

Learning fast

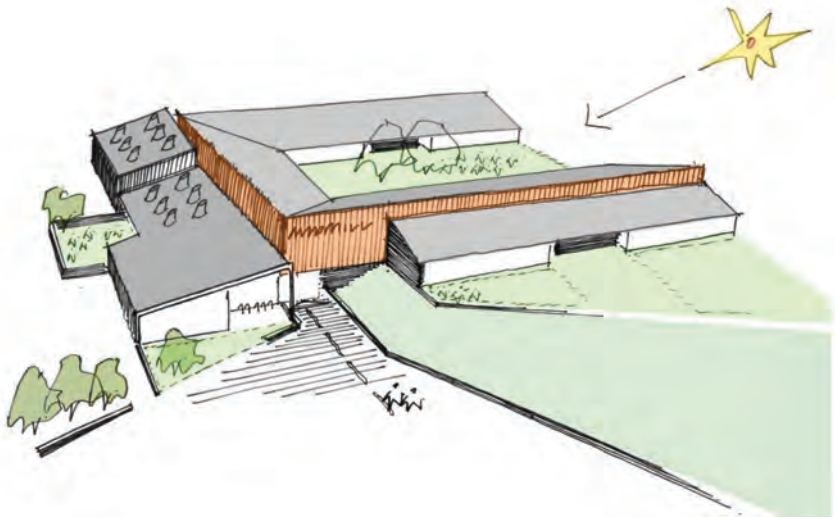
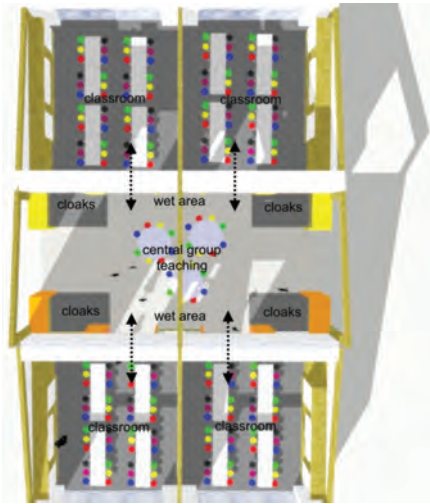
Two of five new schools being provided for Aberdeenshire feature the extensive use of a hybrid glulam and CLT system providing a wide range of benefits for flexible learning environments. Eve Dennehy reports for ADF

In April 2012 Aberdeenshire Council approved a brief to inform the delivery of five new primary schools at Midmill Kintore, Turriff, Drumoak, Hillside Portlethen and Uryside Inverurie. The schools have been funded directly by Aberdeenshire Council's Capital Plan and were traditionally procured to ensure the Authority maintained a tight control of quality. The construction work was tendered via Aberdeenshire Council's Main Contractors Framework Agreement. Morrison Construction was successful on being awarded Midmill, Turriff and Uryside Schools. Hillside and Drumoak Schools were awarded to FM Construction and Robertson Construction respectively.

Aberdeenshire's brief focuses on creating educational spaces which encourage accessibility and social development as part of the curriculum, with natural light, flexible space, transparency for ease of management and direct links to the outdoors as key design elements. The five standalone schools, which are similar in size and scale, have been delivered within a five-year timescale between 2012-17. This gave the Council just two and a half years from the approval of the brief before the first project started on site, with commencement on site of subsequent schools every six months. The two final Schools – Turriff and Uryside are nearing completion with both due for occupation by the end of 2017.

Each school has been individually designed by separate project teams using a 'kit of parts' approach which was developed in response to the brief. Strategic space relationships were





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Images courtesy of Aberdeenshire Council

agreed across all the schools including the relationship of classrooms, where a series of key requirements were identified, including square shaped flexible classrooms and general purpose in-between spaces, that could be opened up for flexible learning. Teaching space is designed around a template of a cluster of four classrooms with a central group teaching area where the wet areas are located to meet accessibility requirements.

Another key part of the brief was the separation of the dining hall and the gym hall which have commonly been shared spaces. Promoting healthy eating is an important part of Aberdeenshire's curriculum, so ensuring that the dining experience takes place in a light, bright space with direct access to outdoors was important. Separating the two spaces also allows the gym to function independently and provide facilities for community sports use, whilst the dining space can function as an additional flexible learning and community space.

Two of the schools have been constructed using a hybrid glulam and CLT portal frame installed by G-frame Structures – a UK delivery partner for Stora Enso who manufactured the CLT. The first, Midmill Primary School, impressed the project teams for the remaining schools and they took the lessons learned at Midmill and applied them to the new school at Turiff, where the same hybrid method was adopted. The project team for Uryside was also keen to use this CLT and glulam combination, but decided that the design and procurement process was already too advanced to change course and this

school has gone ahead as a hybrid glulam and steel construction.

“Glulam and CLT were specified for Midmill and Turiff schools for a number of reasons.” Explains Craig Matheson, architect at Aberdeenshire Council.

“The requirement for a flexible learning environment meant an obvious solution was to introduce a portal frame structure at regular centres which removes the requirement for load bearing and fixed internal partitions. Once this became a structural direction there were two clear options for us to consider of either glulam or steel.

Architecturally we were very keen to explore glulam for the portal frame and as this option developed it became apparent that the benefits extended beyond any aesthetics.”

“On steel options being developed we were required to look at bracing the structure, which in most cases required the bracing to be concealed within internal lining. With glulam we investigated the use of CLT panels to brace the glulam frame and we recognised a series of benefits to this. On external walls the CLT panels could be integrated into the timber frame kit which provided an insulated weather tight wrap to the building and internally there was the potential of leaving the CLT exposed as an internal finish. By forming the larger spaces such as the gym hall in CLT it essentially created a huge plywood box to secure the portal frames to. The architecture and the structure were becoming much more intrinsically linked and for us this opened up the possibility for more interesting and honest spaces.”



Courtesy of Morrison Construction



Courtesy of Aberdeenshire Council



Courtesy of Morrison Construction

Matthew Linegar, head of building systems at Stora Enso and a structural engineer who has spent twelve years specialising internationally in CLT construction, expands on this “Cross Laminated Timber is ideally suited to hybrid applications such as this.” He explains “It has an inherent high in-plane strength and stiffness allowing it to act as a diaphragm plate when used in floors or roofs and as shear walls, thus providing stability to the building and replacing the need for bracing.”

“The loadings of the glulam and CLT are also lighter than steelwork which allowed for a lighter-weight raft foundation solution that resulted in cost and time saving on the ground work.” Adds Craig. “Also, there is a speed of construction which ultimately manifests itself into a saving on the contract. The gym hall, for example, was erected in three weeks in full height CLT panels which, when compared with a 12 week masonry build gym hall, represents a significant time saving.”

The CLT/glulam fabrication went through a rigorous commenting process with proposals presented by G-frame Structures in 3D Revit form. This allowed the design team to review, comment and co-ordinate all aspects of the main structure, meaning that potential co-ordination issues could be identified

prior to fabrication resulting in a relatively swift and easy installation process.

“It was an additional benefit that the project teams were able to liaise with the timber specialist, G-frame Structures, on all structural requirements. Having a ‘single point’ design responsibility prevents any interface falling between the gaps.” Comments Craig.

The delivery of the five Schools will be benchmark reviewed to give an across the board view of three different methods of construction: steel frame at Hillside, glulam and CLT at Midmill and Turiff and glulam with steel at Uryside. Post occupancy reviews will also be undertaken as part of Aberdeenshire’s major projects requirements.

Midmill Primary School

Midmill Primary School at Kintore, Aberdeenshire provides space for 540 pupils. The site sits within open farmland with a proposed housing masterplan to encompass the eastern edge of the town. The site slopes north down to the Tuach Burn and there are two scheduled ancient monuments in close proximity – Midmill Long Cairn and the standing stones at Tuach Hill.

The level changes of the site have provided an opportunity to split the

Courtesy of Morrison Construction

PROJECT FACTFILE

Type of Project: Education
Location: Kintore, Aberdeenshire
Client: Aberdeenshire Council
Architect: Aberdeenshire Council
Main Contractor: Morrison Construction
Engineering: Furness Partnership / G-frame Structures
Hybrid Construction Specialist: G-frame Structures
Completion: 2016

School's functions clearly into two separate areas. The teaching spaces sit at the upper level of the site and the more public spaces including main entrance, community areas, dining areas and gym hall are at the lower level. The teaching level, where the pupil entrances are located, is single storey and the public interfacing area at the entrance of the site is two storey creating a level scale across the building.

The new school accommodates 19 classrooms laid out in a two-winged U-plan approach in order to meet the Education Department's requirement of ground level access for all classrooms and this has allowed the creation of a central courtyard, which provides a 'protected' outdoor space for pupils.

At the heart of the school is the entrance area, dining space, library and stairs which extend to form a central amphitheatre used for ad-hoc performances and which acts as an extension to the dining space as well as providing space for informal teaching. From this central space there are also visual connections to the staff work-base, staff room and the gym hall which give the sense of being in the hub of the building.

CLT forms the library, entrance hall, games hall and the main amphitheatre. The material has been left exposed throughout which creates a warm and welcoming environment for the pupils and staff and specification of the material has resulted in additional cost and time savings to the project as there is no requirement for internal plaster boarding or decoration where CLT is used.

Externally, at lower level, the timber structure is encased with locally sourced Fyfe stone brick of varying colours and textures which cuts into the slope with

planters extending out to assist merging the building into its landscape.

The upper level's key element is an enclosing wall which is horizontally clad, giving a sense of movement around the building. The lesser elements are formed in simpler vertical format cladding with boldly coloured pupil entrances recessed to create shelter. This allows each year group to make a simple visual connection with their respective entrance. The entry colours continue internally which helps provide a sense of orientation and also assists the teachers in managing year groups.

Turiff Primary School

Turiff Primary School is located at Turiff in the agricultural lowlands of the North East of Scotland. The town sits on the banks of the river Deveron which starts in the mountains to the west of Huntly and joins the sea at Banff. Given the rural setting and the rich history of agriculture in the surrounding area, the decision was made early in the design process to use glulam and CLT which it was felt would emphasise the structure and make a clear link to the natural landscape.

In response to Aberdeenshire Council's Brief, the design concept of the school focuses on the creation of a large central space, which forms the creative and social heart of the new school. The concept has been shaped through careful site analysis and maximises the benefits of the views of the surrounding landscape as well as the slight change in level across the site.

From this initial concept plans, sections and elevations were developed for a first class modern education facility. The design incorporates the latest in sustainable technology whilst not forgetting the most





Courtesy of Aberdeenshire Council

basic of architectural principles such as the quality of light and space.

The School is shaped and orientated in order to benefit from the maximum amount of daylight during the different school break times. The building is formed by positioning two relatively simple classroom blocks at an oblique angle opening up towards the view to the south. The space between the teaching wings creates the 'heart' of the building which features a pitched roof and a glass wall to the south that connects inside and out. This dynamic one storey space is 11 metres at its highest point to make the most of the space and the use of natural light.

"We see this space as the focal point for the school." Says architect, Colin Robertson of Halliday Fraser Munro. "Pupils and staff will pass through the space many times through the day at high or low level and will use the space for different functions. It is a space for the entire Turriff community with opportunities for a variety of activities."

The two-court gym hall is formed by CLT which has been left exposed internally. Stora Enso CLT is bonded using formaldehyde-free and environmentally friendly adhesives which are suitable for internal exposure and the material is increasingly being recognised for its ability to create an internal environment which feels warm and safe, particularly in schools and healthcare buildings.

"From our point of view the exposed timber finish within the hall was very appealing and we are pleased with the warm and natural feel of the completed

building which we believe is primarily due to the exposure of the CLT and glulam frame." Notes Colin. "Also CLT offered a faster, less labour intense construction which was a big factor for Aberdeenshire Council who had set a relatively tight programme for the works."

Even in small detail the design takes advantage of the internal and external connection of the structural wood to the surrounding landscape. The design embraces the wood at its heart as the building expresses the structure throughout. Wherever possible the structural timber elements have been left exposed and detailed in a sensitive way such as setting back the adjacent plasterboard walls and creating shadow gaps at the junctions. Working with Furness Partnership, G-frame Structures designed a bespoke connector for connecting the glulam portal to the roof purlins so that the connections would be concealed when viewed from inside the building, having the appearance of neatly mitred joints. The connectors are made of 16 mm steel which has been fabricated to the angle of the roof and the front facade, covered with an over-strengthening steel 'gusset' and fixed to the glulam portal from above and to the side with no physical fixing from the underside.

Glulam posts have been used within the coupling detail for the timber window frames as a way of harmonising the material palette and reinforcing the sense of nature as pupils and staff look out towards the fields and tree lines in the distance. ■



Courtesy of Aberdeenshire Council

TURRIFF PRIMARY SCHOOL FACTFILE

Type of Project: Education
Location: Turriff, Aberdeenshire
Client: Aberdeenshire Council
Architect: Halliday Fraser Munro
Main Contractor: Morrison Construction
Engineering: Furness Partnership / G-frame Structures
Hybrid Construction Specialist: G-frame Structures
Completion: 2017