structural TIMBER CONFERENCE 2026

Stowe School: Designing the Future of Technology & Engineering Education



Matt Caldwell
Buro Happold



James Brentnall
B&K Hybrid Solutions

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Project Brief



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Architectural Vision



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Embodied Carbon Evaluation

Scheme Reference	Structural Scheme Description		APPROXIMATE TOTAL EMBODIED CARBON FOR PRIMARY STRUCTURAL ELEMENTS			STEEL				CONCRETE - IN SITU				CONCRETE - PRECAST				STEEL REINFORCEMENT				DENSE CONCRETE BLOCK				CROSS LAMINATED TIMBER				GLULAM			
						Density		7800	kg/m3	Density		2400	kg/m3	Density		2400	kg/m3	Density		7800	kg/m3	Density		2000	kg/m3	Density		500	kg/m3	Density		500	kg/m3
						kgCO2e/kg		1.55	1.21	kgCO2e/kg		0.138	0.12	kgCO2e/kg		0.178	0.138	kgCO2e/kg		1.99	1.2	kgCO2e/kg		0.093	0.093	kgCO2e/kg		0.437	-1.2	kgCO2e/kg		0.512	-0.3
			Without Carbon Capture [kg]	With Carbon Capture [kg]	COMPARISON	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Carbon Capture	Embodied Carbon [kg] With Carbon Capture	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Cement Replacement	Embodied Carbon [kg] With Cement Replacement	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Cement Replacement	Embodied Carbon [kg] With Cement Replacement	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Carbon Capture	Embodied Carbon [kg] With Carbon Capture	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Carbon Capture	Embodied Carbon [kg] With Carbon Capture	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Carbon Capture	Embodied Carbon [kg] With Carbon Capture	Volume of material [m3]	Mass of material [kg]	Embodied Carbon [kg] Without Carbon Capture	Embodied Carbon [kg] With Carbon Capture
1	Foundation = Lower Storey = First Floor Plane = Upper Storey =	Insitu RC Raft Braced Steel Frame Cross Laminated Timber Cross Laminated Timber	248,948	**127,099**	47%	2.8	26030.2	40346.7	48819.6	175.5	421236	58130.6	6975.67	0	0	0	0	8.8	68450.9	136217	163461	0.0	0	0	0	305.6	152822	66783	-80139.59	21.9	10940	5601.28	-5041.2
2	Foundation = Lower Storey = First Floor Plane = Upper Storey = Roof Plane =	Insitu RC Raft Cross Laminated Timber & Glulam Cross Laminated Timber Cross Laminated Timber Cross Laminated Timber	244,273	**66,302**	24%	0.3	2967.12	4599.04	5564.83	185.3	444809	61383.6	7366.03	0	0	0	0	9.3	72281.4	143840	172608	0.0	0	0	0	390.9	195429	85402.3	-102482.7	40.7	20374.5	10431.7	-9388.6
3	Foundation = Lower Storey = First Floor Plane = Upper Storey = Roof Plane =	Insitu RC Raft Braced Steel Frame Hollowcore RC Plank Braced Steel Frame Steel & Timber	234,103	**250,084**	92%	5.8	54634.3	84683.2	102467	175.5	421236	58130.6	6975.67	0	0	0	0	8.8	68450.9	136217	163461	0.0	0	0	0	60.42	30212	13202.6	-15843.17	0.0	0	0	0
4	Foundation = Lower Storey = First Floor Plane = Upper Storey = Roof Plane =	Insitu RC Raft Concrete Block Hollowcore RC Plank Concrete Block Steel & Timber	297,683	**272,881**	100%	1.4	12813.8	19861.5	24032.4	279.4	670666	92551.9	11106.2	0	0	0	0	14.0	108983	216876	260252	256.7	513358	47742.3	4440.03334	60.42	30212	13202.6	-15843.17	0.0	0	0	0
All embodied carbon values have been taken from the Inventory of Carbon (ICE Database Version 3.0 Beta - 19 June 2019)																																
All values exclude the carbon emissions associated with the distance that the materials need to travel to get to site						'Steel, Section' value taken from ICE v3.0				'C32/40 CEM1' value taken from ICE v3.0			'PC RC40/50 with average UK additions' value taken from ICE v3.0				'Steel, Rebar' value taken from ICE v3.0				'Con block high density, av strength' value taken from ICE v3.0				'Timber, CLT' value taken from ICE v3.0				'Timber, Glulam' value taken from ICE v3.0			
All values exclude the carbon emissions associated with construction activities on site to build the structure						20% added for connections				'RC32/40 25% GGBS' value taken from ICE v3.0				'RC40/50 25% GGBS' value taken from ICE v3.0																
All values exclude the carbon emissions associated with the maintenance and replacement of the building and its elements						For steel, values excluding the recycling of the steel element at the end of life stage, and values including the recycling of the steel element at the end of life stage have been given. The values which include the embodied carbon benefits of recycling the steel at the end of its life can only be used if the end of life considerations for all other materials is considered to ensure a fair comparison.				For concrete, the in-situ elements, pre-cast elements, and concrete block elements have been treated separately. This is because pre-cast elements are typically of a higher strength than in-situ elements. Rather than looking at end of life considerations, values which exclude cement replacement and include cement replacement have been given. Unfortunately there are no cement replacement values for dense concrete blocks available.														For timber, values excluding carbon storage and values including carbon storage have been given. To take advantage of the carbon storage value, the specifications for the timber must sustainably sourced, and the end of life considerations for all other materials must be considered as well to ensure a fair comparison.							

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Knock-On Benefits of Light Weight Superstructure





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Sustainable Teamwork
The Timber Design Workflow

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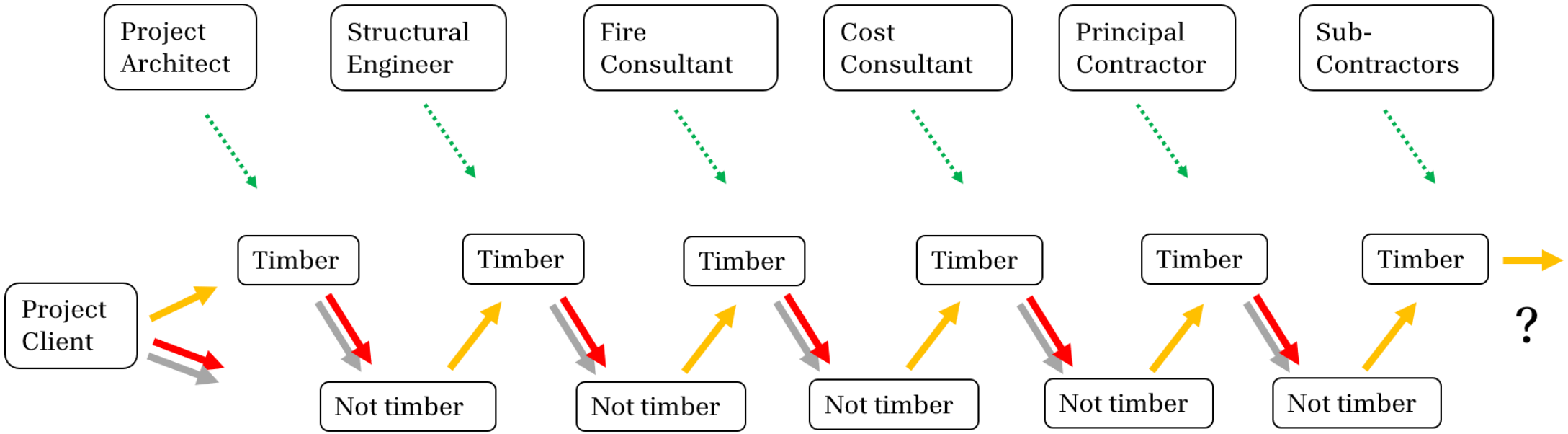
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The Timber Design Workflow

The Mass Timber Industry has a Problem



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The Timber Design Workflow



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The Timber Design Workflow

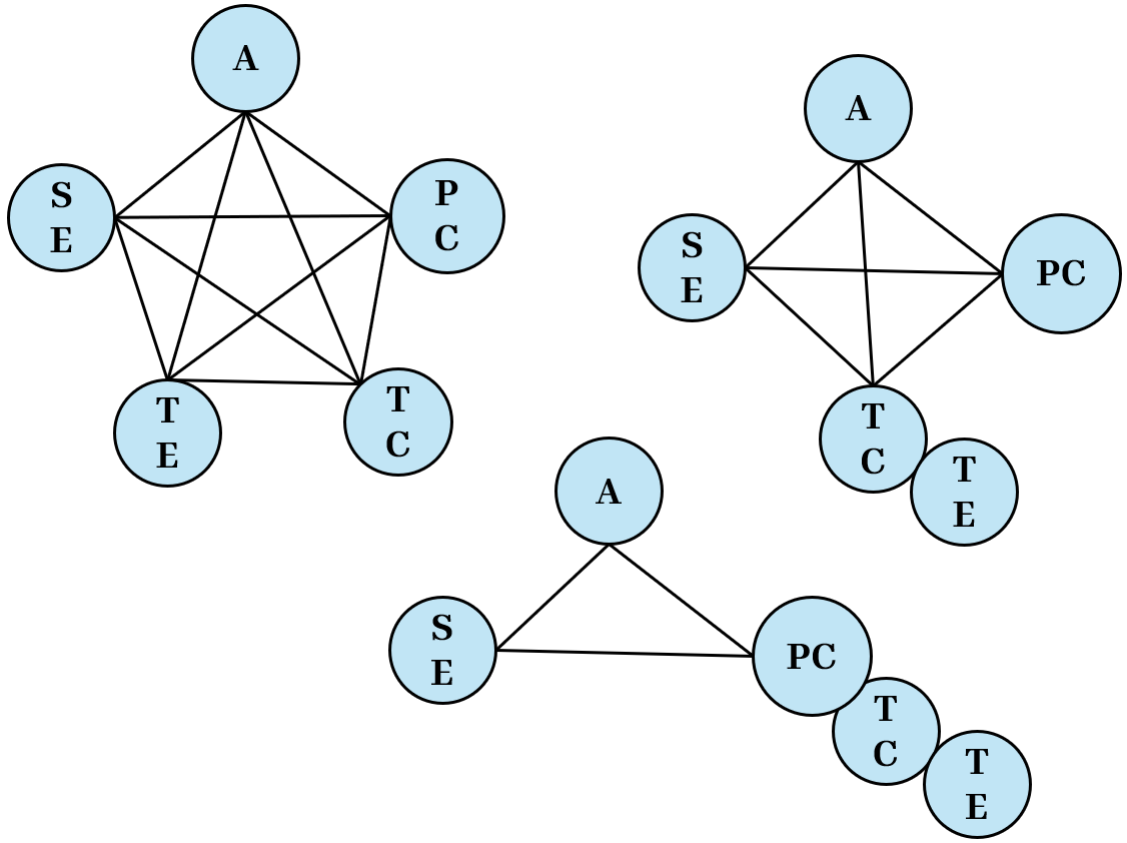
Architect (A)
visual requirements

Structural Engineer (SE)
overall structural design

Principal Contractor (PC)
procurement, logistics, erection, interaction

Timber Contractor (TC)
fabrication, procurement, logistics, erection

Timber Engineer (TE)
connection design, timber element design

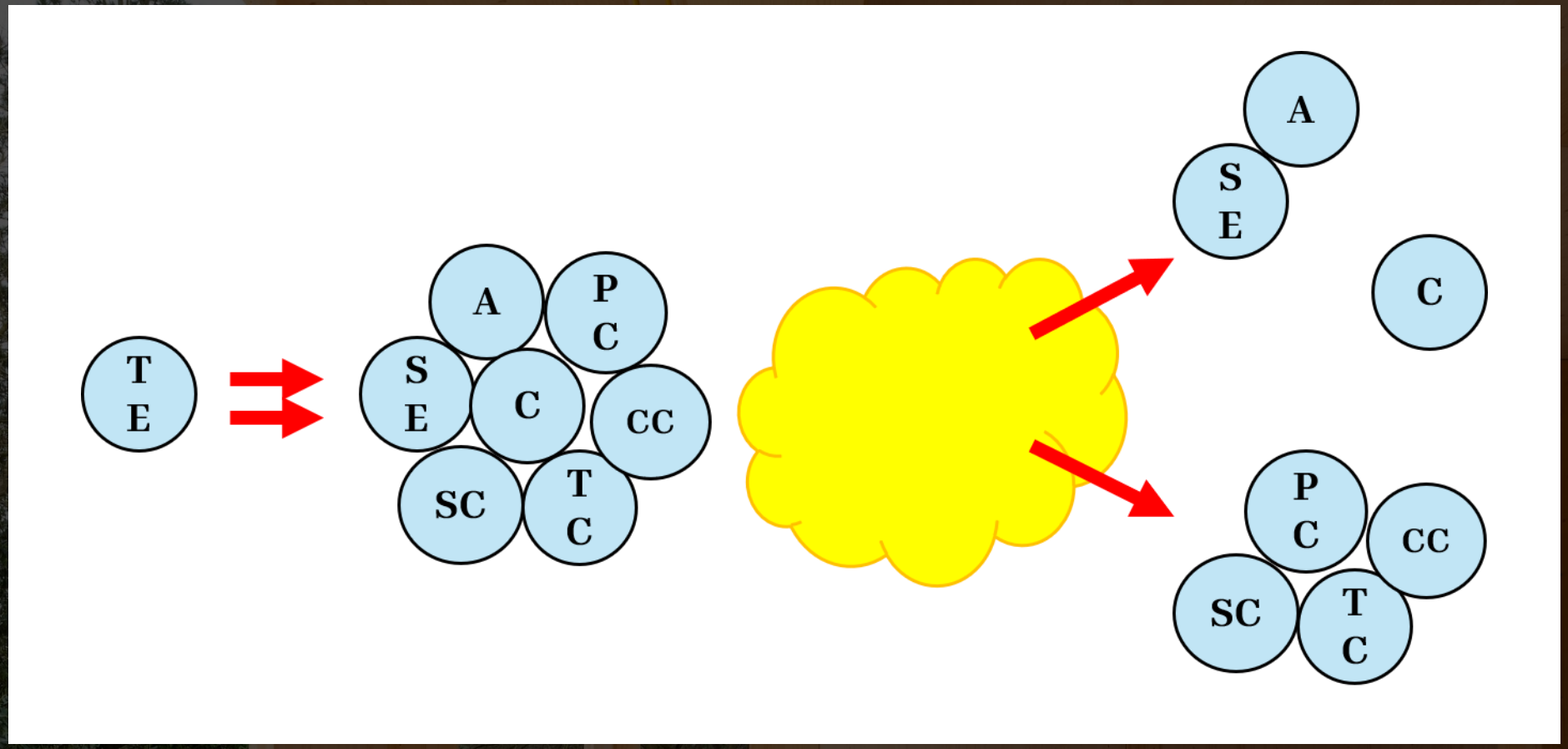


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The Timber Design Workflow



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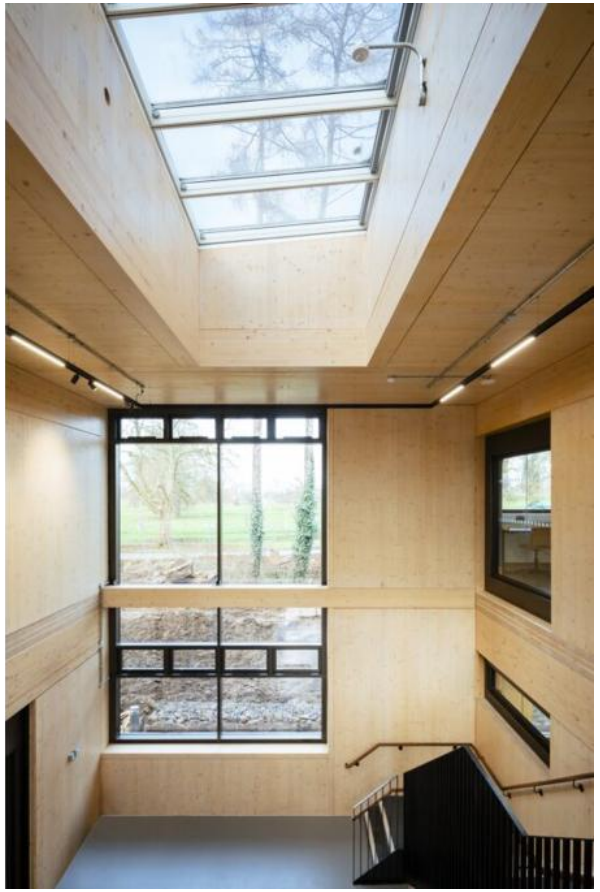
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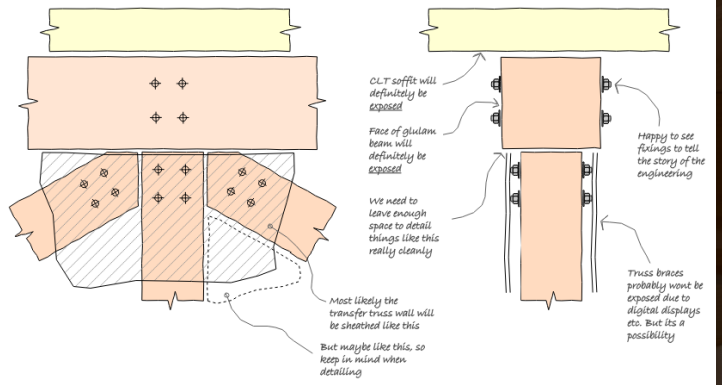
1. Clear visual intent

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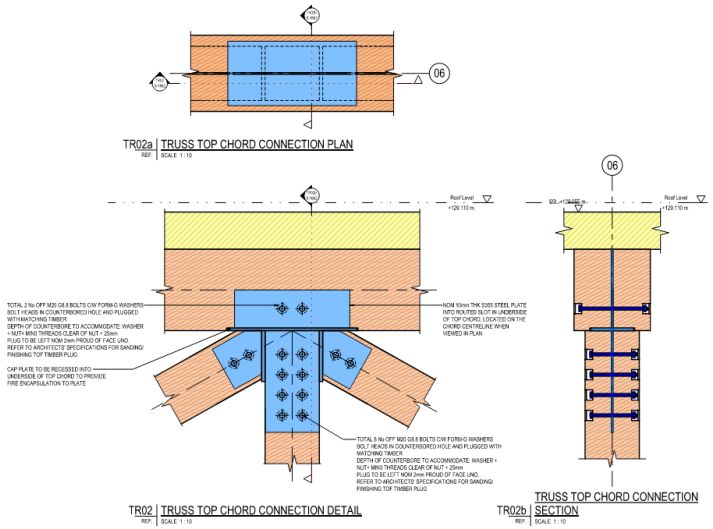
2. Detailed project-specific connection intent drawings

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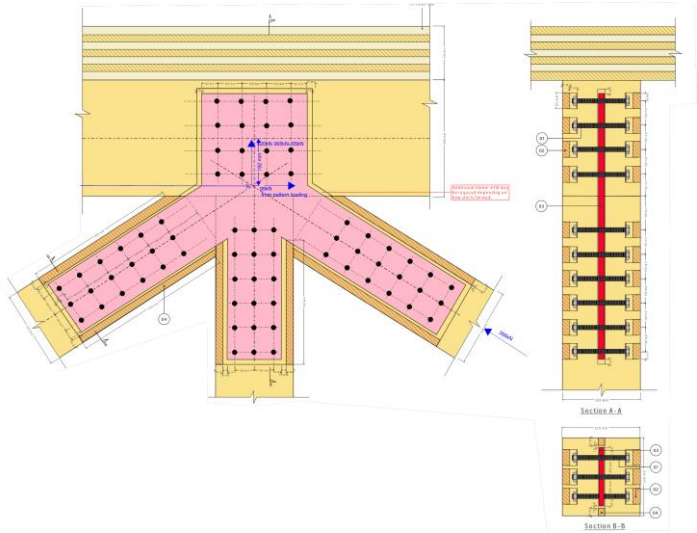
3. Outline connection analysis

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4. Collective understanding of objectives

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5. Free dialogue between all parties

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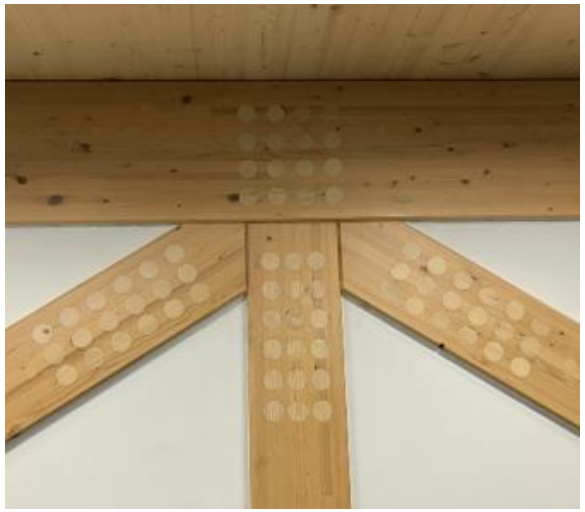
1. Clear visual intent
2. Detailed project-specific connection intent drawings
3. Outline connection analysis
4. Collective understanding of objectives
5. Free dialogue between all parties

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Timber Design & Detailing

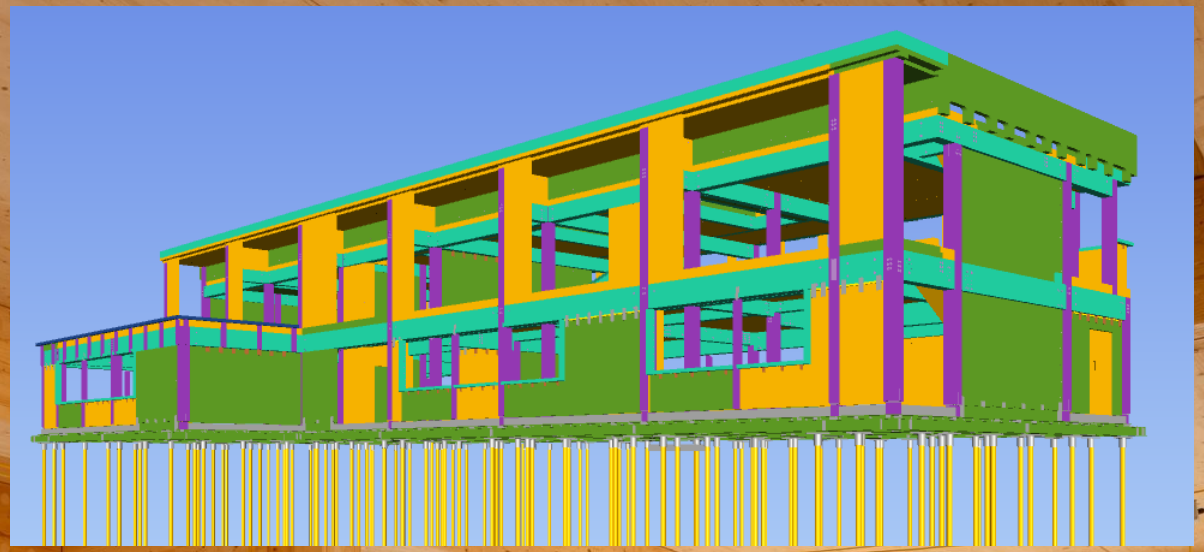
HYBRID SOLUTIONS

B&K Hybrid Solutions played a key role and were appointed by Beard Construction to deliver the DTE building's structural timber frame.

Cross Laminated Timber, Glulam & Supporting Steelwork

- Buro Happold – Member Design
- BKHS + Engenuiti – Structural Connection Design
- BKHS Drawing Office – 3D Model & Detailed Drawings

The result is an innovative, educationally inspiring two-storey facility that has prioritised sustainable materials and biophilic design.



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Offsite Manufacturing

BKHS' Drawing Office produced 2D & 3D information & issued to timber supply chain & in-house steelwork fabrication facility

379m3 – Cross Laminated Timber
110m3 – Glulam
64 Tonnes – Steelwork

- Millimetre Precision – Reducing Waste, Increasing Accuracy & Minimising On Site Delays
- Coordination with Other Trades and Timber & Steel Interfaces – Benefit of One Cohesive Package
- Visual Quality – Exposed Timber Components

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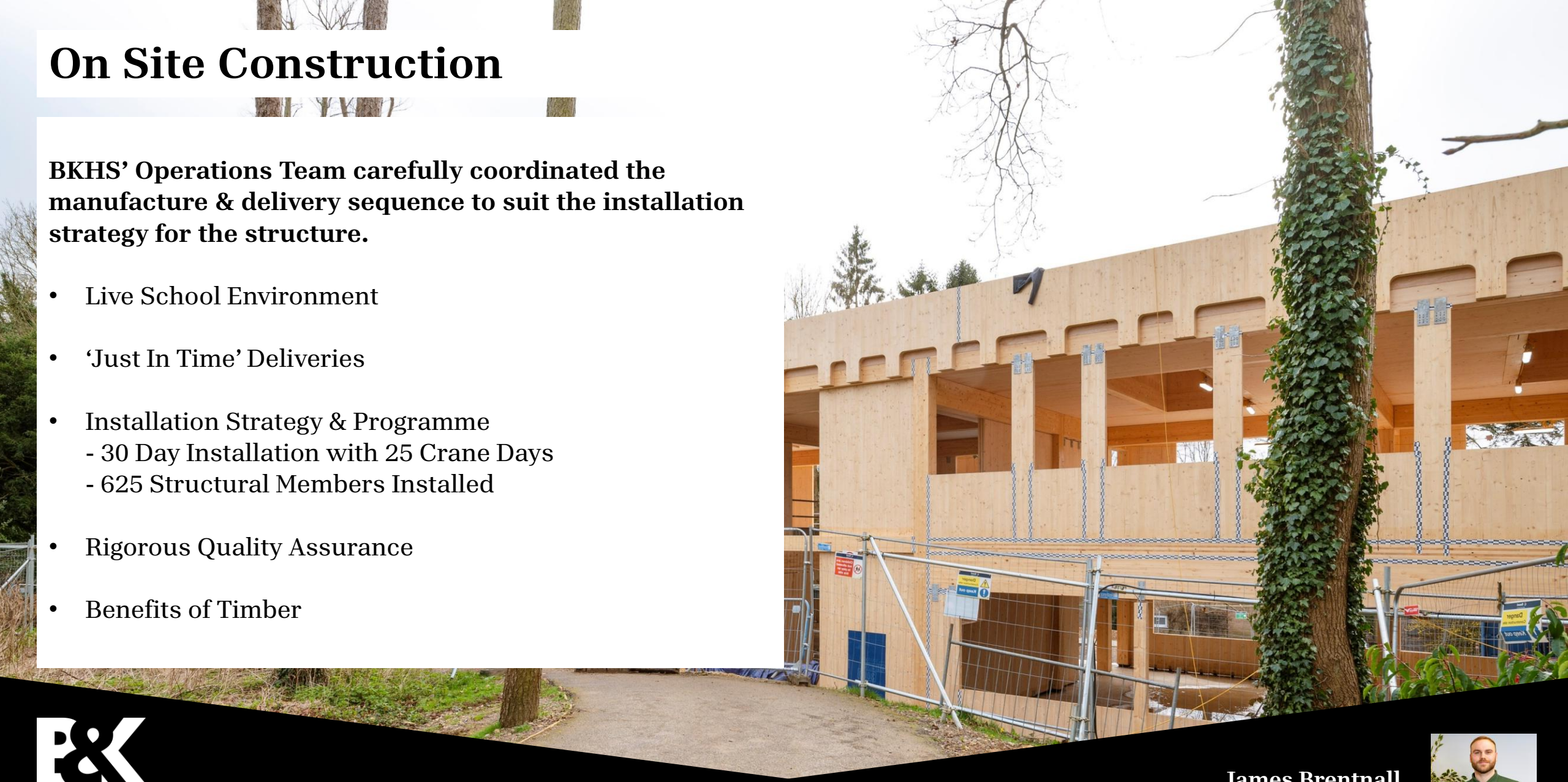
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B&K Hybrid Solutions



On Site Construction

BKHS' Operations Team carefully coordinated the manufacture & delivery sequence to suit the installation strategy for the structure.

- Live School Environment
- 'Just In Time' Deliveries
- Installation Strategy & Programme
  - 30 Day Installation with 25 Crane Days
  - 625 Structural Members Installed
- Rigorous Quality Assurance
- Benefits of Timber



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Coordinated Design + Streamlined Manufacture
= **Successful Site Installation**







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Sustainability

- 360 Tonnes Stored Carbon
- 75% Lower Embodied Carbon Than Concrete Option
- 100% PEFC-Certified Timber
- Designed for Circularity

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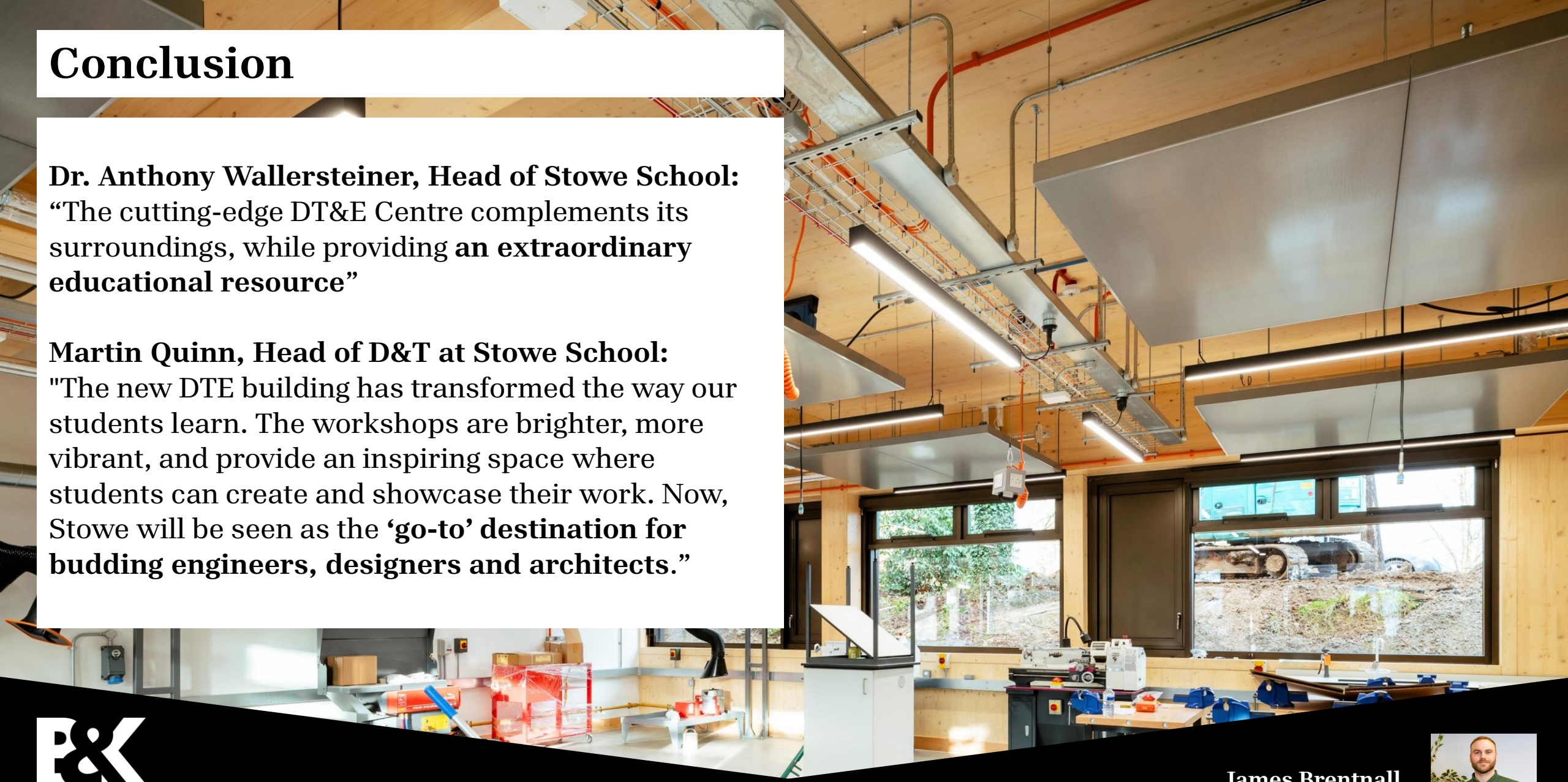
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B&K Hybrid Solutions



Conclusion

Dr. Anthony Wallersteiner, Head of Stowe School:
“The cutting-edge DT&E Centre complements its surroundings, while providing **an extraordinary educational resource**”

Martin Quinn, Head of D&T at Stowe School:
"The new DTE building has transformed the way our students learn. The workshops are brighter, more vibrant, and provide an inspiring space where students can create and showcase their work. Now, Stowe will be seen as the **‘go-to’ destination for budding engineers, designers and architects**.”



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