SKELLY & COUCH

# Building Environment and Services Engineers

# Building Services Survey Report

**CLIENT**

Historic England

**PROJECT**

1703 – Decarbonisation of Cultural Heritage Buildings : Shire Hall Museum

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# 1 Introduction

Skelly and Couch have been appointed by Historic England, as part of the umbrella project 'Decarbonisation of Cultural Heritage Buildings, to undertake a visual building services survey for the Shire Hall Museum.

A Thermal Imaging survey was undertaken simultaneously; this is summarised in a separate report.

The survey took place on 3rd Feb 2025.

The report is based on visual inspections made on 3rd Feb 2025.

The building was open and occupied to staff and the public throughout the survey.

The purpose of the report was to identify M&E equipment energy use that could be addressed with a decarbonisation strategy and the capacity of the existing infrastructure to establish a base point for energy reduction measures and the introduction of decarbonised plant.

The report also describes the principle of the non-energy using M&E services identified incidentally as part of the inspection.

The Shire Hall is a Grade I listed Georgian former courthouse Dorchester. The building now houses the Shire Hall Historic Courthouse Museum. The Shire Hall building is owned by Dorset Council and is leased by the Shire Hall (Dorchester) Trust. The council is responsible for the structure and external envelope.

The Shire Hall includes two no. flats located on the second floor. The flats are rented out with the incoming coming to the museum trust. The flats are managed by a property management company on behalf of the museum trust.

# 2 Recommendations for further analysis

1. Detailed survey of existing M&E installation
2. Detailed survey to identify outputs of the heat emitters in each space.
3. Temperature monitoring in peak season to assess performance of control
4. $CO_2$ monitoring in heavily occupied spaces to assess performance of control
5. Air pressure tests
    a. To quantify how the existing building performs
    b. To more closely establish peak heat of the building
    c. To identify current air movement that may be mitigating over heating measures

# 3 Record Information

The below record information has been received as digital copies or reviewed on site as paper copies.

## 3.1 Surveys

- Building condition survey/Planned preventative maintenance report – Hartnell Taylor Cook on behalf of Dorset Council – May 2024

## 3.2 Utility Bills

- Monthly gas usage data from January 2022 to January 2025
- Monthly electricity usage data from January 2022 to December 2024
- Half-hour electricity usage data from December 2024 and January 2025

Note meter data excludes the flats which are separately metered and paid directly by the tenants.

## 3.3 Drawings & O&M info

- Proposed architectural layout drawings from the 2017 Philip Hughes Associates works – Note that these do not accurately reflect the as-built condition
- Electrical record drawings:
    - Electrical schematic
    - Electrical services distribution layouts
    - Lighting & fire alarm layouts
    - Small power & comms layouts
- Limited electrical O&M information

No record drawings or O&M information is available for the mechanical systems with the exception of some incomplete commissioning information.

# 4 General observations & notes

## 4.1 On-site meeting with Shire Hall

### 4.1.1 Attendees

- Angela Heron Watkins - Museum Developer, Shire Hall Historic Courtroom Museum
- Virginia Smith – Museum Director, Shire Hall Historic Courtroom Museum
- Dan Miles – Historic England
- Hannah Reynolds – Conservation architect, Historic England
- Sehrish Wakil – Building services Engineer, Historic England
- Feimatta Conteh - Arts Council
- Elizabeth Flower - Howorth Tompkins
- Julie Arnesen – Skelly & Couch
- Finley Lofters – Skelly & Couch

### 4.1.2 Previous/ongoing works

Significant work carried out in 2017/2018 to convert the building into a museum. Works included complete replacement of services to most areas of the building.

A building condition survey was commissioned by Dorset Council in May 2024, which highlighted issues with the budling and services, however, these are yet to be addressed.

### 4.1.3 Museum team

The museum is run by a small team, most of which work part time, supported by a number of volunteers. The museum staff currently consists of 4no. staff following a recent restructure. The Shire Hall does not have a facilities team.

### 4.1.4 Occupancy patterns

The museum is open Monday – Saturday 10.00 – 16.00. Staff are generally present 9.00 – 17.00. Cleaning staff in out of hours.

Museum visitors consist largely of school visits, locals and passers-by. Café sees significant café only customers as well as museum visitors. The Learning space is regularly hired out for community groups, events, and training days.

Types of events museum spaces are currently booked for:

- Community groups
- Events
- Exhibitions for artists
- Training days such as council training
- Concerts/Performances
- Memory café (AgeUK)
- Paranormal events in the cells.

Some of these events take place outside of typical museum opening hours i.e concerts (up to 22.00) and paranormal events (until 2.30 in the morning). Out of hours events are currently about every 2 months.

The Learning space typically has an occupancy of ~30 people when used for school groups or training days. Capacity ~70 when seated for a performance.

Annual visitors to the museum are currently at around 20,000, however, only about 11,000 of these are paying customers.

### 4.1.5 Operational notes

The Shire Hall is unheated outside of occupied hours.

No heating is provided to the entrance hall or to the museum spaces on the lower ground floor and basement level. Museum visitors generally keep their coats on.

### 4.1.6 Vision

The Shire Hall has a strong desire to incorporate climate change awareness into their activities, and sees decarbonisation of their own activities as a key part of their social responsibility. The Shire Hall aspire to be an example to other similar organisations.

The Shire Hall intend to open the building up to more commercial activities and event hire to increase the museum profits and make the building more of a community hub.

Looking to maximise occupancy in the lettable spaces.

### 4.1.7 Issues brought up

**Ventilation**

- The Shire Hall report that the ventilation systems generally don't work, and have never functioned properly after the installation during the 2017 works. This includes ventilation systems to the museum and the flats.
- Grand Jury Room and Learning space get very stuff, particularly at higher occupancy levels.

**Heating**

- Heating system only has two zones, so they have to heat more of the building than desirable if i.e. only one room is in use. Current zoning is not practical and the Shire Hall would like more individual room controls.
- The boilers do not have functioning automatic/programmable controls - Boilers were set up with programmable timber during the works, however, this is currently disabled. Staff generally manually enable the heating using the boost function on the boiler when heating is required.
- Shire Hall staff are unsure if the underfloor heating (UFH) to the museum reception/shop is functional. Unsure if there are any UFH controls.
- Staff office at lower ground floor level is reported to be very cold.

**Overheating**

- Building generally stays cool in the summer, particularly the museum spaces on the lower ground floor and basement level. However, Spaces on upper floors and south facing spaces overheat in summer, particularly at high occupancies.

**Windows**

- All windows are openable to provide natural ventilation, particularly for the summertime. However, staff find it difficult to open windows as they are large and heavy. Opening these windows is a two-person job.
- Some windows are secondary glazed, but not all.
- Flat 1 window is in disrepair, this is to be repaired by the council imminently.

**Damp & mould**

- The Shire Hall report that there are some damp issues to some of the space, particularly highlighting one of the store rooms in the basement.
- Mould has been report in the flats. One of the flats has been treated for mould. Both flats have had new extract fans installed recently to try to overcome the damp/mould issues.

**Platform lift**

- Not functioning

**Café power supply**

- Café staff note that the power supply to the café regularly trips when multiple appliances are in use.

## 4.2 Further site observations

Generally poor access to services, particularly to roof mounted equipment to lower roofs to rear. No gates are provided in handrails along walkway and no safe routes across the roof to equipment. Poor access to rainwater goods on rear façade. Access to the roof void and main roof is via loose ladder clamped in place, without handrail.

Generally poor labelling of services throughout, particularly mechanical services.

# 5 Services Description – Museum

## 5.1 Incoming services

### 5.1.1 Power

The electrical intake for the museum is located in the store off the Induction Area in the North-West corner of the building.

The incoming supply is 200A TPN (from record information) intake with utility CT-cut out and meter.

Main panel S1 located adjacent to incoming utility supply.

*Figure 5-1 Incoming electrical supply & utility meter in store off Introduction area*

The flats on the second floor have separate utility meters which are billed to the tenants directly.

### 5.1.2 Water & Fire Fighting

Location of utility mains water meter and stop cock not identified. This is believed to be located in a locked cupboard in the South-West corner of the Introduction Area (based on the Philip Hughes Associates drawings). Access into cupboard was not possible during site visit, the Shire Hall note that the key to this cupboard is missing.

No fire-fighting supply identified or known about.

### 5.1.3 Gas

The incoming gas supply and utility meter is located in the store off the Introduction Area in the North-West corner of the building.

The gas meter is U16.


*Figure 5-2 Gas meter located in store off Introduction Area*

### 5.1.4 Telecoms

Incoming telecoms not identified. Data rack located in the store off the Introduction Area, into which the telecoms will likely be routed.

## 5.2 Above Ground Drainage

### 5.2.1 Rainwater drainage

The rainwater drainage is generally external. Rainwater goods is generally in poor condition as reported in the 2024 condition survey.

Cast iron to the front and side of the building, mixture of cast iron and PVC to the rear.

### 5.2.2 Foul Drainage

Foul Drainage present in the following locations:

- Boiler plant room - Stub-stack present
- Unisex WCs and cleaner's store to lower ground floor
- Learning space – pumped drainage from sink. Pumped drainage not traced.
- Male & Female WCs to lower first floor
- Volunteer kitchen – assumed present, not seen
- Café servery – assumed present, not seen
- Meeting room

SVPs and main pipework generally plastic pipework.

## 5.3 Cold Water

Incoming pipe assumed to be in Introduction area; refer to incoming services section.

Serving outlets as per described in foul drainage section.

Pipework generally insulated in foil faced insulation. High level services in museum areas on lower ground floor/basement are painted out in black.

Possible water tank located on roof of Learning space indicated on Philip Hughes Associates drawings.

*Figure 5-3 Possible water tank on Learning space roof. Access not possible.*

## 5.4 Hot Water

Domestic hot water (DHW) is provided to the following locations:

- Unisex WCs and cleaner's store to lower ground floor
- Learning space sink
- Male & Female WCs to lower first floor
- Volunteer kitchen sink
- Café servery
- Meeting room sink

DHW is provided from electric water heaters:

- Electric water heater in store adjacent to café
  - Heatrae Sadia Multipoint 50
  - Appears to serve café, volunteer kitchen, 2nd floor meeting room, and WCs. DHW pipework not traced.
- Local electric water heater in Learning space store
  - Heatrae Sadia Hotflo 10

## 5.5 Space Heating

### 5.5.1 Primary Source including pumps & controls

**Boiler installation**
Gas boiler installation located in the basement plant room:

- 2no. wall-mounted 70kW MHG ProCon 77 gas boilers installed 15.12.2017.
- Independent flues entering riser to the right-hand side of boilers. Assumed to riser up existing chimney to roof.
- Twin-head pump sets for 2no. heating zones.
- Boiler control panel housing boiler controller & pump controls.
- Pressurisation set, dosing pot & air/dirt separator.
- Expansion vessel
- Stub-stack picking up boiler condensate etc.


*Figure 5-4 Boilers mounted on rear wall of plant room*


*Figure 5-5 Boiler & pump control panel*

*Figure 5-6 Boiler flues entering existing chimney*

**Zoning**

Two no. heating zones with twin-head Grundfos Magna3D 32-100 180 pumps.


*Figure 5-7 Heating pumps serving zones 1 & 2*

Zone 1 appears to serve:

- Café
- Learning room
- Grand Jury Room
- Intro room
- Stair

Zone 2 appears to serve:

- Office
- Courtroom
- Corridor near staff kitchen

It is unclear which zone serves the museum reception & shop.

A schematic of the heating system is not present in the plant room.

**Pipework**
Pipework is generally insulated throughout in foil faced insulation, but with damaged insulation to some areas. High level services in museum areas on lower ground floor/basement are painted out in black.

The ancillaries are insulated to a varying degree. Valve bags are generally present, but gaps between rigid insulation and valve bags.

*Figure 5-8 - Damage to pipework insulation in plant room*

**Control**
Boilers were set up with programmable timber during the works, however this is currently disabled. It is unclear if the controller is broken or just disabled. No heating thermostats appear to be present throughout the building.

### 5.5.2 Emitters including controls

**Cast iron column radiators - LTHW**
The majority of spaces in the building are heated by cast iron column radiators.

*Figure 5-9 Cast iron radiators to Learning space (left), Crown court (middle) & circulation space (right)*

**Panel radiators – LTHW**

The following spaces are heated by panel radiators:

- Introduction area
- Back-of-house circulation lower first floor
- Lower first floor WCs

**Underfloor heating**
The Shire Hall staff believe there is underfloor heating to the museum reception & shop area and basement WCs, which has a polished concrete floor. This is backed up by a certificate of commissioning for underfloor heating present in the O&M file. There are no drawings showing the underfloor heating and an underfloor heating manifold was not located during the site visit. Manifold location is not noted on Philip Hughes Associates drawings.

No other fixed heating system is provided to the area, and the space was up to a comfortable temperature on the day of the site visit.

**Electric oil-filled radiator**
A local oil-filled electric radiators is used behind gift shop counter.

**Controls**
TRVS are present to some radiators, but not all.

**Unheated spaces**
The museum areas to the basement and the entrance hall are unheated.

### 5.5.3 Distribution Pipework & insulation

Distribution pipework was not traced. Pipework is generally insulated throughout in foil faced insulation, but with damaged insulation to some areas. High level services in museum areas on lower ground floor/basement are painted out in black. Exposed final tails.

## 5.6 Ventilation

Mechanical ventilation systems are present in the spaces described below. Remained of spaces are generally naturally ventilated. Basement plant room has permanently open ventilation ducted to roof cowl (no fan).

Mechanical ventilation fans generally appear to be by Nuaire, however, specs are unknown due to poor labelling, poor access and lack of O&M information. Ventilation controls are in some areas not functioning and/or disassembled.

Ductwork routes were not traced.

*Lower ground floor WCs & volunteer kitchen*

- Extract only
- System name: WC extract EF1
- Fan location: Unknown
- Controls
    - Fan controller located in store adjacent to WCs
    - Fan status in failure at time of survey

*Basement museum areas*

- Supply & extract ventilation
- System name: Unknown
- Fan location: Assumed to be located externally on low rear roof. Refer to image below.
- Controls
    - Fan controller located in store adjacent to cells in basement
    - Controller broken/disassembled. Empty back-box on wall and Nuaire cover on floor.

*Figure 5-10 Left: MVHR unit located on low rear roof assumed to server basement museum areas. Access up to unit not possible. Right: assumed system controller location in store at basement level.*

*Lower first floor WCs*

- Extract only ventilation through through-the-wall extract fans
- Controls:
    - Ventilation controls appear to be via PIR in WCs

*Learning space*

- Supply ventilation through combination of linear slot diffusers and ceiling diffusers.
    - Open ventilation grille in centre of rooflight, unclear what the purpose of this is. Rooflight covered by glazed lantern at roof level.
- System name: Learn Supply SF2 SF3
- Fan location: unknown
- Controls:
    - Fan controller located in learning space
    - Automatic controls do not appear to work
    - Manual enabling and override of fan speed possible from controller.

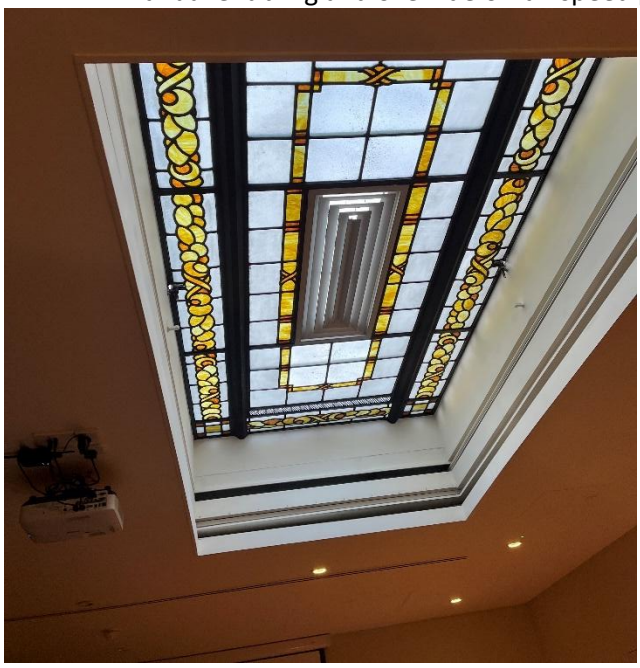


*Figure 5-11 Open ventilation grill in centre of rooflight to learning space. Glazed lantern at roof level above rooflight.*

*Café*

- Kitchen extract ventilation and café supply ventilation provided by separate systems.
- Kitchen extract ventilation through canopy above servery:
    - System name: Kitchen extract
    - Fan controller con wall adjacent to café servery
        - System operational during site visit
        - System set to manual controls
    - Fan location: assumed to be located on lower roof to rear of building.
- Café supply ventilation with heater battery, supply to café through slot diffuser on face of bulkhead above cafe counter.

- System name: Café supply air SF1
- Controls
  - Fan controller on wall adjacent to café servery
  - System set to manual controls
  - Heater in fault during site visit
- Fan location: assumed to be located on lower roof to rear of building.
- Kitchen extract running during site visit

*Figure 5-12 Cafe extract fan on low rear roof*

*Figure 5-13 - Cafe supply & extract ventilation*

*Crown court*

- Mechanical extract through 1no. historic ornate ceiling grille. Second ceiling grille open to roof void above.
- System name: C Court Extract EF7
- Extract fan EF7 located in roof void
- Controls
    - Fan controller located in the Grand Jury Room
    - Extract fan currently disabled.
    - Automatic controls do not appear to work.
    - Manual enabling and override of fan speed possible from controller.

*Figure 5-14 Historic ornate ceiling grilles in the Crown Court*


*Figure 5-15 Extract fan EF7 located in roof void*

*Grand Jury Room*

- Mechanical supply and extract ventilation with heat recovery (MVHR).
    - Extract through historic ornate ceiling grille
    - Supply location not identified
- System name: unknown
- MVHR unit located in roof void
- Controls
    - Fan controller located in the Grand Jury Room
    - Ventilation system disabled and controller disassembled.


Figure 5-16 Right: Grand Jury Room fan controller disassembled (right bottom). Left: MVHR unit in roof void assumed to serve grand Jury room

*Figure 5-17 Left: Ornate ceiling grille in Grand Jury Room. Right: ductwork connection onto ceiling grille in roof void.*

## 5.7 Electrical Installation

### 5.7.1 Switch gear

Main incoming in the store off the Induction Area in the North-West corner of the building. The main panel board is located adjacent to the CT cut-out and utility meter. Refer to incoming services section.

Note flats have separate incoming supplies. Refer to the section of the report detailing the services installation to the flats.

The main panel board feeds distribution boards throughout the building.

The main panel board and distribution boards were installed during the 2017 works.

### 5.7.2 Condition

Appears good, installed 2017.

### 5.7.3 Spare Capacity

Unknown.

### 5.7.4 Cable installation

Generally in cable tray.

## 5.8 Lighting Installation

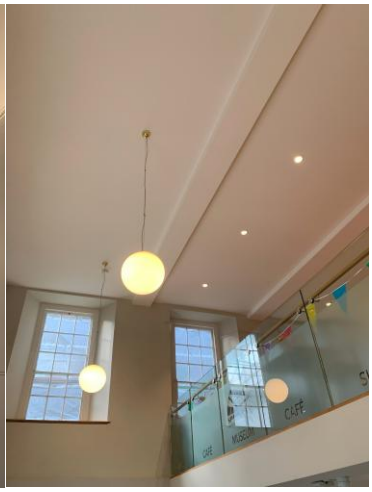
New lighting installed to most areas in the building during the 2017 refurbishment works. Lighting installations from 2017 are generally LED fittings, however, fluorescent light fittings appear to have been used in some areas. Lighting systems dating to before the 2017 works appear to be fluorescent. Further survey required to confirm which areas have fluorescent lighting.

### 5.8.1 Types of fittings

**Pendants**

Left to right: Cells, circulation, museum reception/shop





Left to right: Crown court, main entrance


**Track lighting**

Left to right: Main entrance, Grand Jury Room, Introduction area

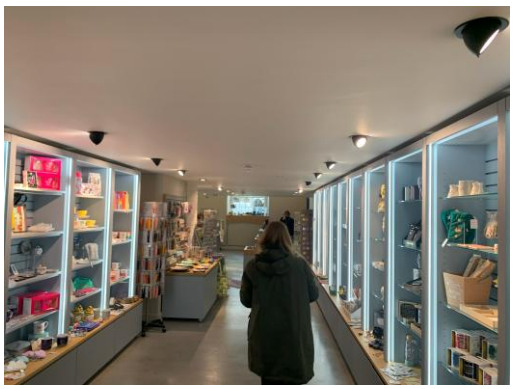

**Suspended strip lights**
Staff office

**Surface mounted strip lights**
Left to right: Second floor meeting room, Volunteer kitchen, Basement corridor



**Recessed downlights**
Left to right: Learning space, Café,


Reception/Gift shop




**Surface mounted fittings**
Left to right: Cells, basement corridors



### 5.8.2 Control

WCs & Stores generally have PIR lighting controls, other internal spaces have manual controls.

Controls strategy for external lighting unknown.

### 5.8.3 Emergency

Mixture of integrated and standalone emergency fittings. Static inverter located in roof void. Unclear which areas are served by the static inverter.

*Figure 5-18 Statis inverter located in roof void*

### 5.8.4 External

Wall mounted out to rear entrance and on roof

Recessed floor fittings (strip/spots) uplighting façade. Building mounted street light.

## 5.9 Comms installations

### 5.9.1 Access control

Not present. Manual locks are used throughout.

### 5.9.2 CCTV

CCTV head end & display screen located in store off introduction room.

Cameras throughout spaces including externally at rear entrance.

### 5.9.3 Intruder system

Intruder alarm panels are located at main entrance and rear entrance.

### 5.9.4 Fire

The main fire alarm panel is located adjacent to the main entrance. The panel is an MX Pro panel.

Figure 5-19 Left: Main fire alarm panel adjacent to main entrance. Right repeater panel located by the entrance from the car park to the rear of the building.

Smoke detection to the Crown Court and Grand Jury Room is provided by an aspirating system. Detector and pipework are located in the roof void above the spaces served.


Smoke detection to the remainder of the building is generally by smoke detectors.

### 5.9.5 Facilities for the disabled

**WC alarms**
Disabled WC alarms present in the AWCs.

**Disabled refuge**
Several disabled refuges are present in the building. The disabled refuge panel is located adjacent to the fire alarm panel by the main entrance.

**induction loops**
None identified.

**Platform lift**
Platform lift present in museum area near the cells. The platform lift is out of order.

### 5.9.6 Lightning Protection

Lightning protection in the form of conductor tape along roofs and on external wall.

# 6 Services Description - Flats

## 6.1 Incoming services

### 6.1.1 Power

Each flat has a separate incoming utility electrical supply. Size and details of supply unknow. Electricity is billed directly to the tenants by the utility.

Utility meter and consumer unit located in each flat.

### 6.1.2 Water

Location of incoming water unknown.

### 6.1.3 Gas

None present

### 6.1.4 Telecoms

Unknown

## 6.2 Above ground drainage

### 6.2.1 Rainwater drainage

Refer to the Museum services description section.

### 6.2.2 Foul drainage

Foul Drainage present in the following locations:

- Flat 1 & Flat 2 bathrooms, kitchens & utility cupboards – assumed present, not seen

SVPs and main pipework generally plastic pipework.

## 6.3 Cold Water

Mains cold water is provided to the following locations:

- Flat 1 & Flat 2 bathrooms, kitchens & utility cupboards

## 6.4 Hot water

Domestic hot water (DHW) is provided to the following locations:

- Flat 1 & Flat 2 kitchens and bathrooms

The DHW is provided by a Heatrae Sadia Electromax Combined electric flow boiler and direct unvented hot water cylinder.

## 6.5 Space heating

### 6.5.1 Primary Source including pumps & controls

**Boiler installation**
a Heatrae Sadia Electromax Combined electric flow boiler and direct unvented hot water cylinder is located in the utility cupboard in each of the two flats.

*Figure 6-1 Electric boilers to flats*

### 6.5.2 Emitters including controls

The flats are heated by LTHW panel radiators with TRVs fed off the flats' respective electric boilers.

The communal hallway outside the flats is heated by an electric radiator.

*Figure 6-2 Left: LTHW panel radiator to flat. Right: Electric radiator to communal hallway*

### 6.5.3 Distribution pipework & insulation

Distribution pipework not traced. Pipework is generally insulated throughout in foil faced insulation. Exposed final tails.

*Figure 6-3 Insulated pipework to flats*

## 6.6 Ventilation

Mechanical extract ventilation is present to both flats.

A Nuaire extract fan is located in the roof void above the flats is assumed to serve the flats. However, the ductwork routes were not traced. The fan does not appear to function and no controls were located during the survey.

Ducted kitchen extract hoods and some evidence of ceiling extract valves present in both flats.


*Figure 6-4 Right: Un-labelled extract fan in roof void. Left: Ventilation ductwork from kitchen cooker hood*

Ceiling mounted Vent-Axia extract fans are present in the bathrooms of both flats. The Shire Hall note that these were installed recently to combat moisture/mould issues in both flats.

*Figure 6-5 Ceiling mounted Vent-Aixia extract fans in flat bathrooms*

# 7 Fabric

A brief summary is provided here, but please refer also to architectural and conservation reports.

## 7.1 Walls

**Front façade**
The main front façade is constructed from limestone ashlar. Internal faces are plastered.

**West façade**
The west façade is assumed to be constructed from solid brick. The brick is exposed on the external face, the internal face is plastered.

**South façade**
The south façade of the main building is exposed brick, while the lower extensions are rendered.

## 7.2 Roof / rooflights

**Main roof**
The main roof consists of a pitched roof with multiple pitches clad in slate. The roof is insulated at ceiling joist level. The insulation is believed to have been installed as part of the 2017 works.

Several sun tubes penetrate the roof to provide daylight to the internal bathrooms and hallways in the flats.

*Figure 7-1 Left: Roof insulation. Right: Sun tubs penetrating pitched roof*

**Flat roofs**

The extensions to the rear of the building have flat roofs of unknown construction. The Learning room and rear entrance hall have glazed lanterns with glazing at ceiling level.

*Figure 7-2 Images of flat roofs to the rear of the building showing the roof lanterns*

## 7.3 Windows/doors

Timber sash windows throughout. Secondary glazing present to some areas. Secondary glazing is a mix of secondary sashes and more modern secondary glazing.