

**Botanic Garden Glasshouse
Lacock Abbey
Lacock
Wiltshire**

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1.0 Construction and History

The glasshouse was reconstructed in the mid 2000's on the footprint of the earlier greenhouses. The construction is a timber frame built against the outer face of the southern wall of the walled garden. The western, left hand section of the building was the first constructed and then the right hand part built a few years later. The timber used in the construction was Douglas Fir which is a softwood and the left hand first 10 bays have been replaced in Sepele which is an African hardwood due to rot in the original frame. It should be noted that the original window were reused.



The glasshouse has a mono-pitched roof which is supported by main rafters supported at the northern end off a bearer set off the masonry wall and then onto a post at the front which is part of the front glazed frame. The rafter is joined by a small metal cleat and at the rear an angle to the main bearer. The mono-pitched roof consists of an upper sash which is opening and then a lower fixed sash. On the front frame the windows have a central pivot.



The front frame is supported off a brick plinth which is generally 7 courses high and 215mm wide

The upper opening sashes are controlled by a bespoke autovent system and where this has failed sandbags are being utilised.



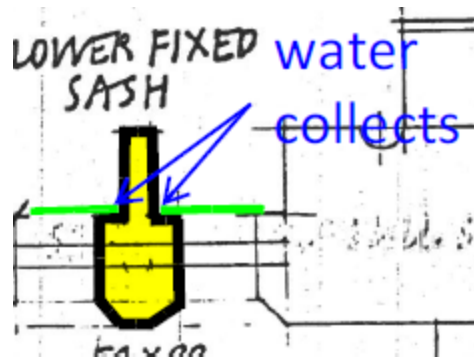
2.0 Structural Issues

A specialist timber assessment was carried out by Tim Floyd and the items raised in his report will be incorporated in the detailed survey section of this document.

There is clearly an issue with rotting of the timbers due to the type of timber used and also the original detailing. For a building of only some ten years old then there are fundamental failures in that there has already been wholesale replacement of timbers and other areas which are of concern.

The first issue is the condition of the glazing bars which is set so that the glass sits on top and then held with a small tack. The edge is not properly sealed and therefore water is collecting at the side of the glass and tracking down to the lower section and collecting at the end. Therefore the glazing bars are showing distinct rot and thus the glass panels are loose.





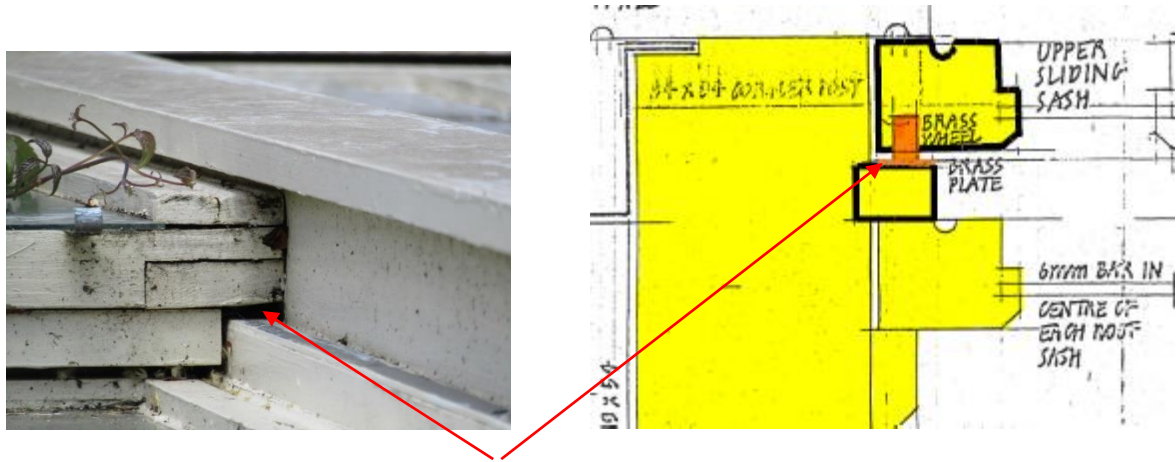
Internally the damp issues around the glazing bars are clearly evident as there is moss growth evident.



The second issue is the condition of the lower sashes where the water is discharging off the glass and then into the end grain of the softwood. Therefore where the sashes are jointed the timber is suffering from wet rot as indicated by the moss growth.



The top sashes are constructed with brass wheels set on the bottom to run along a bearer sat inside the main rafter. The design is adequate but is very dependent on the bearer being clear and also that the top sash is fully intact. The opening mechanism is also dependant on the autovent system and although comment is made on it's operation a detailed review is considered outside the scope of this report.



Sashes work when the timber is intact and there is a clear gap



Sashes fail when the timber is rotted and there is no gap for the runner

At the head of the roof the flashing to the original wall has lifted in places and also there are areas which there is leakage and therefore it is important that this is fully exposed and the flashing fully intact.

3.0 Recommendations

The original design and specification has resulted in an accelerated decay of the timber, especially the upper and lower sashes. This includes the glazing bars as well as the sash frames. The glasshouse overall is not considered to be unstable but it does require attention and regular monitoring of the connection between the main rafter and the front frame.

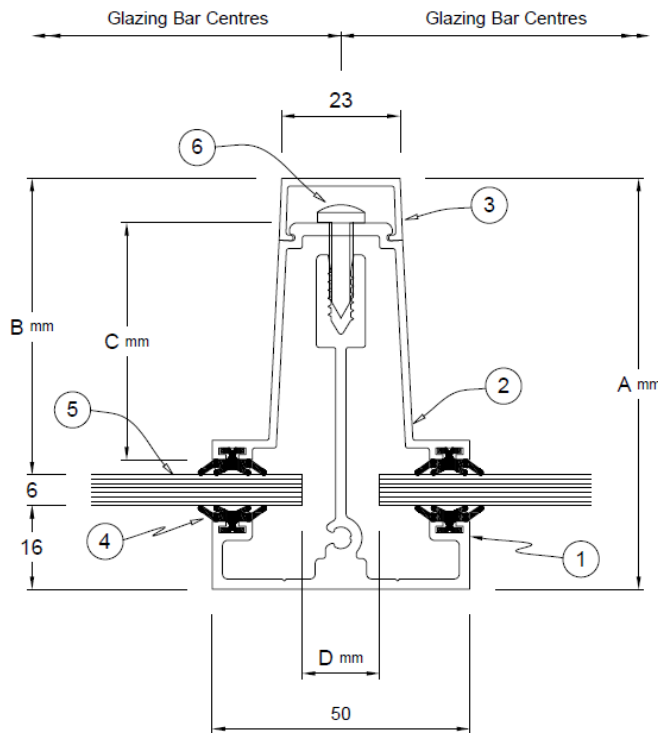
There are several options for the short and long term repair.

1. Replace

To reduce the long term maintenance issues with the glasshouse then the complete structure could be replaced with a new aluminium framed glasshouse in the same style as the existing. Although this would alleviate the current issues completely there are significant cost implications

2. Upgrade

One of the main issues is the water run off and the junction of the glazing to the glazing bar. Where a sash requires replacement then the glazed section could be replaced utilising a hardwood frame but using a glazing system such as that produced by the patent glazing company. They produce an aluminium glazing bar and restraint system and therefore the rotting of the timber glazing bar would be eliminated. The appearance will be similar but the sashes would have to be re-detailed so they still function with the top opening sash which may be problematic due to the height of the upstand cover strip.



Diagrammatic sketch of traditional aluminium glazing bar with traditional aluminium cover caps

Key :-

- 1 = TC Range Glazing Bar extruded from aluminium alloy 6063-T6 to BS 1474.
- 2 = CT Range Cover Cap extruded from aluminium alloy 6063-T6 to BS 1474.
- 3 = CT0 Cosmetic Cap extruded from aluminium alloy 6063-T6 to BS 1474. (Can be supplied without Cosmetic Cap)
- 4 = Fin gasket extruded from Thermo Plastic Rubber to BS 7412
- 5 = Infill can accommodate all specifications of safety glass and polycarbonates between thicknesses of 4mm and 12mm
- 6 = No 10 Stainless steel Pan head self taper to BS EN ISO 3506 grade A2

Appearance :-

Materials are available in an untreated finish (Mill). Coloured finish (Polyester Powder coated to BS 6496 to a range of RAL colours), or Anodised to BS3987.

Performance :-

This system is designed to conform to all requirements of BS 5516, 2004 when installed to all The Standard Patent Glazings recommendations and installation instructions.

Non - Fragility :-

System can conform when installed to all The Standard Patent Glazings recommendations and installation instructions to ACR[M]001 2011 class A and CWCT TN 66 - 67 2010 class 1. Please contact ourselves for further information and details.

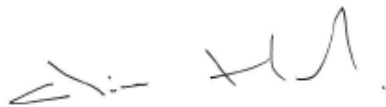
Bar	Dimensions			Glass Deductions	Performance Data		
	A	B	C		Ix-x mm	Zx-x mm ³	Span
TC 1	80	58	46	10 - 20 (15 avg)	210,209	4,912	2,500
TC 2	95	73	61	10 - 20 (15 avg)	393,677	7,830	3,500

Note:- Spans(distance between fixing positions) shown are indicative only depending on location, altitude,loadings height of glazing, pitch, infill thickness and bar centres. We will provide the glazing bar to suit the required conditions. Please contact ourselves for further information Spans above are based on 600mm centres with a 6mm glass infill duor pitched at 20° in a built up area.

3. Repair

The most appropriate option is to repair the existing but upgrading the materials. The front frame has already been replaced with Sepele and a similar procedure could be introduced with the repairs. The sashes can be replaced and rebuilt but in a stable hardwood and if a high quality paint system is also utilised then that will provide a degree of protection against the poor original detailing. The sashes can be designed so that the joints are protected and will not collect as much water into the end grain and so again reducing the risk of long term damage. Without a complete redesign of the glasshouse in terms of the detailing or the material as set out in options 1 and 2 then the proposal is to reduce the impact of the issues. A similar approach can be taken with the rafter ends to ensure these are more durable. The opening sash system with the brass wheel on a brass runner plate is functional as long as the gap is maintained and regularly cleaned and this should work with the sashes rebuilt. This option will allow a more piecemeal approach to the repairs as it can be carried out in Bays. This work also includes the top flashing to ensure the existing wall coping is intact as well as the lead. The condition of the bays are recorded with the repairs required in the appended document.

The recommendation would be to systematically replace the sashes with a stable and durable hardwood. All the issues with the original design can not be eliminated without significant intervention but the impact can be greatly reduced. This involves regular redecoration and close co-ordination of the sash jointing details with a high quality joiner and/or architect.



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