16-0159 M&E

A SUMMARY REPORT OF THE EXISTING MECHANICAL AND ELECTRICAL BUILDING SERVICES

FOR

NEVILLE HOUSE

AT

CORBY

REV 4.0

ISSUING OFFICE:-

Higham Ferrers Office	Peterborough Office	**Birmingham office**
The Charles Parker Building	One Minerva Business Park	**The David Rolton Building**
Midland Road	Lynch Wood	**Twelve Quartz Point**
Higham Ferrers	Peterborough	**Stonebridge Road**
Northants	PE2 6FT	**Birmingham**
NN10 8DN		**B46 3JL**
01933 410909	01733 405500	**0121 767 9160**

CLIENT

Corby Borough Council
Deene House
New Post Office Square
Corby
Northants
NN17 1GD

CONSULTING ENGINEERS

Rolton Group Limited
The Charles Parker Building
Midland Road
Higham Ferrers
Northants
NN10 8DN

	Name	Position	Signature
Author:	Nicholas Phillips HNC	Senior Project Engineer	
Verifier:	Steve Harding BEng (Hons)	Senior Project Engineer	

Revision

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1.0	02.06.2016	First Revision
2.0	27.06.2016	Executive Summary updated, Section 4.3 added.
3.0	05.07.2016	Report updated to comments
4.0	25.07.2016	Report updated to comments

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1.0 EXECUTIVE SUMMARY

At the request of the client (Corby Borough Council), the Rolton Group were commissioned to carry out a survey of the property at Neville House, in Corby in May 2016. The works were generally limited to the ground floor entrance lobby, stairwells, second, third and fourth floors and the roof terrace only. The main lift serving the flats falls outside of this report.

The Mechanical and Electrical Building Services survey was carried out on the 9th of May 2016, which identified the following items as the primary capital expenditure items to be considered for review and / or replacement:

General

- Fire alarm equipment shall be inspected for compliance with BS 5839-1 and BS 5839-6.
- Due to the apparent age and condition of the existing electrical installation and associated final circuit wiring and distribution boards, we recommend that an electrical installation condition report (EICR) is undertaken in accordance with BS7671.
- Hot water services have been removed from all of the apartments and will require installing with new systems. Systems shall be installed and comply with BS 1566 and BS 3198.
- Heating services will require replacing with new due to the condition and age of the existing services.
- Ventilation services to the bathroom and kitchen areas will require replacing with new systems as they are non-compliant with current standards.
- Water storage tanks supplying the building will require replacing with new as they are non-compliant with current water regulations.
- Above ground drainage systems will require replacing with new due to the condition and age of the existing services.
- Low/Zero Carbon technologies have been considered to serve this building under Section 4.3 of this report. This provides an overview of potential renewable technologies that we consider will benefit the building and reduce the carbon footprint.

2.0 INTRODUCTION

Rolton Group were commissioned by Corby Borough Council to carry out a survey of the property at Neville House, George Street, Corby NN17 1QD. The survey was limited to the accessible areas covering the second, third, fourth and fifth floors and a roof level of the building.

Our survey was limited to the areas which were safely accessible and made available to us on the day, covering the mechanical and electrical building services installation only.

Property Description

Neville house is a five storey building, with a roof terrace on George Street in Corby.

The ground floor of the building is currently used for retail, combination of shops, bars, restaurants etc. The first floor is office space which is currently under refurbishment, with the remaining three upper floors, which this survey relates, are residential (flats) and are currently unoccupied. It is understood that Neville House was constructed during the late 1960’s.

2.1 LIMITATIONS

This report is based upon non-intrusive visual inspections. Unless specifically stated, we have not inspected any parts of the premises which are covered, hidden or inaccessible and we are therefore unable to report regarding the condition of services installations or any defects present within such areas. We have also conducted no specific inspections with regard to:

- asbestos,
- contamination
- deleterious materials,
- specialist plant or equipment,
- below ground foul and storm water drainage systems.
- testing or operation of services items, plant or equipment

Compilation and collation of all relevant health and safety information should be carried out as a priority to ensure compliance.

Until documentation is available, separate Risk Assessments/Method Statements should be prepared as soon as possible for the building prior to carrying out planned preventative maintenance (PPM) on the installed services in the building.

3.0 DESCRIPTION AND CONDITION OF EXISTING SERVICES

3.1 MECHANICAL SERVICES

This section provides an overview of the mechanical services installations including heating, ventilation, domestic hot & cold water and above ground drainage.

Due to elements of systems being concealed (above ceilings, within wall voids, or within floor voids), the content of this report relates to those elements of systems which could be seen and safely accessed at the time of inspection.

The installed mechanical systems are of varying age and condition as the systems appear to have been updated and extended during multiple refurbishments of the property.

The life expectancy factors contained herein have been derived from the CIBSE Guides, particularly guide M.

3.1.1 VENTILATION SYSTEMS

General

Natural ventilation is generally used throughout, which consists of openable windows and rotary vent-a-matic vents located within the kitchen areas in each Flat.

Bathroom Extract System

All bathroom areas throughout the building are provided with a local extract ventilation systems. This system is routed from the bathroom area via rectangular ductwork through the living room and discharges on the front elevation of the building. As these services are boxed in we were unable to assess the condition of the extract fans and ancillary items.

The makeup air path is through doorways, which are not fitted with transfer grilles and therefore rely on air drawn under doors.

Control of the extract system is assumed to be via activation with the light switch and overrun timer.

Condition Appraisal

All of the above mention extract systems appeared in generally good condition, areas that were exposed, but were not functionally at the time of the survey. We recommend the system is replaced with new due to the age of the systems.

Extraction fans have a life expectancy of up to 20 years as identified in CIBSE guide M appendix section 12 A1.

3.1.2 HEATING SYSTEMS

Heating

Heating throughout all the flats are provided via wall mounted electric panel radiators, with some areas fitted with storage type heaters. Temperature control is available to all of the units via individual integral control. All of these services have reached the end of their serviceable life and replacements are recommended due to the age and condition they are currently in.

However there are a small number of storage type heaters which could possibly be retained as they look relatively new, 1 or 2 years old. We recommend a functional appraisal of these heaters to highlight any defects that can pose harm for an occupant.

All other areas of the building, corridors, landing areas, storage areas and landlords' areas are not provided with any form heating systems.

Condition Appraisal

Below provides a reference guide on the end of economic life to assess the systems mentioned.

Wall mounted electric storage radiator systems have a life expectancy of up to 10 years as identified in CIBSE guide M section 12 A1.

3.1.3 DOMESTIC WATER SERVICES & SANITARY WARE

Mains water

The mains incoming water to each of the flats is supplied via water storage tanks located on the fourth floor plant room. The current condition and age of the storage tanks are non-compliant to current water legislations and will require replacing. We understand at some point the water storage tank was decommissioned and flats 3, 8, 9 and 12 were modified to be fed direct from the mains cold services with local metering installed.

Hot Water

Hot water was originally generated by the use of an electric emersion cylinder which was located in purpose built cupboard in each of the flats. This has since been removed with local pipework services isolated. Hot water services pipework appears to be installed to serve each flat via just a flow system with no form of trace heating installed.

We recommend a new hot water system to serve the kitchen and bathroom areas to be installed to each of the flats, as currently hot water cannot be generated for an occupant due the existing system has been removed.

Existing pipework shall be inspected and tested to confirm if it is possible to retain these services or to replace with new.

Condition Appraisal

All visible pipework appears in good condition with no signs of leakage.

Copper pipework systems have a life expectancy of up to 45 years as identified in CIBSE guide M section 12 A1.

Plastic pipework systems have a life expectancy of up to 20 years as identified in CIBSE guide M section 12 A1.

3.1.4 ABOVE GROUND DRAINAGE

The above ground drainage system is located to serve sanitary fittings on all floors. The drainage pipework is boxed in / concealed throughout. The system is ventilated to atmosphere at roof level.

The kitchen includes a stainless steel type single bowl sink.

Bathrooms are provided with above ground drainage to all items of sanitary ware.

Very little of the above ground drainage system is visible, however those areas that are visible appear generally in a poor condition along with the sanitary fittings which are also in a poor condition. We recommend a complete fit out of these areas due to the age and condition they are currently in.

Condition Appraisal

Below provides a reference guide on the end of economic life to assess the systems mentioned.

uPVC drainage pipework systems have a life expectancy of up to 20 years as identified in CIBSE guide M section 12 A1.

Sanitary appliances have a life expectancy of up to 20 years as identified in CIBSE guide M section 12 A1.

3.2 ELECTRICAL SERVICES

This section provides an overview of the electrical services installations within the building including LV distribution, lighting systems, small power, security including access control systems and fire alarm systems.

Due to elements of systems being concealed (above ceilings, within wall voids, or within floor voids), the content of this report relates to those elements of systems which could be seen and safely accessed at the time of inspection.

The installed electrical systems are of varying age and condition as the systems appear to have been updated and extended during multiple refurbishments of the property.

The life expectancy factors contained herein have been derived from the CIBSE Guides, particularly guide M.

3.2.1 LOW VOLTAGE (LV) DISTRIBUTION

The main incoming LV supplies to the apartments and landlord areas are located in the switch room on the second floor.

The main incoming supply to the apartments consists of a multicore incoming cable which terminates into the bottom of a main cut-out/multiway fuse board which is fully enclosed. Individual outgoing circuits run from the top of the fuse board to distribute to each apartment in multicore cables. The outgoing circuits terminate into a main cut-out in each apartment which feeds the adjacent meter and consumer unit(s) for the property. The consumer units then feed the electrical circuits within the apartment which are protected by miniature circuit breakers.

Condition Appraisal

The main incoming supply and distribution for the apartments appears to be in good condition. The consumer units and distribution within each of the apartments is in a fair condition however equipment is outdated and non-compliant with current standards. These services will require a completely new installation in order to bring the service up to current standards.

The main incoming supply and distribution for the landlord's services appears to be in a poor condition with a lack of mechanical protection to cabling, a mixture of old and new standards with some items of equipment outdated. These services will require a completely new installation in order to bring the service up to current standards.

LV distribution switchgear have a life expectancy of up to 25 years as identified in CIBSE guide M appendix section 12 A1.

Final circuit cabling systems have a life expectancy of up to 15 years as identified in CIBSE guide M appendix section 12 A1.

3.2.2 GENERAL LIGHTING

The lighting system comprises a mixture of pendants, circular recessed down lights, compact fluorescent downlights and feature wall lights.

The main lighting systems throughout the each of the flats are operated by switched manually, with some areas by pull cords.

Condition Appraisal

The lighting type, age and condition varies greatly throughout depending on room use and appear in a poor condition, replacements are required.

Internal luminaires have a life expectancy of up to 20 years as identified in CIBSE guide M appendix section 12 A1.

3.2.3 SMALL POWER

Small power is supplied from a local consumer unit with single phase miniature circuit breaker (MCB) within each of apartments which are all installed with an energy meter with some benefiting of key top up.

Small power is distributed throughout the rooms and communal areas in the form of standard faceplate accessories. Accessories within the kitchen area were finished in plastic type fittings.

All other small power services are as follows:

- Supplies to mechanical equipment.
- Supplies to kitchen equipment and appliances.

Condition Appraisal

The consumer units and distribution within each of the apartments is in a fair condition however equipment is out-dated and non-compliant with current standards. These services will require a completely new installation in order to bring the service up to current standards.

Final circuit cabling systems and electrical accessories have a life expectancy of up to 15 years as identified in CIBSE guide M appendix section 12 A1.

A full electrical installation inspection and test report should be carried out to BS 7671:2008(2011) and NICEIC guidelines, with category / code defects highlighted and reviewed.

3.2.4 FIRE DETECTION AND ALARM SYSTEM

Fire alarm detection is located in the landlord areas via manual call points with the main panel located third floor landing area.

There are no manual call points installed within each of the flat areas.

Smoke detectors located within the fifth floor had dust caps mounted on smoke heads. Flat 9 is installed with a complaint smoke detection system but has been pulled out from its fixings and wiring is loose.

Condition Appraisal

A complete overhaul of the fire alarm system is required due to the age and condition of the existing system.

Fire alarm equipment shall be inspected for compliance with BS 5839-1 and BS 5839-6.

Fire detection and alarm systems have a life expectancy of up to 15 years as identified in CIBSE guide M appendix section 12 A1.

3.2.5 DATA COMMUNICATIONS

A standard BT telephone service enters the property in the electrical cupboard and is connected into the patch panel.

Standard data and telephone outlet points were installed in a number of rooms throughout the flats and are linked back to the patch panel which is located within the third floor meter room.

Condition Appraisal

The BT outlets appeared in good condition and does not show any signs of aging.

Data systems has a life expectancy of up to 10 years as identified in CIBSE guide M appendix section 12 A1.

3.2.6 CCTV, ACCESS CONTROL AND INTRUDER ALARM

CCTV and Intruder alarms systems have not been installed to serve this building.

Access control is via an audio entry panel located in the ground floor entrance lobby, with entry panels installed located within each flat entrance.

Condition Appraisal

The access control system is located in the ground floor entrance lobby and generally appears to be in an acceptable condition, with some apartments the system has been removed. Given the age of the system and natural wear and tear is visible we recommend a new system to be installed.

Access control systems have a life expectancy of up to 15 years as identified in CIBSE guide M section 12 A1.

3.3 INCOMING SERVICES

3.3.1 INCOMING WATER SUPPLY

The mains incoming water enters the building in the second floor complete with metering. The services the original services rises through to the fourth floor to serve water storage tanks. Potable water supply is then distributed to all the flats. We understand at some point the water storage tank was decommissioned and flats 3, 8, 9 and 12 were modified to be fed direct from the mains cold services with local metering installed.

3.3.2 INCOMING ELECTRICAL SERVICES

The main incoming supply enters the building within the second floor switch room, this comprise of two supplies one for the landlords and the remainder to serve the apartments. Local metering to the landlords supply is present, with the apartments having local consumer units installed and local metering.

4.0 RECOMMENDATIONS & CONCLUSIONS

The following conclusions and recommendations have been made based on the observations from our survey of the mechanical and electrical building services installation in Neville House, George Street, Corby NN17 1QD.

The life expectancies[1] are quoted as a range (normal to maximum life expectancy), based on the system being maintained in accordance with the manufacturer's recommendations, current good practice, and operation within design parameters and protected from extreme conditions and damage.

4.1 REMEDIAL WORKS REQUIRED

General

- Fire alarm equipment shall be inspected for compliance with BS 5839-1 and BS 5839-6.
- Unable to verify operation of bathroom ventilation fan units. Assumed fault or isolated cause of problem.
- Due to the apparent age and condition of the existing electrical installation and associated final circuit wiring, we recommend that an electrical installation condition report (EICR) is undertaken in accordance with BS7671.
- Hot water services to be installed due to existing being decommissioned and isolated.
- Heating services to be installed due to the age and condition of existing systems.
- Ventilation services to the bathroom and kitchen areas require installing new systems.
- Potable water storage tanks to be replaced due to non-compliant.

4.2 GENERAL BUILDING SERVICES & DOCUMENTATION

No operation and maintenance (O&M) manuals were present on site and the following information should therefore be sought:

- Drainage systems test certificate
- Electrical installation certificate and associated electrical installation condition report
- Fire alarm certificate of conformity
- Flushing, chlorination and disinfection certificate
- Pipework pressure testing written schemes of examination and certification
- Water system flushing, cleaning and chemical dosing certificate

[1] Life expectancy data is taken from CIBSE Guide M – Maintenance Engineering and Management

4.3 LOW/ZERO CARBON (LZC) TECHNOLOGY OPTIONS

Below provides a range of individual renewable and low/zero carbon (LZC) technologies to identify the most appropriate to be considered to serve Neville House, Corby:

	Technology	Suitability for Site
Renewable Technologies	Photovoltaic Panels	High (Low)
	Air Source Heat Pumps	High
	Biomass	Low
	Fuel Cells	Low
	Ground Source Heat Pumps - Closed Loop	Low
	Ground Source Heat Pumps - Open Loop	Low
	Solar Hot Water Panels	Medium
	Wind Power	Low
Low Energy/Low Carbon Technologies	Water Conservation	High
	Rainwater Harvesting	Low
	Absorption Cooling	Low
	Combined Heat and Power	Low
	Greywater Recovery	Low

As can be seen in the above table, renewable and low / zero carbon technology opportunities are limited due to site specific constraints and location. However, additional carbon savings will also be achieved from energy efficient design and low carbon construction.

The following are brief summaries of the individual renewable technologies that have been considered:

4.3.1 PHOTOVOLTAIC PANELS

Suitability - High (Low)

Photovoltaic panels is a useful source of electricity to offset everyday small power usage. During periods of non-occupancy photovoltaics will still provide useful electricity that can be fed back into the national grid.

Suitability of this system is high as the location of the panels can be located on the flat roof of the building which benefits of being south facing with no local shading. However, we have considered the capital costs and pay back periods currently for this system to be installed and would advised to be a low suitability.

4.3.2 AIR SOURCE HEAT PUMPS

Suitability - High

Air source heat pumps are a well-established technology that can easily be integrated with existing building services systems. Using the heat from the external air temperature this is absorbed and can either be transferred into a liquid or air which can be distributed to serve heating circuits or ventilation systems.

Location of siting the external units would be located on the flat roof of the building with the distribution through existing following the routes of existing service risers.

Suitability of this system is high due to the absence of natural gas to serve the building, which could be used to serve gas fired boilers.

4.3.3 BIOMASS

Suitability - Low

The site heat demand will be relatively small and intermittent where biomass is better suited to high constant heat demand that is not present in the Neville House.

In addition a large store would be required for the biomass fuel. This store would not fit within the current building floor plans and therefore an external store would be required. Again location for this externally is very limited.

Suitability for the site is low due to the external storage requirement and the high variation and fluctuations in heat load reducing the boiler efficiency due to its inability to effectively modulate its output. The system also would have to be a centralised system with heat meters to each of the flats.

4.3.4 FUEL CELLS

Suitability - Low

Fuel cells would provide both heat and electricity to the building however fuel cells are better suited to high constant heat demand that is not present on this site.

Fuel cells are considered to be a low suitability option for the building due to fluctuating heat load, the large capital costs of a system and a lack of suitable commercially viable solutions.

4.3.5 GROUND SOURCE HEAT PUMPS – CLOSED LOOP

Suitability - Low

Ground source heat pumps would extract heat/cool from the ground in similar quantities to the air source heat pumps from the air. This parity between the two systems means that the two technologies are mutually exclusive.

Ground source systems have an improved coefficient of performance over air source but the cost of installation is much higher due to the amount of excavation/depth of boreholes required. Being located within a built up area means the area required to install this system is not available making the building suitability low to be served by this system.

4.3.6 GROUND SOURCE HEAT PUMPS – OPEN LOOP

Suitability - Low

An open loop ground source heat pump could provide heat/cool for use within the building heating/cooling systems.

Different to closed loop systems, the open loop ground source heat pumps extract the groundwater for use within a heat pump where with the closed loop system no ground water is extracted.

Although open loop systems provide better CoPs than closed loop systems, the additional costs incurred from ongoing maintenance due to the particulates that are contained in the extracted water.

Like the closed loop system, the external space required to install this system is not available within the site leaving the suitability as low.

4.3.7 SOLAR HOT WATER PANELS

Suitability - Medium

Solar hot water panels (also known as Solar Thermal) harness heat from sunlight by capturing energy which is radiated by the sun within solar panels or collectors. The heat is the transferred via service pipework to a cylinder which in turn pre-heats the water, reducing the need of electricity to heat the hot water to the required temperature.

Location of the solar hot water panels require the same type of roof space as for installation of the photovoltaic panels and also orientation.

Large hot water storage capacity will be required to make effective use of the generated heat and would consider this system to be a medium suitability.

4.3.8 WIND POWER

Suitability - Low

Wind turbines would provide good levels of electricity generation as a simple standalone technology with little effect on the building's design.

The surroundings of the site are largely built up retail / residential areas.

Wind turbines are considered to be of a low suitability for the site due to the uncertain impact of the surroundings, possible planning implications and high capital cost.

4.3.9 WATER CONSERVATION

Suitability - High

As part of the design process low flow fittings and water saving appliances should be included to all sanitary items as general good practice.

4.3.10 RAINWATER HARVESTING

Suitability - Low

Rainwater harvesting for the site would be beneficial to provide toilet flushing. This would be installed as a system separate to the mains water supply to avoid contamination.

Collecting rainwater for storage in a tank buried within the external landscaping, where it would also be cleaned and filtered, would provide water for the uses above. However siting the tank to serve this system is not available within the site, also limited supply of water and continuous maintenance required leaving this suitability for the building as low.

4.3.11 ABSORPTION COOLING

Suitability - Low

Absorption cooling requires larger equipment and is also less efficient than 'standard' cooling methods and so the benefit comes from using absorption cooling only where a waste heat source is available.

With no waste heat source available, no allied technology proposed and no cooling demand, absorption cooling is low suitability for the building.

4.3.12 COMBINED HEAT AND POWER

Suitability - Low

Combined heat and power (CHP) would provide both heat and electricity to the building.

CHP would be applicable at medium to large scale with a view to creating a district energy centre for export of electricity and heat to the surrounding area(s) however this would come at a premium cost.

Suitability for the site is low due to the high variation and fluctuations in heat load reducing the CHP's efficiency due to its inability to effectively modulate its output.

4.3.13 GREYWATER RECOVERY

Suitability - Low

The increased complexity of greywater systems required to facilitate this and cost thereof would negate any benefit that may be gained from this process.

In addition rainwater harvesting would provide the same function of toilet flushing, leaving greywater recovery as a low suitability option.

The conclusions and recommendations contained within this assessment report are based on our desktop study of the information available to Rolton Group. It is believed that these observations are representative of what will be the normal operation of the buildings but this should be confirmed through detailed review and assessment before implementing measures, particularly where they involve substantial capital expenditure.

APPENDIX A

PHOTOGRAPHS

Figure 1. Flat 12 – Lighting and local pull cord.

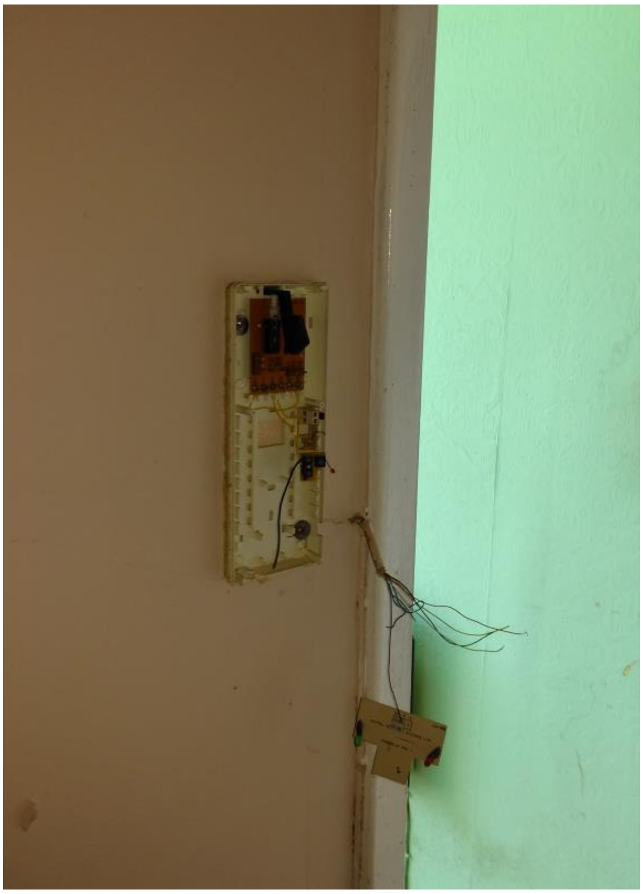

Figure 2. Flat 12 - Access control.

Figure 3. Flat 12 - Kitchen area with local in glass ventilator.

Figure 4. Flat 12 - Existing electric panel heater.

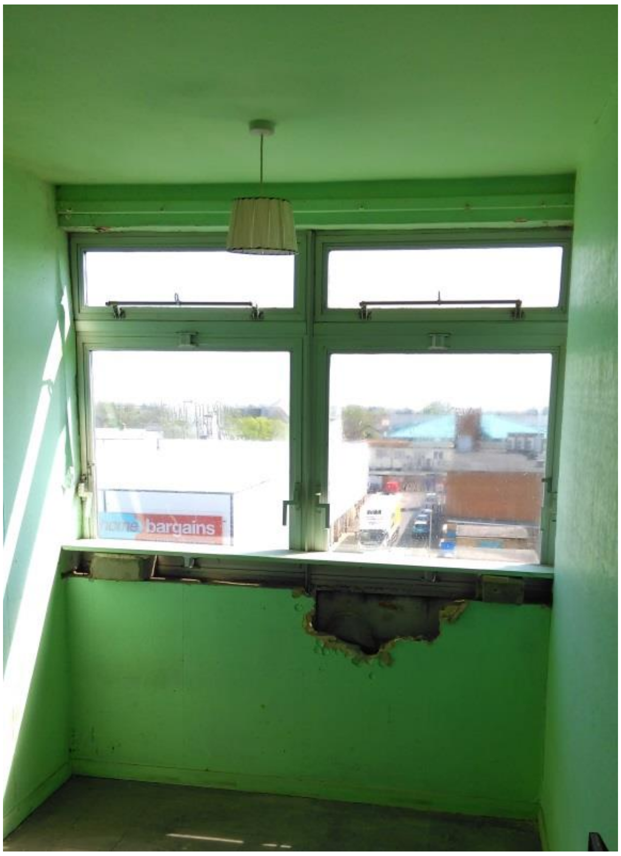

Figure 5. Flat 12 – Lighting & condition of building fabric.

Figure 6. Flat 12 – Incoming electrical supply & local metering.

Figure 7. Flat 12 – Bathroom area lighting, ventilation and high level heater.

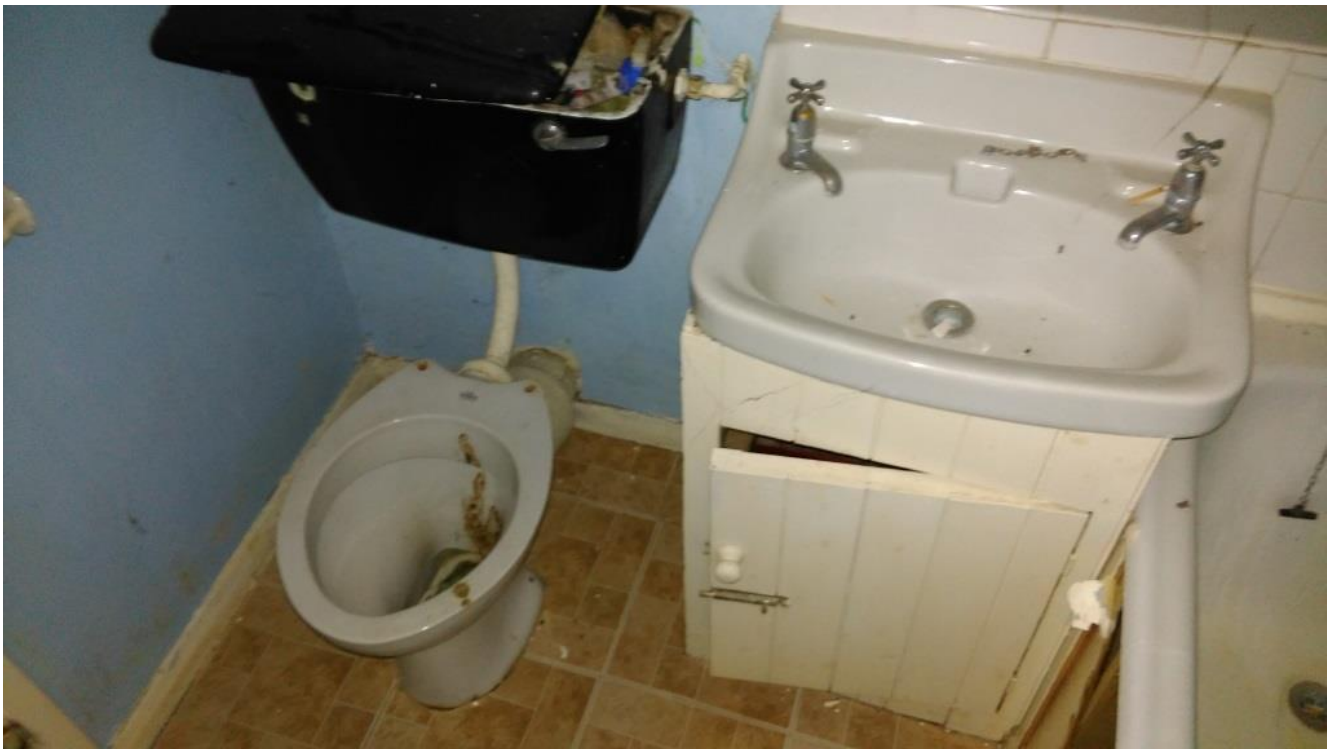

Figure 8. Flat 12 – Bathroom sanitary ware condition.

Figure 9. Flat 12 – Electric storage heater

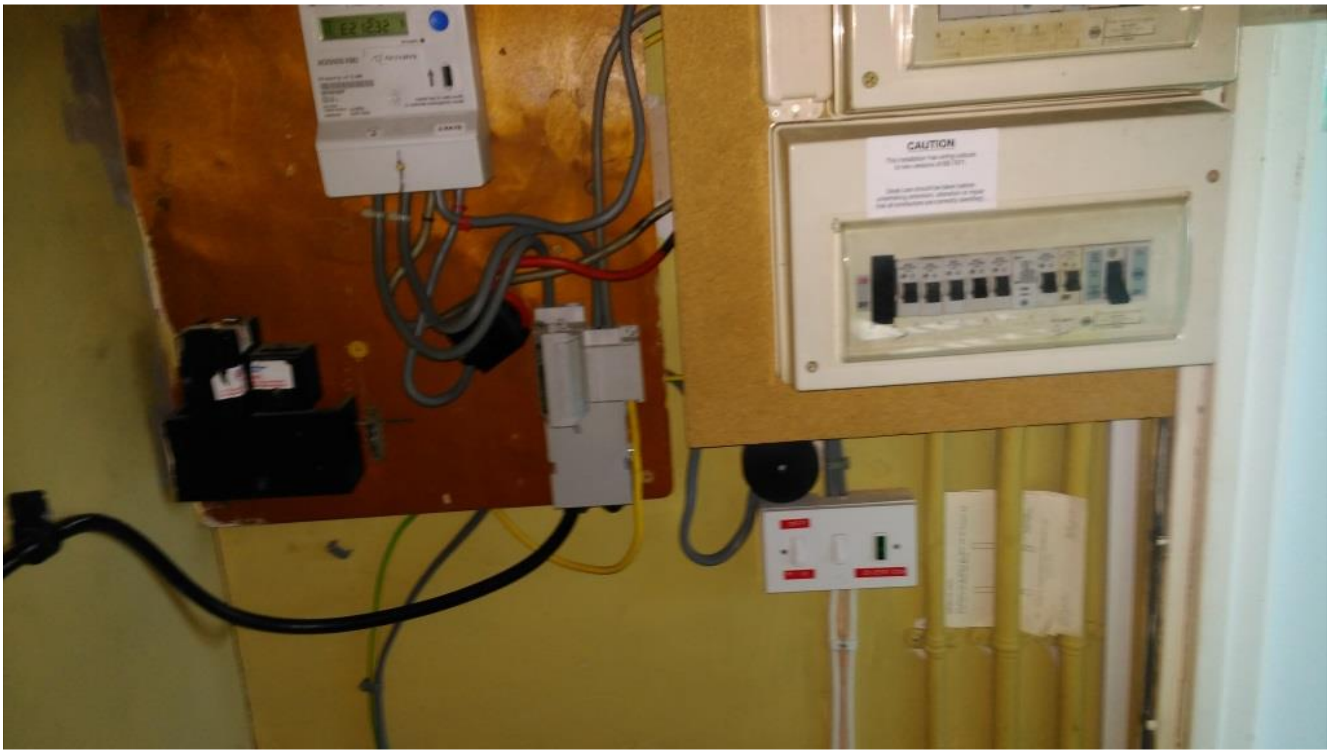

Figure 10. Flat 10 – Incoming electrical supply & local metering.

Figure 11. Flat 10 – Domestic hot water cylinder removed.

Figure 12. Flat 1 – Incoming electrical supply & local metering.

Figure 13. Flat 1 – Electric panel heater.

Figure 14. Flat 1 – Ventilation system to bathroom area.

Figure 15. Flat 1 – Inside condition of Ventilation ductwork and highlighting the extract fan.

Figure 16. Flat 2 – Incoming electrical supply & local metering.

Figure 17. Flat 2 – Incoming electrical supply.

Figure 18. Flat 2 – Kitchen Area

Figure 19. Flat 2 - Domestic hot water cylinder removed.

Figure 20. Flat 2 – Electric panel heater.

Figure 21. Flat 2 – Bathroom area.

Figure 22. Flat 8 – Incoming electrical supply & local metering.

Figure 23. Flat 8 – Incoming water supply & local metering.

Figure 24. Flat 8 – Electric storage heater and local lighting.

Figure 25. Flat 8 – Bathroom area ventilation system.

Figure 26. Flat 7 – Incoming electrical supply & local metering.

Figure 27. Flat 7 – Incoming electrical supply & local metering.

Figure 28. Flat 7 – Ventilation system serving bathroom area and electric storage heater.

Figure 29. Flat 7 – Inside condition of Ventilation ductwork and highlighting the extract fan.

Figure 30. Flat 7 – Electric storage heater.

Figure 31. Flat 9 – Incoming water supply & local meter.

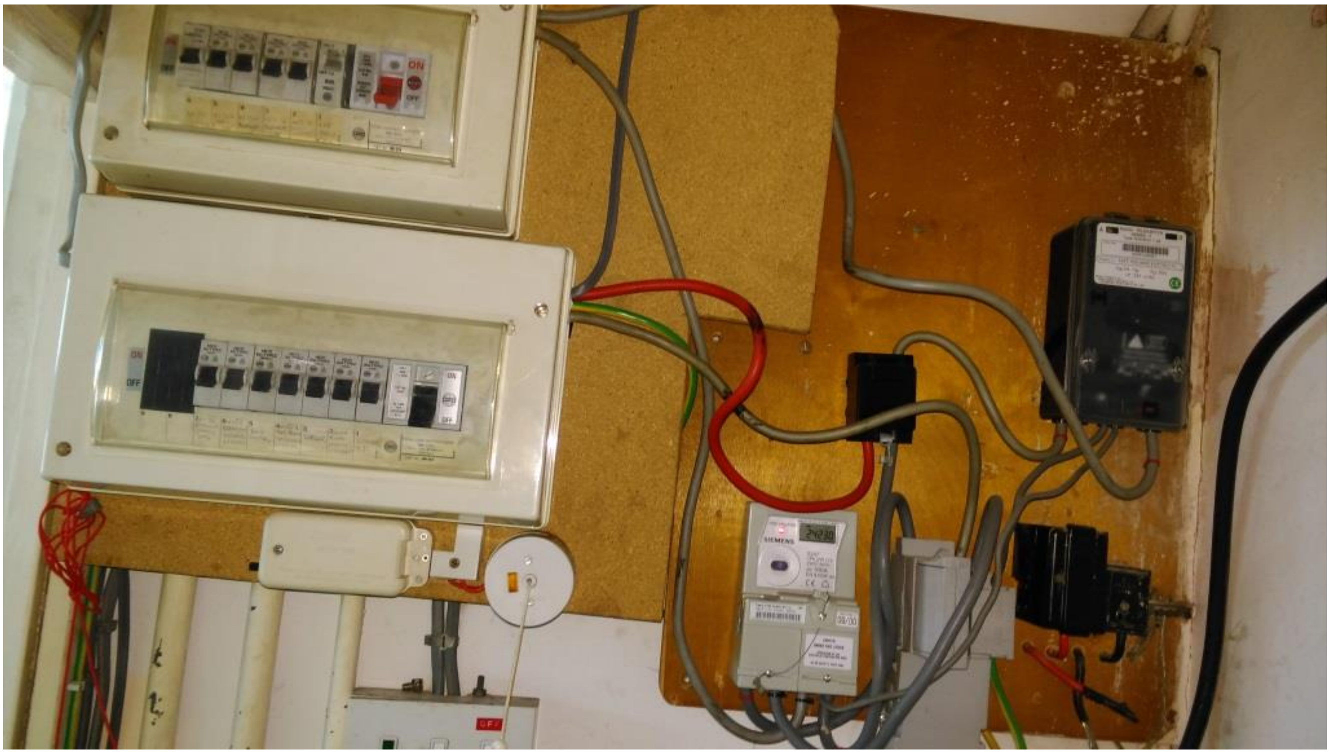

Figure 32. Flat 9 – Incoming electrical supply & local metering.

Figure 33. Flat 9 – Faulty smoke detection system

Figure 34. Flat 9 – Faulty smoke detection system

Figure 35. Flat 9 – Electric storage heater.

Figure 36. Flat 9 – Lighting and local pull cord.

Figure 37. Flat 6 – Incoming electrical supply & local metering.

Figure 38. Flat 6 - Incoming water supply & local meter.

Figure 39. Flat 6 – Electric storage heater, Access control and Ventilation system serving Bathroom area with power supply serving local extract fan.

Figure 40. Flat 6 – bathroom area.

Figure 41. Flat 5 – Incoming electrical supply & local metering.

Figure 42. Flat 5 – Kitchen area Lighting and Electric storage heater.

Figure 43. Flat 5 – Kitchen area.

Figure 44. Flat 5 - Incoming water supply & local meter.

Figure 45. Flat 5 – Incoming electrical supply & local metering.

Figure 46. Flat 3 – Kitchen area with local in glass ventilator.

Figure 47. Flat 3 - Incoming water supply & local meter.

Figure 48. Flat 3 - Domestic hot water cylinder removed.

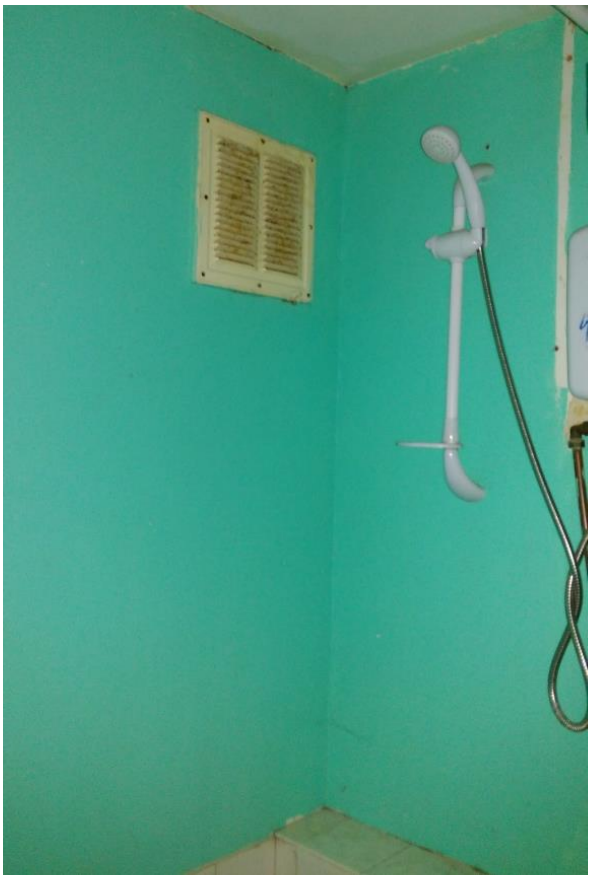

Figure 49. Flat 3 – Bathroom area ventilations system.

Figure 50. Flat 3 – Water meter display located in corridor.

Figure 51. Main incoming electrical serving the building.

Figure 52. Access control keypad located in the first floor lobby.

Figure 53. Fire alarm panel located on the third floor landing area.

Figure 54. Fire call point and alarm bell located on third floor landing.

Figure 55. Cold water storage tank located on fourth floor.

Figure 56. Internal condition of cold water storage tank located on fourth floor.

Figure 57. Lift motor room.

Figure 58. Details of the existing lift.

Figure 59. Inside main BT Patch panel.

Figure 60. Details Main BT Patch panel.

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