Performance).

RBK00033897_0064

features & benefits

SmokeVent fans are available from 250mm up to 2000mm diameter, supplied for free standing operation in ducted systems, although they are also suitable for installation in roof extract units.

Fans can be supplied as Single or Two Stage, Single or Two-speed operation, and with such a comprehensive range of standard sizes, SmokeVent provides the flexibility to supply models for new or refurbished projects.

cost effective

The highly efficient impellers make this a very economical method of moving high volumes of air at low to medium pressures.

The SmokeVent range offers additional cost savings as it satisfies the requirements for both emergency smoke extraction and general daily ventilation in a single unit.

design appeal

The integral spun flanges allow for smoother airflow and added efficiency.

safety and control

A mechanical smoke extract system that is independent from external conditions allows emergency control of the situation by the fire services. The removal of smoke assists the safety of the occupants in the event of a fire.

accessories

Full accessory range including; mounting feet, anti-vibration mounts, matching flanges, flexible connectors, silencers, bell mouth inlets, non-return dampers and wire guards - All selected in advance to match the fan, which means this avoids any on site installation and fitting problems.

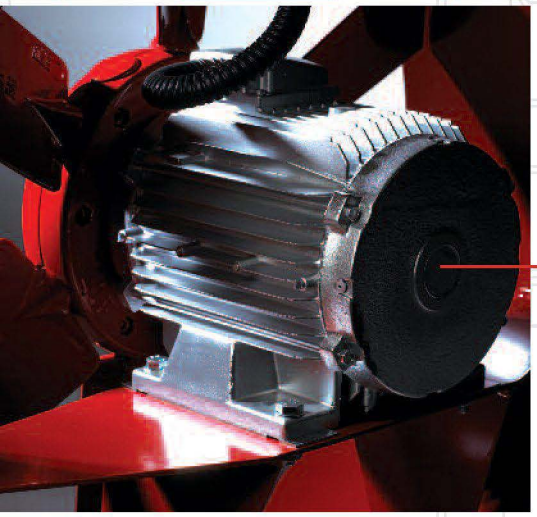
rapid delivery

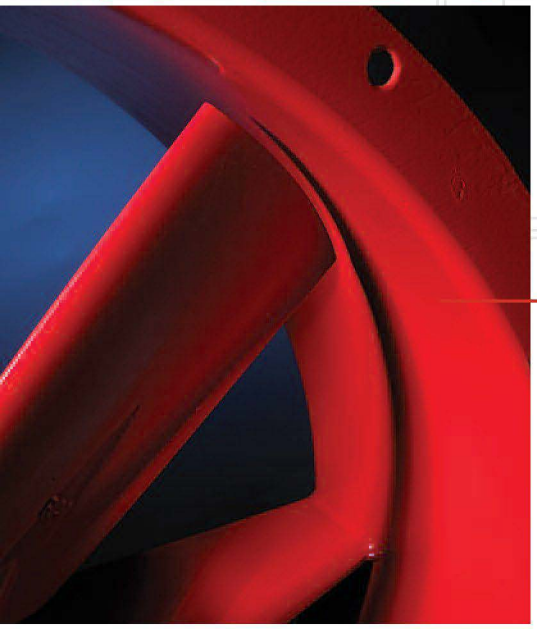
SmokeVent long cased axial fans within the Elta SELECT range, shall either be available from stock or on short delivery.

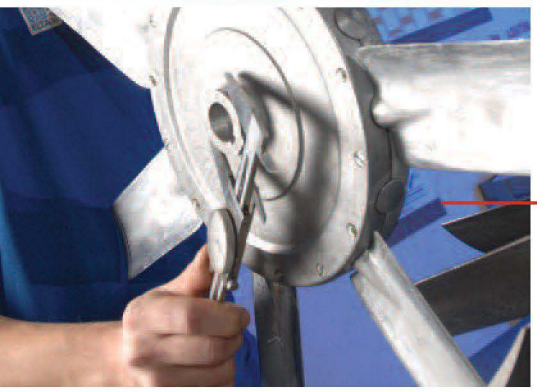
ELTA SELECT

warranty

Each SmokeVent comes complete with a 12 month warranty (excluding emergency smoke operation).







SMOKE DEN

specification

impellers

Adjustable pitch aerofoil impellers are provided with blades made from high quality pressure die cast aluminium (LM6), natural finish. Impellers are factory set at an angle to provide maximum performance. The hubs are manufactured from die cast aluminium alloy (LM24).

Assembled impellers will have their blades positively locked by pinning, for added security, for operation in the smoke regime.

Assembled impellers are to be dynamically balanced to Grade G6.3.

motors

Motors are to be foot or pad mounted totally enclosed metric type to IP55, with sealed for life bearings, standard industrial paint finish and Class H insulation to EN 60034-5, suitable for use at normal continuous duty and a once only use under smoke operation at 200 °C or 300°C for 2 hours up to 2000mm in diameter and 400°C for 2 hours up to 1250mm in diameter.

Flying leads are brought out via a temperature resistant conduit system, to an external IP55 terminal box for customer cabling interface

casings

The all metal fan casing provides a long lasting and robust construction.

The units have been constructed from a single sheet of steel, with both motors and axial impellers mounted within the length of the unit casing.

All casing parts are heavy gauge mild steel sheet, roll formed and welded, then hot dipped galvanised to BS 729 after fabrication.

quality management

Units are to be designed and manufactured with procedures as defined in BS EN ISO 9001: 2000.

Units are tested at elevated temperatures to the requirements of EN 12101 - 3: 2002.

All SmokeVent units are to be tested to ISO 5801:1997 (airside performance) and BS 848 Part 2: 1985 (sound performance).

RBK00033897_0066

SMOKE VENT

applications

The major cause of death in the event of a fire is due to smoke inhalation. A smoke extract system is required to enable occupants to escape before being overcome by smoke and to facilitate access for fire fighters in order to extinguish the fire.

The same ventilation system is normally used to satisfy both the general ventilation and smoke control requirements. Smoke and heat exhaust ventilation systems are designed to:

- Keep access and escape routes clear of smoke.
- Aid fire fighting operations.
- Delay or prevent flashover or full fire development.
- Reduce the subsequent damage to the building structure and its contents.

Elta Fans provide a wide range of smoke ventilation fans that are specifically developed to satisfy the demands of 'emergency' ventilation, particularly during fires. There are a wide variety of applications for our products, which include:

- Atrium Smoke Extract
- Sports Hall Smoke Extract
- Emergency Stairwell Pressurisation
- Shopping Precinct Smoke Exhaust Systems
- Emergency Tunnel Ventilation
- Roof Smoke Extract Exhaust Cowls
- Office Ventilation and Emergency Smoke Extract systems
- Car Park Ventilation and Smoke Extract Systems
- Marine and Offshore Living Quarters Emergency Smoke Extract

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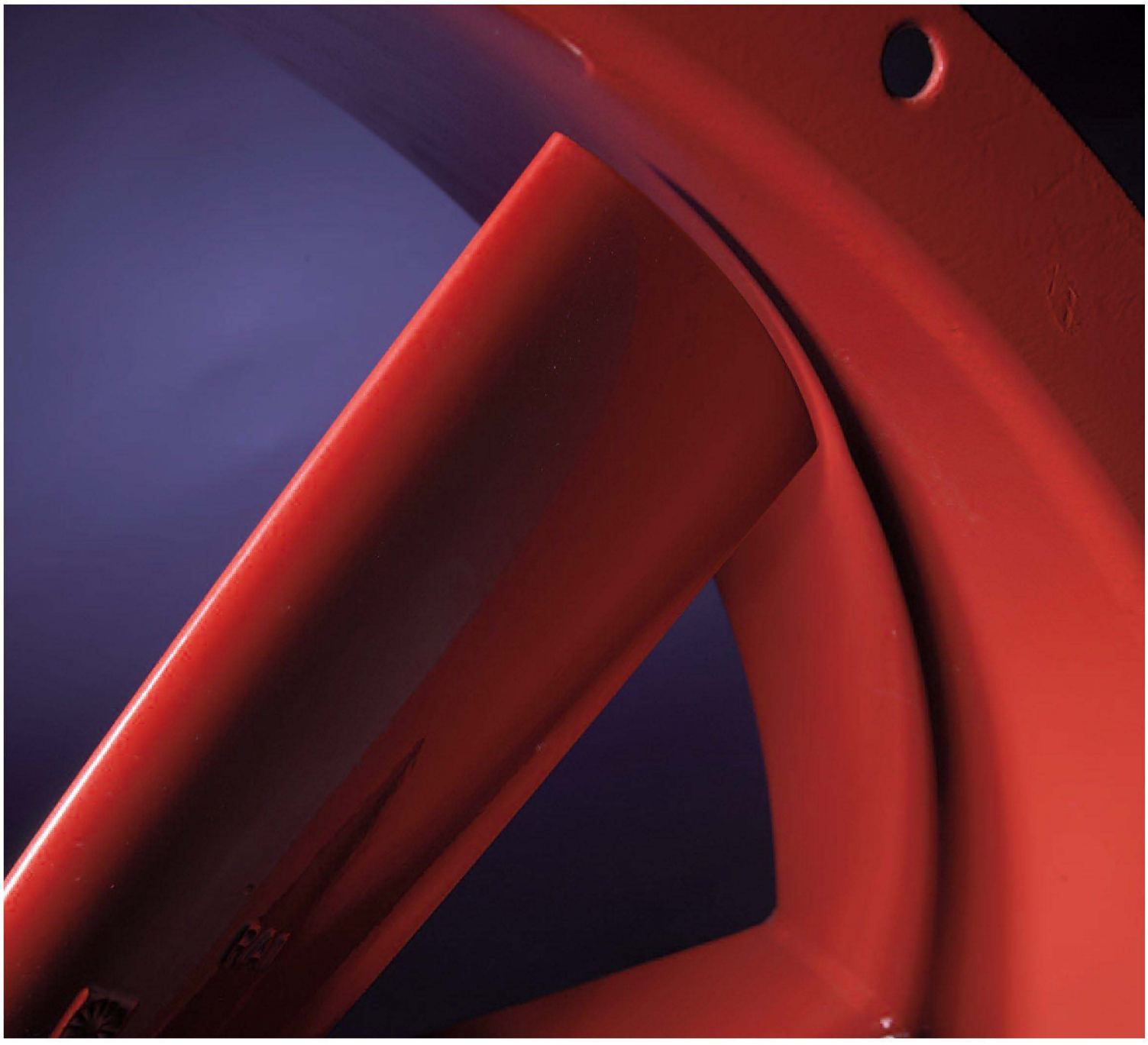

carparkventilation.com
Innovation, Application, Determination

A member of the ELTA GROUP LIMITED

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Applied Technology:	**Tel:**	[redacted]	**Fax:**	[redacted]
Building Services:	**Tel:**		**Fax:**	
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