

# Attendees

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#### 1. Introduction

- 1.1 benjamin + beauchamp architects (b2) were tasked to advise on the specification and outline schedule by BJP Consulting Ltd; documents that are being readied to guide the work to reinstate the defective underfloor heating system. It is understood that there are issues with the floor construction, and so in order to best inform our review of BJP's specification, an assessment of the floor has been carried out. This in turn has led us to make a series of recommendations regarding the replacement of the floor construction.
- 1.2 Our investigation of the floor included a review of the existing drawings and record photographs held by the church, church's appointed solicitor, the Diocese of Bath & Wells and the County Records Office. The existing floor was opened up locally for our inspection.
- 1.3 We have also had the benefit of the Buro Happold report commissioned as part of the (now settled) dispute with the previous architect and contractors.
- 1.4 What follows is a summary of the findings and recommendations outlined at our meeting on 09 November 2023.

## 2. Technical Review

#### **Buro Happold Report Findings**

- 2.1 The Buro Happold report focused mainly on the performance and inadequacies of the existing heating system. It largely ignored issues related to the floor design and installation.
- 2.2 The Buro Happold report does however suggest within the section remedial works to be undertaken. 'The mineral wool insulation beneath the entire timber floor will need to be replaced at which point the integrity of the damp proof membrane can be assessed'.
- 2.3 It further states:
  - 5.12.8 Replace damaged flooring and sub-structure.
  - 5.12.9 Replace insulation with rigid insulation.

5.12.10 Verify completeness and integrity of entire damp proof membrane making good as necessary.

- 5.12.13 Install adequate floor void ventilation grilles.
- 2.4 The Buro Happold table of defects summary 3.21 also states:



Defect - A lack of ventilation to the underfloor void

Loss Incurred – Potential for condensation to form in floor void.

Causation – <u>Sub-standard design.</u>

# Further Observations - benjamin + beauchamp architects

- 2.5 When reviewing the construction photographs a damp proof membrane (DPM) appears to have been laid over the majority of the floor area, but there are areas where no DPM is visible. The introduction of a DPM within historic buildings is not recommended conservation practice.
- 2.6 The floor/sub-structure below the DPM is damp and moisture will continue to rise through it until it meets the membrane. The moisture will track towards the edges of the DPM thereby concentrating the levels of moisture at these points. To be effective the DPM needs to link with a damp proof course (DPC) in the walls or columns, but none is present in this historic building. The DPM finishes against the side walls of the church and at the base of each column, the concentrated moisture levels at these points exhibit as damp staining on the stone or peeling or flaking limewash. Greater levels of moisture are also appearing as darkened staining on the timber floor in these locations.
- 2.7 The existing timber floor fails to comply with good building practice. The building regulation guidance at the time of construction, Part C (2004 Edition incorporating 2010 and 2013 amendments) states:

Two opposing external walls should have ventilation openings placed so that the ventilating air will have a free path between opposite sides and to all parts. The openings should be not less than either 1,500mm<sup>2</sup>/m run of external wall or 500mm<sup>2</sup>/m<sup>2</sup> of floor area, whichever gives the greater opening area.

A minimum ventilation void of 150mm should be provided below the underside of precast concrete and timber suspended floors. Cold bridging and interstitial condensation can occur with joist depths less than 150mm.

2.8 The existing timber floor construction comprises of 100mm timber joists @ 600mm approx. centres with a void below that varies from approx. 30mm to 50mm at best, the stone central aisle sub-divides the main body of the church. There is no effective external cross ventilation to this space.

## 3. Conclusions of Technical Review

- 3.1 There is no sensible way by which the existing timber floor structure can be repaired and retained in its current form without the significant risk of similar problems occurring in the future.
- 3.2 Each of the main areas of the church will require a different approach outlined below.

## **Chancel & Sanctuary**

3.3 The floor in these areas now includes a DPM under a concrete slab with rigid foam insulation over, under floor heating (UFH) pipes clipped to the insulation with a screed benjamin + beauchamp architects www.b2architects.com



over and finished with blue Lias Paving). There are signs of damp in the walls just above floor level, these could be tolerated as they do not represent a significant ongoing problem. These areas might need local redecoration on a more frequent basis. The output of the UFH would be good through this floor construction.

The flow and return pipes to this zone could be intercepted and joined into any new UFH design layout. Suggest that the chancel and sanctuary are left untouched, outcome of intervention doesn't warrant cost.

#### West entrance steps and ramp

3.4 Similar construction to 3.1 with only a small circuit of UFH pipes at head of stairs, it maybe possible to intercept these pipes and connect into a new UFH layout. Low levels of damp showing in the base of the walls in this area. Suggest that this area is left untouched, outcome of intervention doesn't warrant cost.

## Nave & North/South Aisles

3.5 Existing construction flawed, existing structures to be removed, including central aisle. The beam and block floor over the boiler room is perfectly adequate and can remain in situ. Lias slabs can readily be salvaged from central aisle. A replacement floor is needed.

## 4. Recommendations

# 4.1 Chancel/Sanctuary, West Entrance steps and ramp

Leave in situ untouched, seek to incorporate UFH in new heating layout.

## Nave & North/South Aisles

- 4.2 Two options for the main body of the church floor.
  - 1) New compliant ventilated timber floor.
  - 2) Insulated stone floor.

Both incorporating UFH. Both options require the removal of all new building materials and further excavation of approximately 200mm.

- 4.3 Ventilated Timber Floor Points to Consider
  - 1) Provision of building regulation compliant cross ventilation will require numerous low level air vents to be formed in the north and south external walls of the church. Change to external appearance of church will require planning permission.
  - 2) New min 150mm deep floor joists will need to be supported on open hit-and-miss sleeper walls at min 2m intervals on independent strip foundations.
  - 3) The stone central aisle construction will require equal number of open, air pathways.
  - 4) Some of the existing timber floor coverings could be re-used, but substantial quantity likely to be unsalvageable.
  - 5) The double layer of plywood supporting the parquet style block flooring acts as an insulator and will result in reduced efficiency of UFH relating to increased energy usage.
  - 6) Due to the inherent damp underfloor conditions, the longevity of the timber structure will be directly related to the efficiency of the cross ventilation which will be compromised in the area of the north porch, pulpit and boiler room ceiling.
- 4.4 Insulated Stone Floor Points to Consider



- 1) Lay crushed 'foam glass' insulating hardcore to a depth of 200mm with breathable geotextile membrane over with UFH pipes clipped to stainless steel mesh under 125mm limecrete slab with 20mm thick stone floor finish. To provide breathable, insulated floor. This negates the introduction of a DPM.
- 2) New stone slabs required except where slabs salvaged from new aisle. Possibility to lift, relay and incorporate 3No original stone aisles left intact under current floor.
- 3) Output from UFH maximised with masonry structure providing a reservoir of heat.
- 4) Discussions required with BJP, Westford Mechanical and Mecserv as design will vary from originally agreed re-instatement, but changes are minimal and can be agreed in a straightforward manner.
- 4.5 Both options will require dialogue with and approval from the DAC.
- 4.6 In light of the above, the PCC should consider a new stone floor in place of the existing timber floor.