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OPERATING AND MAINTENANCE INSTRUCTIONS

for the

ABOVE GROUND SMOKE VENTILATION SYSTEM

at

Grenfell Tower Apartments, London

for



ESTABLISHED 1890
JS WRIGHT & CO LTD
BUILDING SERVICE ENGINEERS

REVISION	ORIGINAL	A	B	C	D	E
ISSUED BY	D Harrison					
DATE	03/05/2016					
PURPOSE	Final					
CHECKED BY	R Yeadon					
APPROVED BY	T Haigh					
AMENDMENTS	O					

Our ref **PSBUK 750190 O&M**

Date **03/05/2016**

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Company Registration Number 400 66 40

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CLIENT DETAILS

CLIENT	JS WRIGHT & CO LIMITED The Atlas Building Portland Street Birmingham B6 5RX
TELEPHONE	0121 322 4000
CLIENTS SUBCONTRACT No	DP/29111/9497
IN ALL CORRESPONDENCE QUOTE	PSB UK LTD CONTRACT No 75019
PSB UK LTD REF:	75019O&MO

INDEX

SECTION 1.0 – HEALTH AND SAFETY AT WORK

SECTION 2.0 – INTRODUCTION

SECTION 3.0 – DESIGN

SECTION 4.0 – EQUIPMENT SPECIFICATION

SECTION 5.0 – INSTALLATION

SECTION 6.0 – OPERATION

SECTION 7.0 – MAINTENANCE

SECTION 8.0 – LIST OF DRAWINGS

SECTION 9.0 – ELECTRICAL TEST CERTIFICATES

SECTION 10.0 – COMMISSIONING REPORT

SECTION 11.0 – COMPLETION CERTIFICATE

SECTION 1.0 - HEALTH & SAFETY AT WORK

PSB UK Ltd and its associated sub-contractors have, in the design and manufacture of this Equipment, conformed to the legal requirements of the Health and Safety at Work Act 1974, to ensure that as far as is reasonably practicable, the equipment is designed and constructed so that during operation it is safe and does not give rise to risk of injury to operators when properly used. The equipment has been tested and examined relative to the specified duty. The original supplier has made available adequate information and facilities for complete discussion of all aspects of the equipment design and operation, and clarified any conditions necessary to ensure that when put to use it will be safe and without risk of injury to operators and other personnel.

During the design and construction period every endeavour was made to carry out the necessary research and investigation so far as was reasonably practicable to ensure the elimination, when the equipment was properly used, of any risks of injury which the design of the equipment and its application within the plant might create.

The above summary of considerations of operation and safety are directly related to the requirement of the Health & Safety at Work Act 1974, and is intended to cover those aspects of plant design and operation which form the initial responsibility of the original equipment supplier and his design, and installation programme.

The second aspect of equipment operation, maintenance and safety relates to the activities of the clients maintenance staff who will be engaged in the day-to-day overview of this equipment. It is their responsibility to ensure that such equipment operation and maintenance work which takes place respects those original conditions established by the original equipment supplier and all operation and maintenance work carried out within the plant observes the requirements of the Health & Safety at Work Act 1974, with respect to those activities.

Due regard must be made to the operational limitation of the equipment and all operations should conform to the limitations of plant performance established within the operating and maintenance and also in accordance with the results achieved and accepted during tests.

SECTION 1.0 - HEALTH & SAFETY AT WORK (Continued)

All maintenance should follow the prescribed procedures and where in light of local knowledge and conditions alternative procedures are followed, such procedures should follow the requirement of personnel safety as laid down or inferred by the Act.

Before commencing any maintenance activity all prime movers and electrical equipment must be isolated and the related safety notices displayed. At this stage guards may be removed, equipment opened up and the related maintenance activity carried out on the equipment. It is the responsibility of the maintenance supervisor or authorised representative to ensure that beyond all doubt the safety procedures adopted at this stage are completely adequate to guarantee the safety of the actual maintenance personnel.

Other aspects of personal safety relate to the maintenance of adequate general equipment cleanliness, walkway clearances, adequate lighting and provision of equipment conducive to personal safety.

The above details are not intended to cover every aspect of health, safety, operation and maintenance, but are indicative of typical aspects of the equipment.

The requirements above are to ensure that the original provisions of the equipment suppliers continue to be respected by the plant and equipment user and in particular that the health and safety of the employees is safeguarded at all times during the subsequent operation and maintenance activities.

SECTION 2.0 - INTRODUCTION

PSB UK Ltd were contracted by JS Wright & Co Ltd to Design, Supply, Install & Commission, Above Ground Smoke Ventilation Systems at Grenfell Tower Apartments, London.



SECTION 3.0 – DESIGN

3.1 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.

3.2 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 was 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.

SECTION 3.0 – DESIGN (CONTINUED)

3.3 Smoke Control System

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 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 will close (extract and inlet air) and all four dampers in the smoke affected lobby will then open and all dampers on the other floors are to remain closed.

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.

There are two pairs of smoke extract fans (one duty and one standby in each pair) one pair on the roof top plant room roof and one pair mounted within the new ductwork section on Level 02. There is also a single environmental fan located in the ductwork on Level 02.

SECTION 3.0 – DESIGN (CONTINUED)

The environmental fan and the smoke extract fans on the Level 02 will have a set of bypass dampers so that in environmental mode the smoke fan is isolated from the system and in smoke mode the environmental fan is isolated from the system.

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.

The mechanical system 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.

The environmental system will operate as follows:

- 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 a mechanical environmental extract shaft and the other will act as a mechanical fresh air make up shaft.

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.

SECTION 3.0 – DESIGN (CONTINUED)

The mechanical system will operate as described above and the mechanical environmental 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 dampers close and all other floors are then locked out
- Environmental controls are locked out
- By pass dampers to environmental systems close
- By pass damper to the smoke extract fan set opens
- Make air is provided via the stairwell penthouse louvre which is permanently open.
- 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.

The Boxing club and the common room lobbies have a single Wall mounted Automatic Opening Ventilator (AOV) fitted in each space. The AOV will consist of a bottom hung window which has a 24vDC actuator fitted. Each of the ventilated lobbies are fitted with a dedicated smoke detector linked into the central smoke control system and will both be complete with a fire override switch.

The cause and effect for the AOV ventilators are;

Smoke detected in a lobby only the applicable ventilator will open and the main mechanical system will remain unchanged.

The number & location of the temperature sensors for the environmental system are not within PSB UK Ltd and supplied by others these will operate by a signal from the BMS.



SECTION 4.0 – EQUIPMENT SPECIFICATION

4.1 Lobby

4.3.1 80 No Automatic Lobby Ventilators (By Others)



Automatic Lobby
Ventilators.pdf

4.3.2 1 No Control Panel



Control Panel.pdf

4.3.3 1 No HMI Mimic Override



HMI Mimic
Override.pdf

4.3.4 1 No Outstation Modular Control Panel



Outstation Modular
Control Panel.pdf

4.3.5 10 No Modular Battery Backup Panel



Modular Battery Back
up Panel.pdf

4.3.6 26 No Fireman's Override Switch's



Firemans Override
Switch & Smoke Dete

4.3.7 26 No Smoke Detectors



Firemans Override
Switch & Smoke Dete

SECTION 4.0 – EQUIPMENT SPECIFICATION (CONTINUED)

4.3.8 2 No Extract Fans



Extract Fans.pdf

4.3.9 1 No Fan Starter Control Panel



Fan Starter Control
Panel.pdf

4.3.10 83 No Pressure Sensors



Pressure Sensor.pdf

4.3.11 3 No By-pass Dampers



By-pass
Dampers.pdf

SECTION 5.0 – INSTALLATION

The installation of the Stairwell & Corridor Ventilation Systems was supply only and carried out J S Wright & Co Ltd sub-contractor in accordance with the approved drawings and does not present any specific difficulties, its relation to the adjacent area, which depends on the extent of supply undertaken by PSB UK Ltd.



SECTION 6.0 - OPERATION

6.1 Lobby Smoke Ventilation System Operation

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 a 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 provide 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 main 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.

SECTION 6.0 - OPERATION (CONTINUED)

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 and the mechanical environmental 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 dampers close and all other floors are then locked out.
- Environmental controls are locked out.
- By pass dampers to environmental systems close.
- By pass damper to the smoke extract fan set opens.

SECTION 6.0 - OPERATION (CONTINUED)

- Make air is provided via the stairwell penthouse louvre which is permanently open.
- 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.

SECTION 7.0 – MAINTENANCE

7.1 Equipment Maintenance

The attached documents listed in **Section 4.0 – Equipment Specification** above are designed to give sufficient information for the servicing of manufacturer's /supplier's equipment.

Please ensure that regular maintenance is carried out on every item listed as failure to do so could cause serious damage and may invalidate warranty claims.

The system provided requires little maintenance during normal operation.

It is also recommended that where Permits to Work, Method Statements, Risk Assessments, Health, Safety and Environmental requirements and certificates for crane and lifting equipment are necessary, they are obtained before any maintenance work is undertaken.

Unscheduled or Periodical Maintenance

Where the manufacturers / suppliers have not given specific frequencies for routine or periodical maintenance of their products, it is important that initially, regular inspections are carried out and recorded. Equipment experience will then indicate whether fewer inspections are required.

Should any unscheduled maintenance be required during the warranty period please contact our **Service Department on +44 (0) 1274 694 999**.

SECTION 8.0 - LIST OF MAIN DRAWINGS

8.1 PSB E 75015 800E Lobby Electrical Schematic (Lobby)



E75015-800E.pdf



SECTION 9.0 – ELECTRICAL TEST CERTIFICATES

By J S Wright & Co Ltd Sub-Contractor

SECTION 10.0 – COMMISSIONING REPORTS



grenfell tower
rev02.pdf

SECTION 11.0 – COMPLETION CERTIFICATE



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