

Arch 464
ECS
Spring 2021

Name _____

Quiz #1

Mass Timber, Light Space



South elevation of Stroud Chapel.

All images: Architects Journal, 10 January 2021

For this problem you are a daylighting analyst for the newly constructed Stroud Chapel. Your task is to analyze strengths and weaknesses of the existing daylighting strategies for the chapel's main worship space. Adequate daylight and solar control are of essence.

Context. The chapel is located just west of central Stroud at 51°44' NL. It has a humid climate dominated by cloudy days throughout the year. Summers are mild/humid and winters are cool/humid.

READ THE ENTIRE QUIZ BEFORE YOU BEGIN!

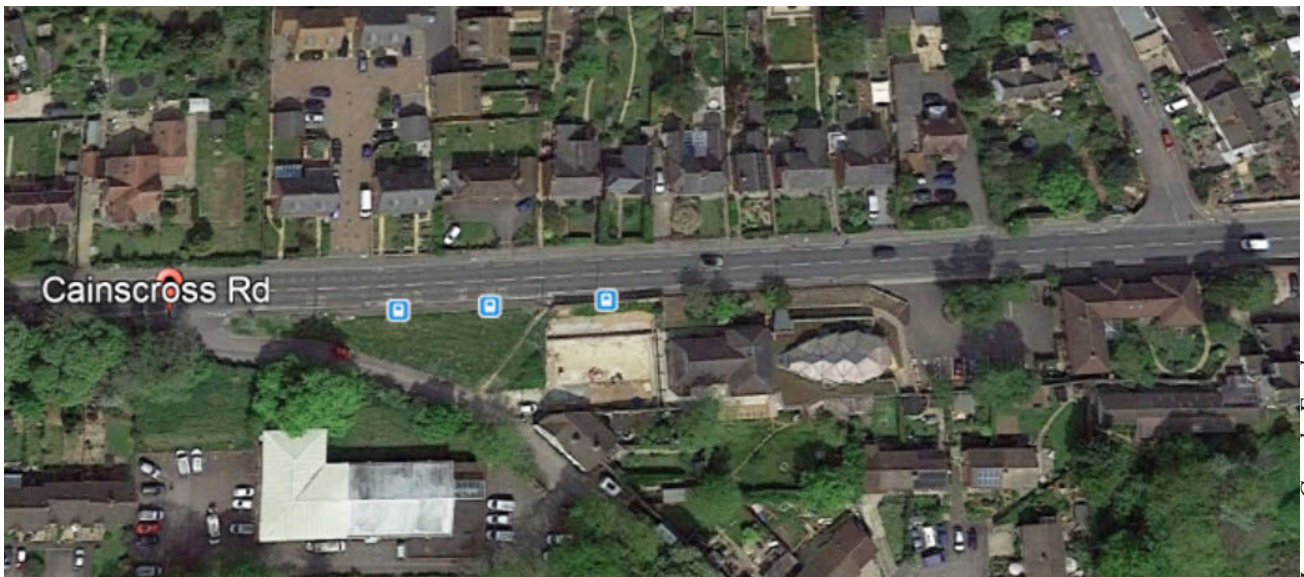


Image: Google Earth

Stroud Chapel by Nicolas Pople Architects

The East Sussex-based practice has designed a cross-laminated timber church in Gloucestershire

The existing chapel on Cainscross Road in Stroud was constructed in 1968 but by the end of the 20th century was already too small for its growing congregation. Nicolas Pople Architects was instructed in 2012 to begin designs for a replacement and, after a number of iterations, opted for a conservation approach, whereby one wing was demolished to make space for a new chapel, while the original sacramental space was converted into a social space. This also had the benefit of orienting the new chapel east-west, which is preferred in the Christian faith.

In addition, the space was not to be the focus of attention: the ritual is what matters. From a design point-of-view this required a balancing act between static and dynamic and careful attention to detail so that, paradoxically, the design does not draw the eye. The process involved a great deal of client participation with visualisations and workshops, leading to large-scale (1:20) physical models.

—Nic Pople, director, Nicolas Pople Architects

Architect's choices

The extensive use of cross-laminated timber (CLT) was driven by three factors: the freedom to produce a form in which non-orthogonal geometries could harmonise with structure as in nature; sustainability in carbon sequestration; and the very restricted confinement of the site. The internal surfaces and the structural diagram are based knowingly on Gothic stone vaulting, but only as a principle. However, the use of CLT allowed many wall panels to be off-vertical, which is not possible with traditional load-bearing materials. This gives the space west-east direction, with a focus on the altar wall.

—Nic Pople, director, Nicolas Pople Architects

Specification

Nicolas Pople Architects had already completed a church with structural engineer Corbett & Tasker for the same client in London. It was another CLT structure but, being attached to a listed building and with severe site restraints, the external form of the shell was necessarily relatively conventional. At Stroud, we were able to be more innovative, employing a geometrically complex folded plate system to create a far more dynamic space.

The structure is essentially a ribbed monocoque with the service wings resisting any side-thrust from the roof. The detailed design work with Corbett & Tasker involved digital 3D modelling and then input on fabrication for the CLT components, which were made in Munich.

The west end of the roof is an integral part of the passive ventilation system. Fresh air is taken in from the garden side of the building, pre-heated as necessary, and released at low level into the chapel. Damper units concealed by the acoustic screen control the airflow and react to wind direction. The roof form was modelled to maximise a Venturi effect, producing negative air pressure around the outlets.

—Nic Pople, director, Nicolas Pople Architects



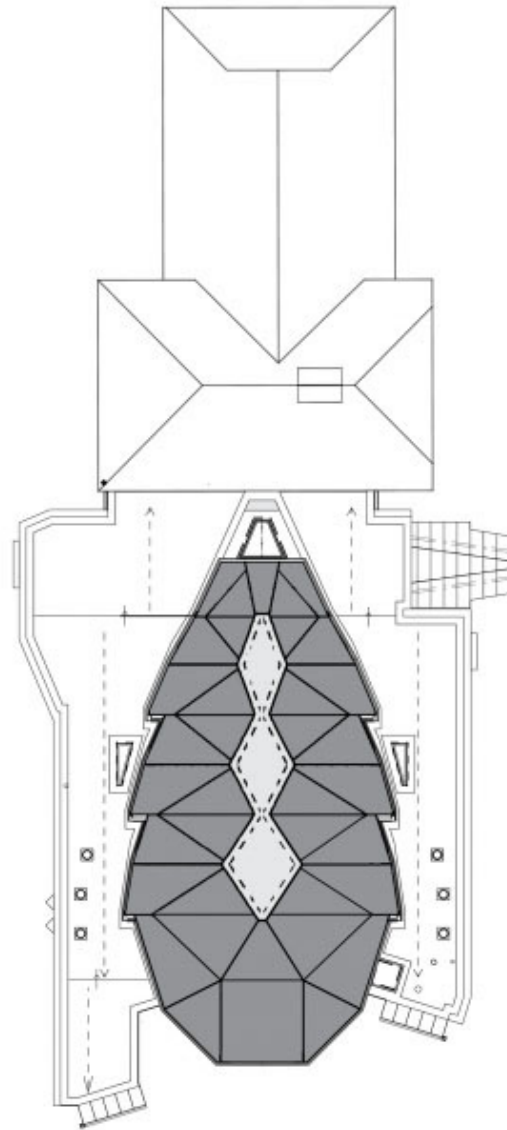
The CLT Stroud Chapel under construction.

Image: Nicolas Pople Architects

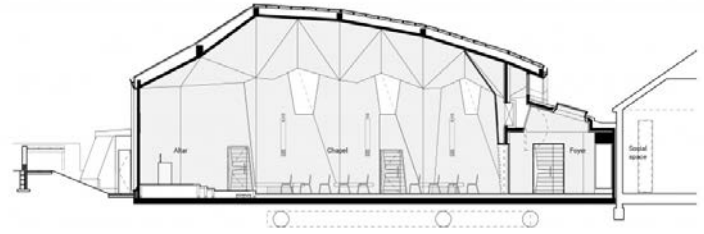
Ground floor plan



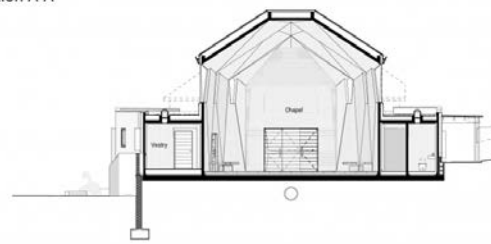
Roof plan



Section B-B



Section A-A



0 2m

6 pts. 1. **Cite** three age old adages/rules-of-thumb that are either followed or ignored in the design of the chapel. Fully **explain and illustrate** why you believe that the apertures and surfaces are effective or ineffective in providing a visually comfortable room.



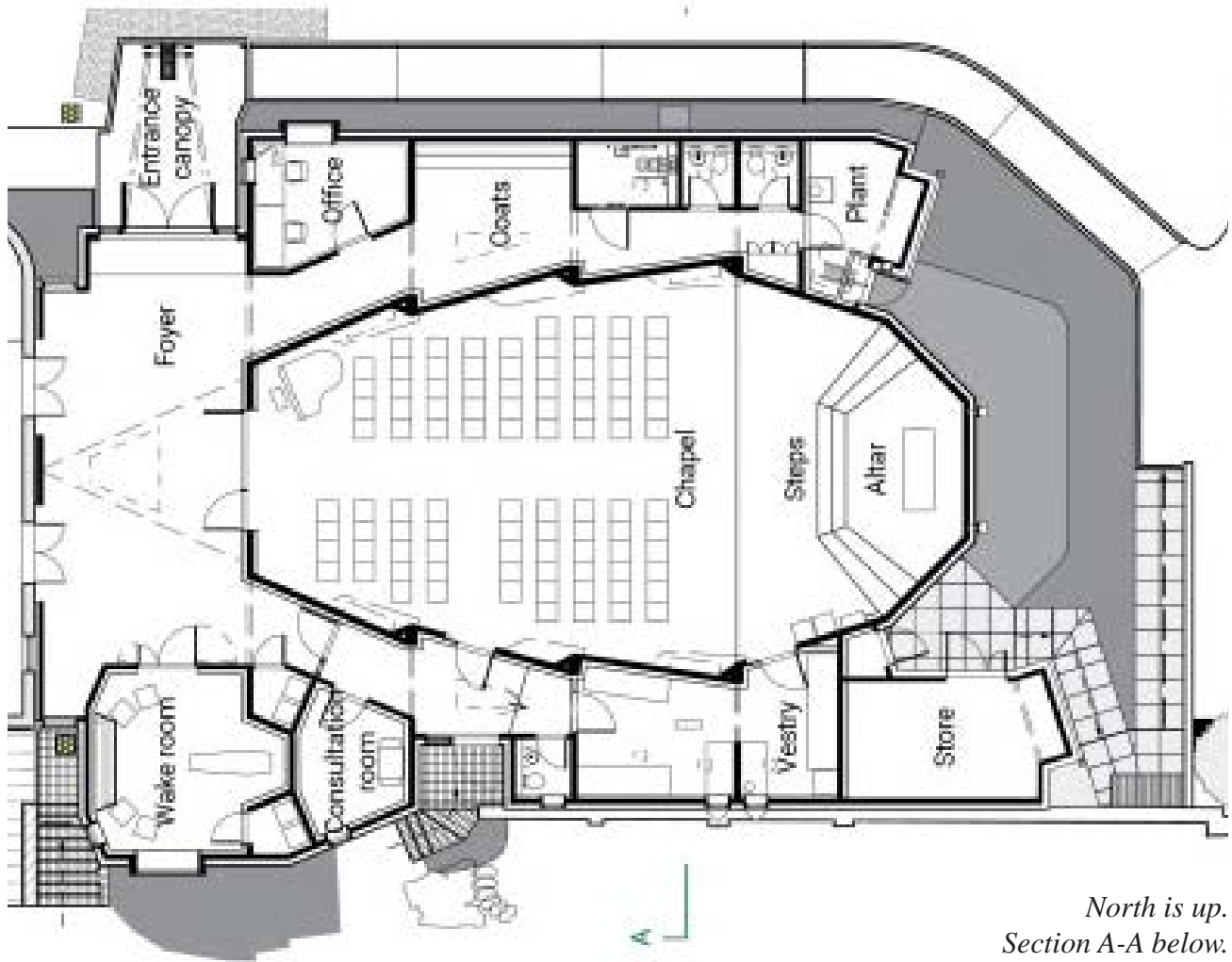
View from the altar looking west.

1

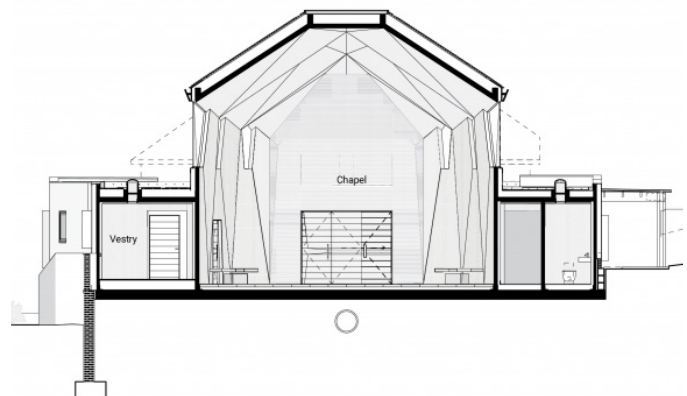
2

3

6 pts. Show how sun light and daylight are distributed in the Chapel on a sunny summer morning at 10am in the floor plan below. Critique your demonstration of sun penetration and lighting.



North is up.
Section A-A below.



8 pts. 3. Based on your plan critique in question 2, **design and place** a toplighting fixture that would improve the lighting in the Chapel. **Explain your intent and show** its effect and placement in the roof plan and **sketch** your design to illustrate how it works.

