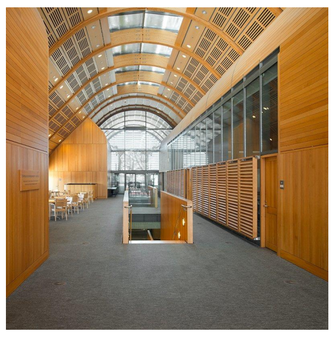
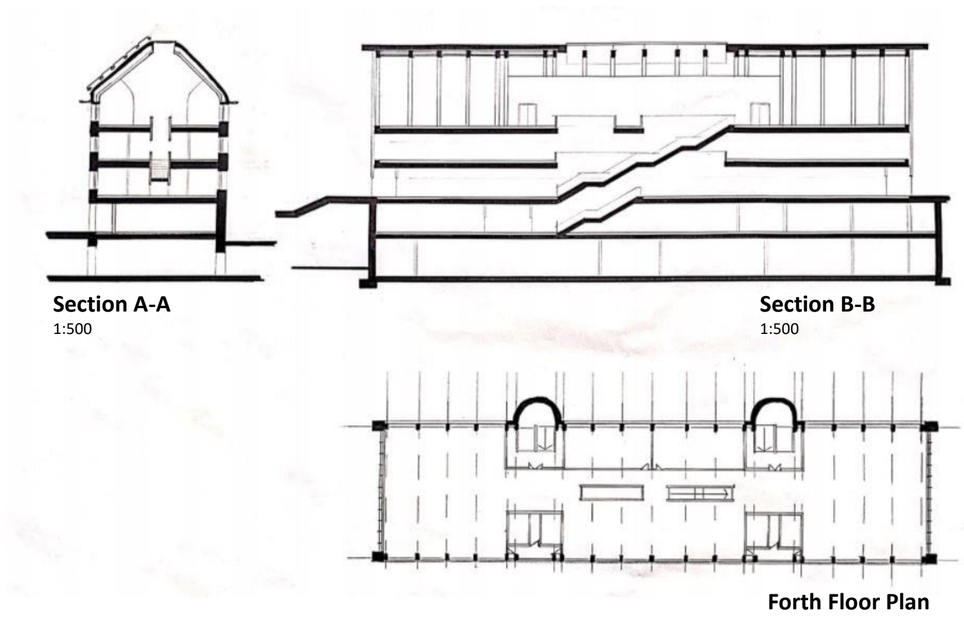
Introduction to Kroon Hall:

When the School of Forestry and Environmental Studies at Yale University decided to embark on gathering their dispersed faculty under a single roof the resulting building was always going to be a sustainable and eco-friendly one. Taking a brown field site which formally housed a gas-fired power plant Michael Hopkins Architects were engaged to create a healthy place to study and work. The 5,450m² facility was designed to consume half the energy of equivalent academic building and reduce greenhouse gas emissions by over 60%. Using a blend of well thought out design principles, environmental technology aids and sustainable materials the long and thin four storey structure is organised around a slot-like stairs that cut through a narrow sky lite central atrium connecting the East and West entrances elevations with timber-shaded curtain walling recessed between the North and South elevations of Briar Hill sandstones blocks to match surrounding Yale buildings. In-situ concrete columns and floor slabs make up the primary structural frame for the basement to the three floors. Twenty-one laminated Douglas Fir arches support the vaulted barn-like roof which is lined with Red Oak panelling sourced from a forest owned and managed by the school.



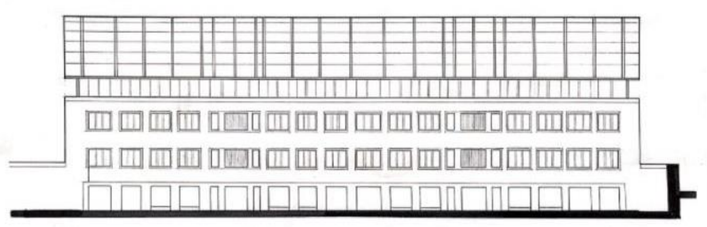


Section A-A
1:500

Section B-B
1:500

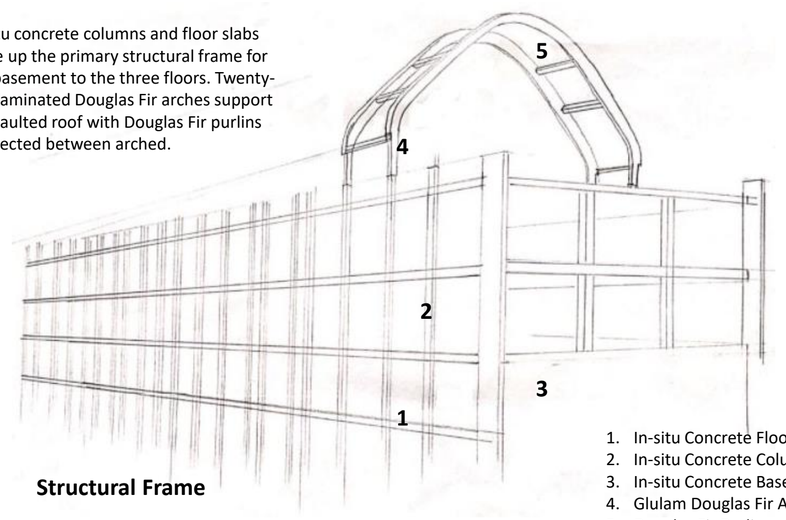
Forth Floor Plan
1:500

East Elevation
1:500



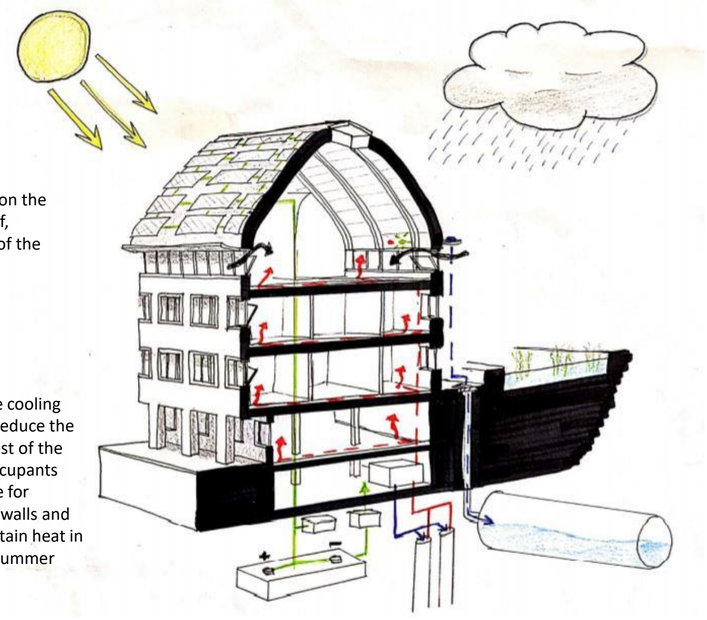
South Elevation
1:500

In-situ concrete columns and floor slabs make up the primary structural frame for the basement to the three floors. Twenty-one laminated Douglas Fir arches support the vaulted roof with Douglas Fir purlins connected between arched.



Structural Frame

1. In-situ Concrete Floor Slab
2. In-situ Concrete Column
3. In-situ Concrete Basement Wall
4. Glulam Douglas Fir Arch
5. Douglas Fir Purlin



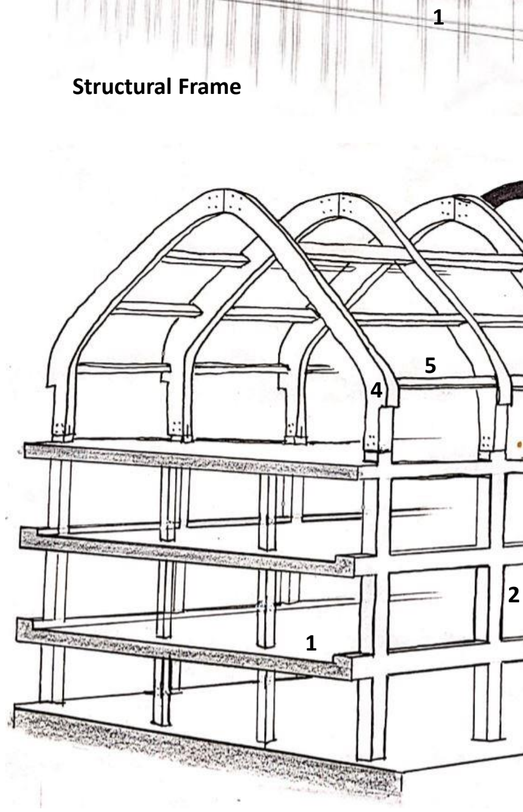
Large bank of photovoltaics on the south face of the arched roof, supplying about 25 percent of the building's power.

Fresh air ventilation and free cooling cycles on air handling units reduce the need for air conditioning most of the year. Indicator lights alert occupants when conditions are suitable for opening windows. Concrete walls and exposed concrete ceilings retain heat in winter and help cool in the summer through solar mass.

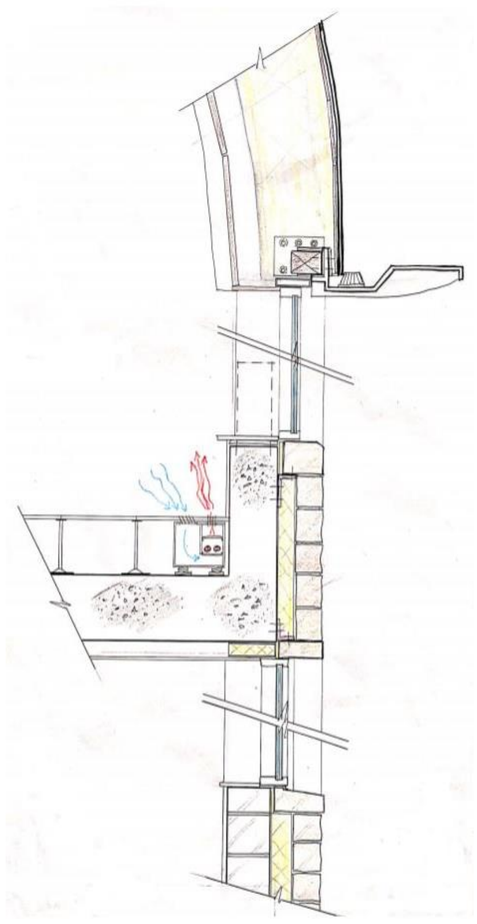
Surface water is collected from the roof and grounds, then filtered through native aquatic plants. Wastewater (greywater) is collected from sinks and showers, then combined with the stormwater and used for all non-potable needs such as toilet flushing and irrigation. Water demand is further reduced by the installation of low flow plumbing and irrigation fixtures.

Displacement ventilation and indirect cooling uses 75% less energy than a similar typical building. In the winter, the heat recovery system warms the air using available energy from the occupants, lights and appliances which is then supplemented by geothermal energy.

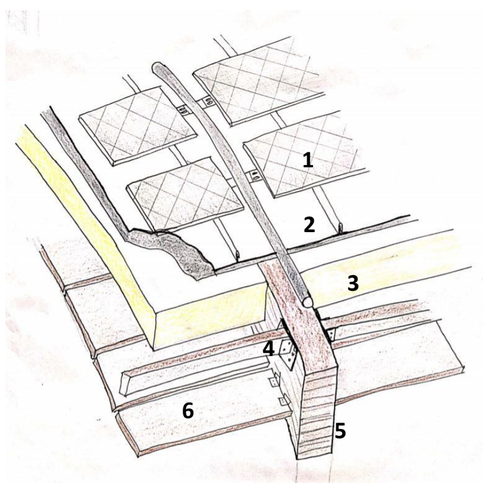
Sustainability Strategy



Structural Study 1:200

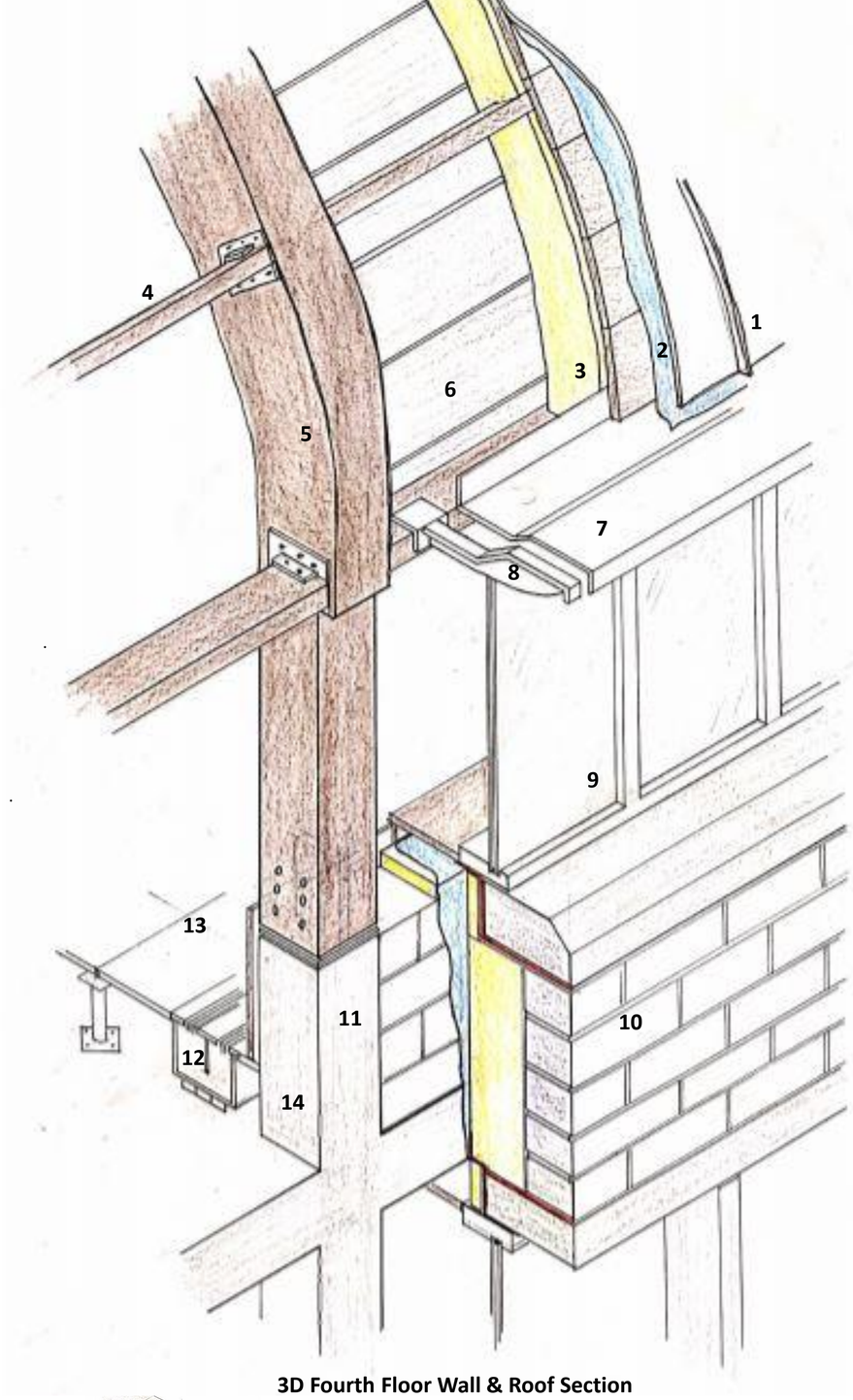


Wall Section 1:50



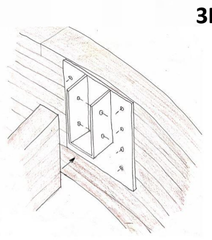
Roof Build Up

1. PV Panel and Galvanised Steel Frame
2. Standing Seam Zinc Roof and Waterproofing
3. Insulation
4. Laminated Timber Purlin and Steel Bracket
5. Glulam Douglas Fir Arch
6. Red Oak Internal Panelling

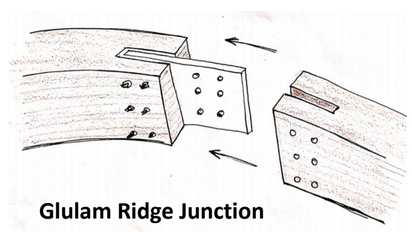


3D Fourth Floor Wall & Roof Section

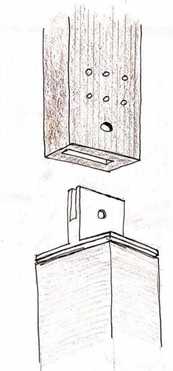
1. Standing Seam Zinc Roofing
2. Waterproofing Membrane
3. Insulation and OSB Layer
4. Laminated Timber Purlin
5. Glulam Douglas Fir Arch
6. Red Oak Internal Panelling
7. Rainwater Guttering System
8. Guttering Bracket
9. High Performance Glazing
10. Briar Hill Sandstone
11. In-situ Concrete Column
12. Trench Heating
13. Raise Floor
14. In-situ Concrete Floor



Purlin Connection



Glulam Ridge Junction



Arch Foot Connection

Sources and Useful Links:

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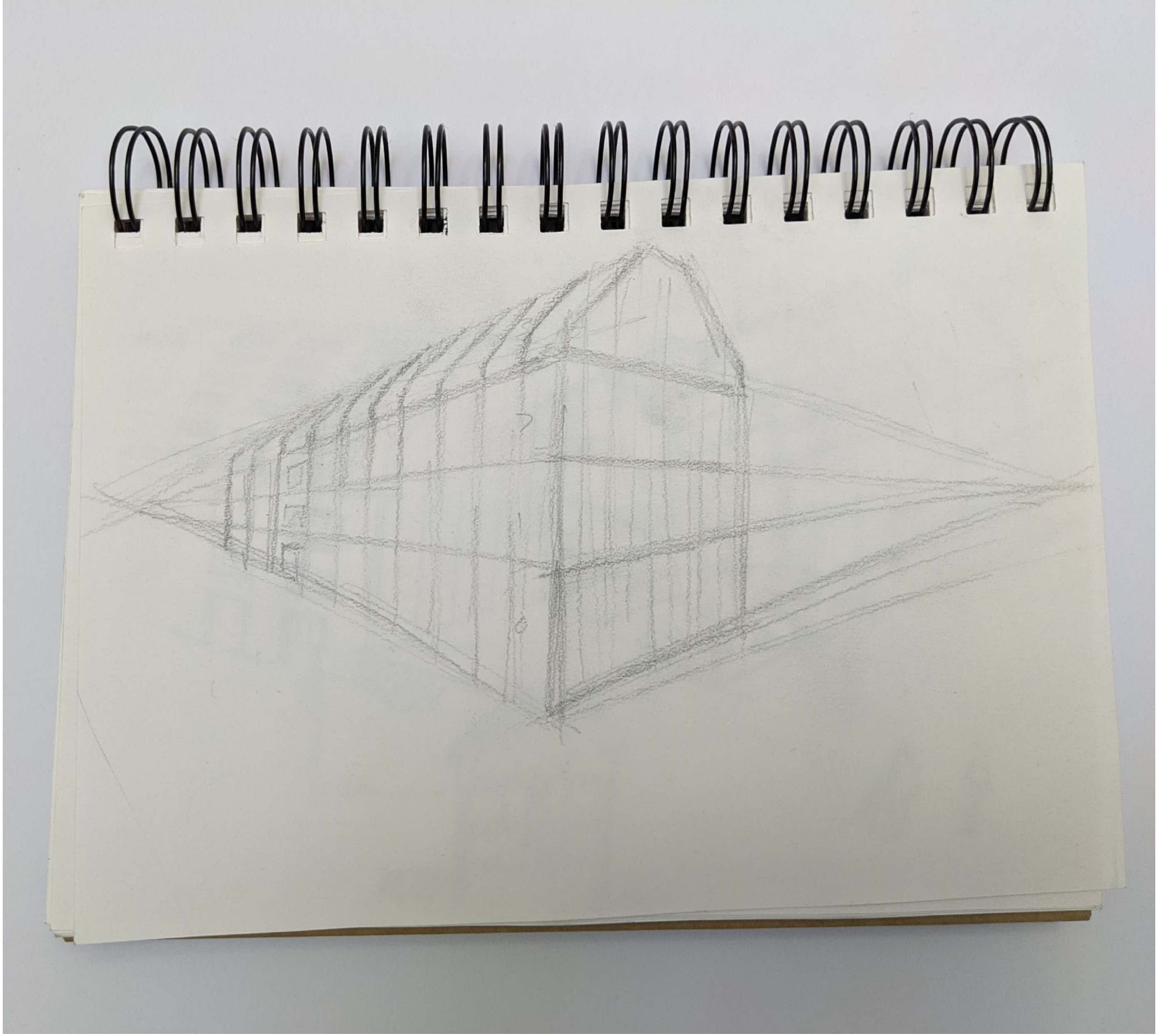
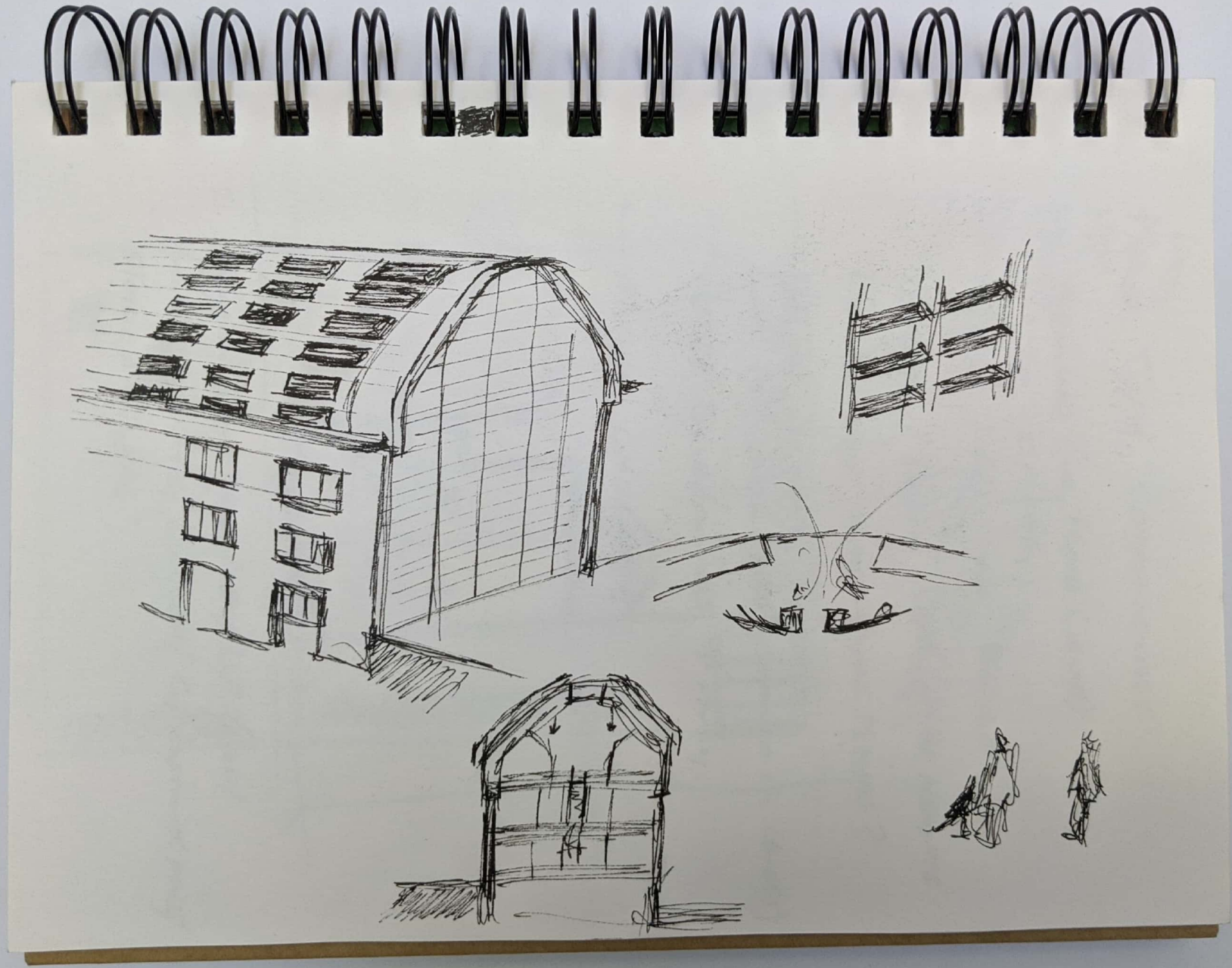
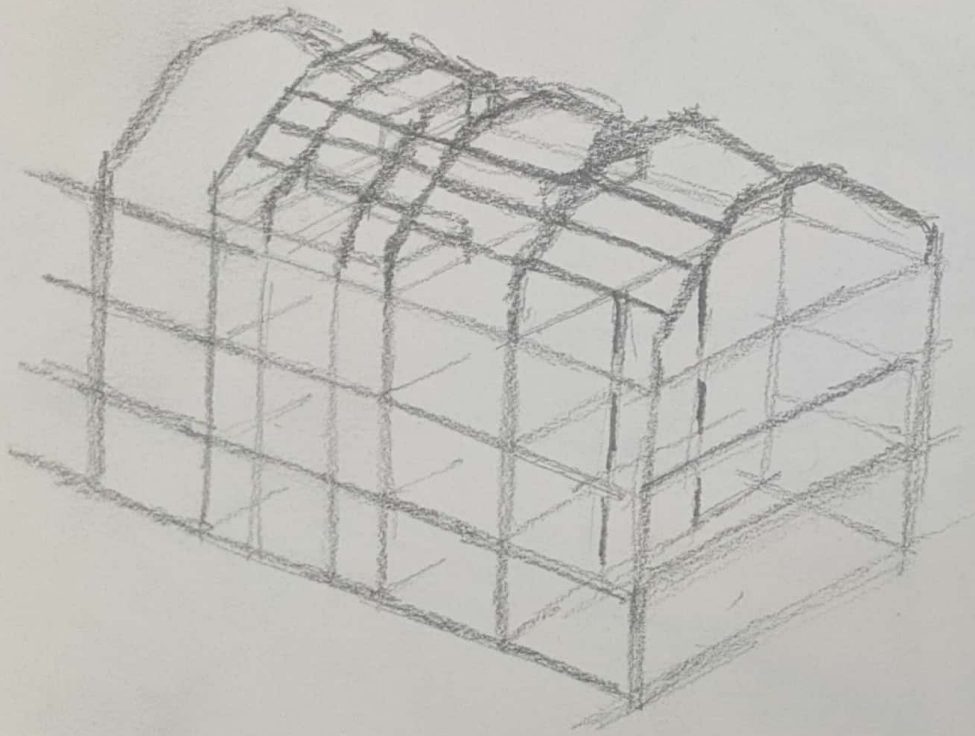
https://www.architectmagazine.com/project-gallery/kroon-hall
https://www.hopkins.co.uk/projects/2/111/
https://centerbrook.com/project/yale_university_kroon_hall_school_of_forestry_and_environmental_studies

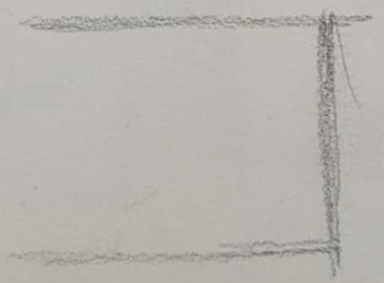
EXPLORATION OF EXEMPLAR TIMBER BUILDING, Kroon Hall, Yale University by Michael Hopkins Architects

Aidan McKenna, Year 3 Architectural Technology, Dublin School of Architecture, TU Dublin









KROON HALL

AIDAN MCKENNA
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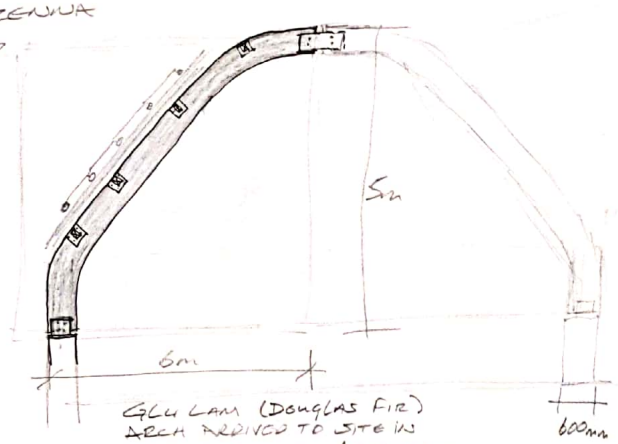
STRUCTURE

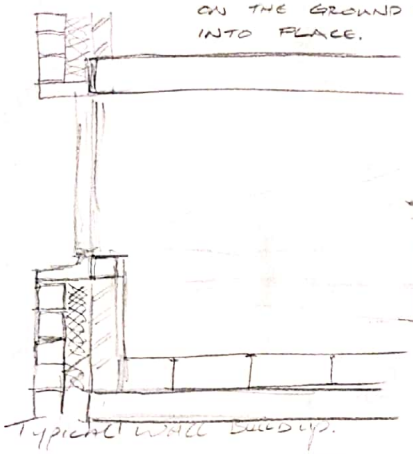
- CONCRETE SUPERSTRUCTURE
- MASONRY STONE WALLS
- CONCRETE CORES
- INTERNAL WALLS + ARCHES CEILING LINE WITH RED OAK.
- GLU LAM (DOUGLAS FIR) ARCHES

SUSTAINABILITY

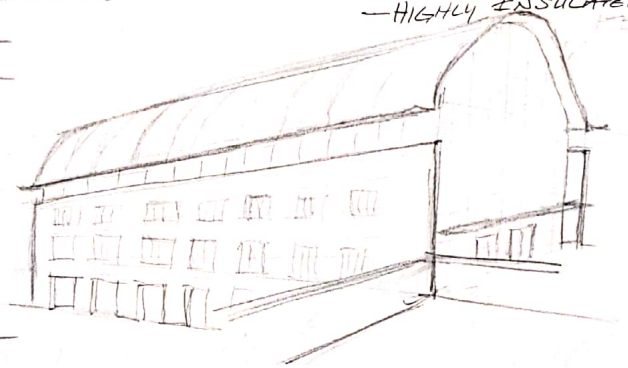
- PV PANELS
- RAIN WATER HARVESTING
- GROUND SOURCE HEAT PUMP
- SOLAR SHADING
- EXPOSED THERMAL MASS (MASONRY, MASS CLT)
- NATURAL LIGHT (12m DEPTH
- SOLAR HOT WATER.
- NATURAL VENTILATION - THRU OPEN/CLOSE WINDOW INDICATORS
- HIGHLY INSULATED
- FSC CERTIFIED TIMBER USED.



GLU LAM (DOUGLAS FIR) ARCH ARRIVED TO SITE IN TWO SECTIONS. ASSEMBLED ON THE GROUND + LIFTED INTO PLACE.



Typical cross section.



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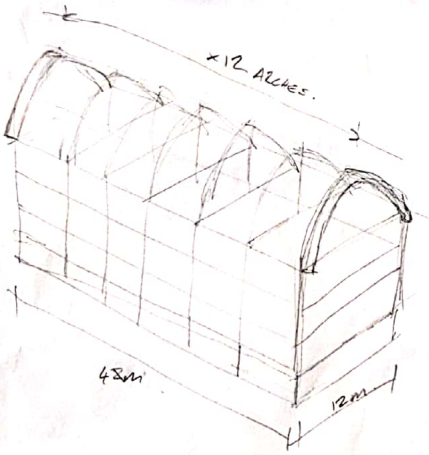

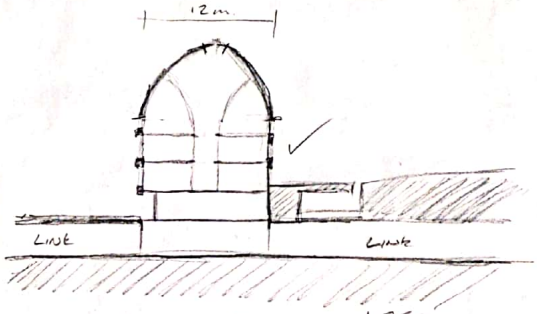

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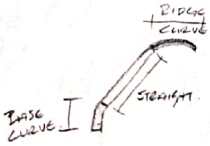

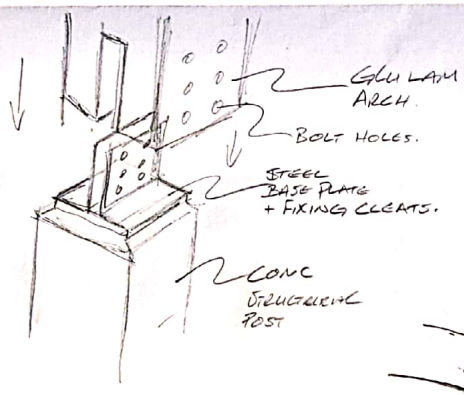

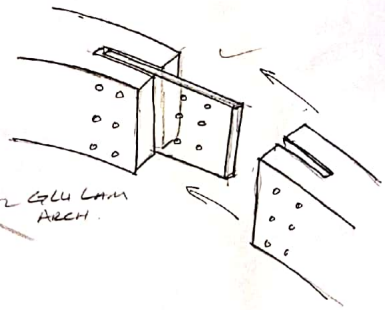

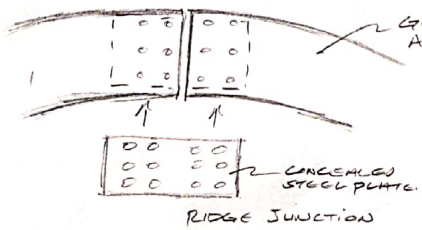

RIDGE JUNCTION

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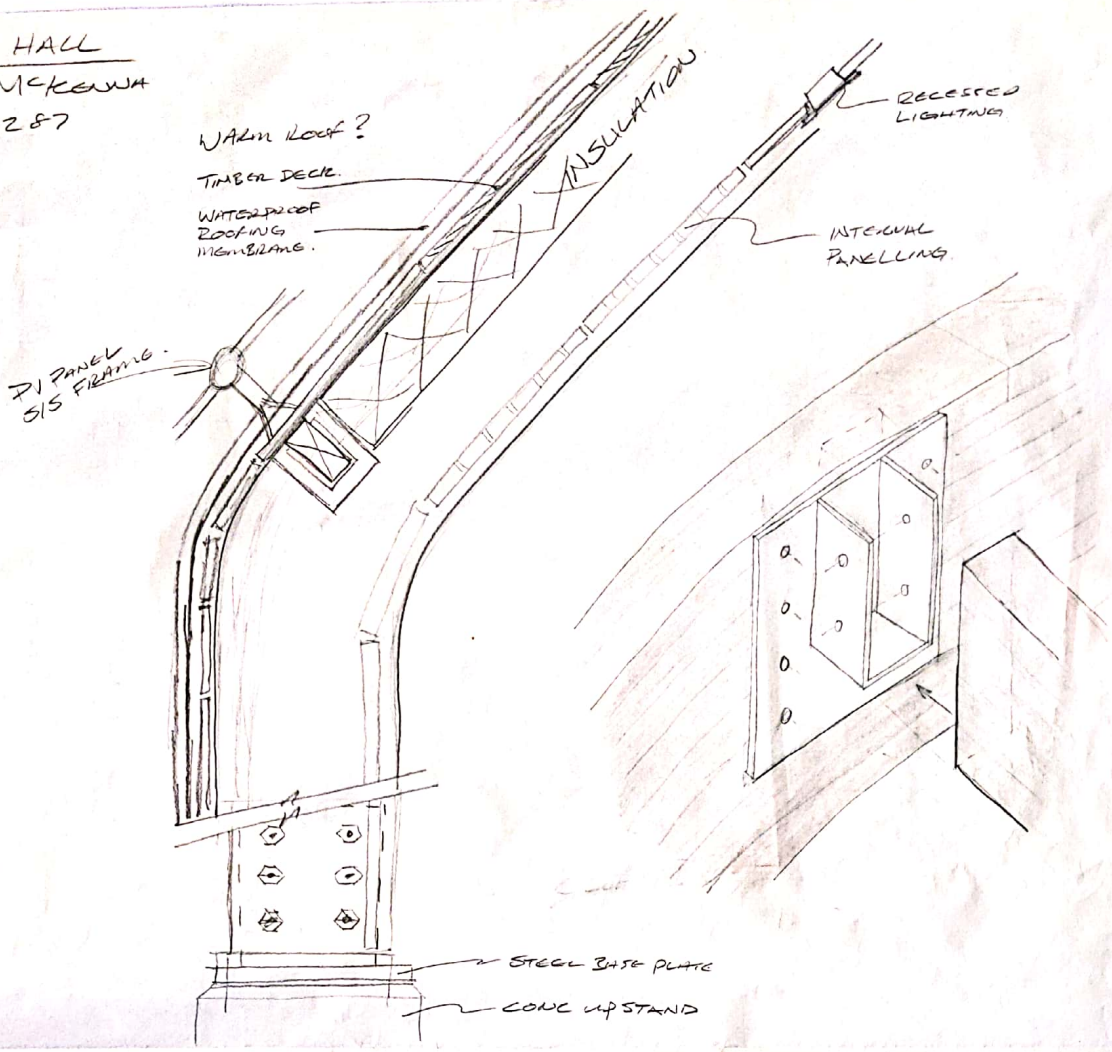

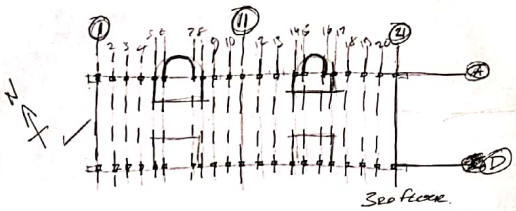

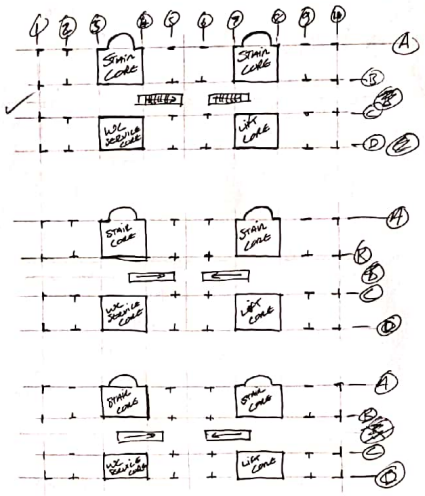

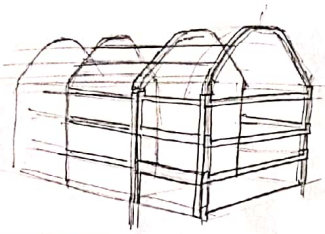

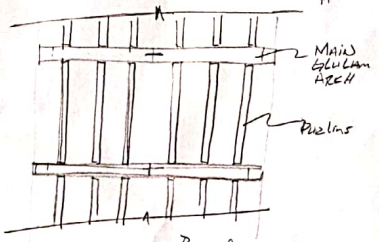

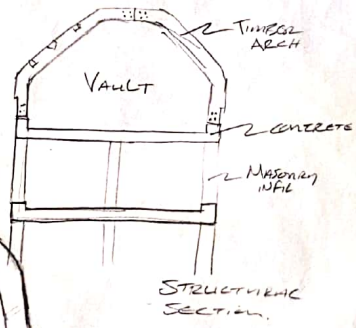

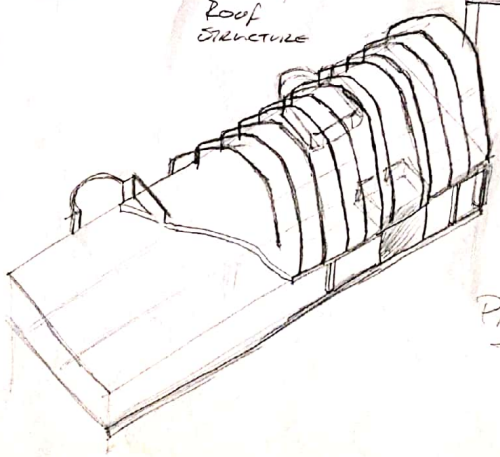

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