# HALE ALLEN JONES

**Submission for The Institution of Structural Engineers**
**East Anglian Branch Award for Structural Excellence**

## Feature Roof to Dayroom at Lanchester Court, Norwich

**Submitted by David Chesher IEng AMIstructE**

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## *Synopsis of Scheme*

This roof is not submitted on the basis of size or prestige of the project. The scheme is part of a much larger development built at the same time, the roof comprises a very small element of the development.

The dayroom roof is submitted for the following reasons:-

- The Engineers proposed the concept for the roof.
- The roof was afforded within the overall budget for the Contract.
- The proposal was unexpected, and therefore was regarded as unusual but is based on simple standard practice, but was nevertheless considered an ideal proposal for the dayroom by the Architect and the Client.
- The design philosophy was quite simple in design and demonstrates what can be accomplished with a minimal amount of design input, if the details are such that the forces are kept almost pure for a simple analysis to be adopted.

## *Background to Proposal*

Both the Client and Architect considered the construction of the dayroom to be the part of the scheme that would have to be sacrificed if the scheme were to come in over budget.

Since it was expected that the tendered scheme would be considerably over budget this part of the project did not initially receive much attention by the Client or Architect in terms of design. What little design did exist did not extend much beyond the plan arrangement and the intention to build a conservatory across a splayed corner of the otherwise rectangular building, which apart from the roof of the glazed conservatory, was known to have a tiled roof.

Having completed the design and specifications for the adjacent main building block we enquired what was anticipated in respect of the dayroom. We were requested to prepare a design for a trussed rafter roof and allow for some trimming arrangement at the splay to support the trusses across the splayed interface between the glazed conservatory and the traditional tiled masonry building.

By this time the Architect was concentrating on working drawings for the adjacent main building block. We enquired if we could suggest a proposal for the design of this roof since we saw some potential to create a more visually interesting roof for the future inhabitants, rather than a plaster boarded ceiling to a basic trussed rafter roof, simply trimmed at the splayed interface. We received approval in principle to advance a scheme for the dayroom roof.

The proposal is broadly that shown on our sheet No 7792/67 and sketch sheets Nos 7792 SK1 to SK5 inc. The conservatory is shown on our sheet Nos 7792/76 to 80 inc.

The design proposals were approved by the Client and the Architect, subject to the project costs being maintained on budget as the main building progressed.

Eventually the project costs were accepted to be at a point where no further significant extras were anticipated and the overall scheme was still within budget. At this stage it was decided to proceed with the exposed feature roof design, rather than seek an alternative cheaper solution due to economic constraint.

## *Brief Description of the Roof Design*

The plan arrangement enabled two relatively closely spaced frames to be positioned across the centre of the building which would be cross braced in plan between the rafters with exposed stainless steel rods and fittings to provide lateral stability in the temporary condition. This would also provide visual credibility to the final structural stability internally to the completed structure, although it was recognized that the hip end would in effect duplicate this resistance to out of balance dead and superimposed loads, wind forces and notional out of balance forces. The ceiling is boarded and also acts as a plate diaphragm.

The hip rafters were to be supported at their ends, from a cantilevered ridge beam, which would simply be sat on the top of the truncated horizontal main frame members.

The connections were to be an important feature of the roof with all incoming node members clearly aligned along the centre line of the members, which pass through the centre of the connection.

The roof frames are prevented from spreading via simple ties, again using stainless steel rods and fittings. The tie is split at the main rafter to pass around it, rather than passing through it, in order to avoid the need for an accurately drilled hole. It was considered that this would not be easy to achieve in practice.

Glulaminated timber sections were adopted throughout to ensure consistency in visual appearance and to ensure that the section sizes and lengths required would not become difficult to source. This also enabled the benefit of higher stresses to be utilized in order to minimize the number of connection dowels and thus avoid unsightly and congested fixing details within the timber sections.

The conservatory roof was designed as two main trusses intersecting each other at 45°. When combined they form a laterally stable frame. The ridge beam and the two simple hip rafters span onto this. The rafters are all tied to a central steel node via inclined ties to prevent spread at the eaves. However, in one direction (that of the two simple rafters) the roof was not tied, due to there not being opposing rafters at this location. Therefore one tie was incorporated and taken up to the line of the intersection of the ridge member and the frame to the splay. This member is omitted in the photographs, which show the temporary bracing members pending delivery of the stainless rod and associated fittings. The roof was eventually completed with the installation of the permanent bracing members within the last 12 months.

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**The project address is:-**
Lanchester Court
Old Palace Road
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**The Client was:-**
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**The Structural Engineer was:-**
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**The Architect was:-**
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**The Quantity Surveyor was:-**
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**The Main Contractor was:-**
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**Specialist Sub-Contractor (Glulam) was:-**
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