PROJECT CASE STUDY

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Pen Y Dre High School
Merthyr Tydfil, Wales

PEN-Y-DRE HIGH SCHOOL, MERTHYR TYDFIL PROJECT CASE STUDY

Beton Bauen
SPECIALIST CONTRACTING

Project Overview

Pen Y Dre High School is a comprehensive for pupils aged between 11-16 years old, located on the Gurnos estate, Merthyr Tydfil, South Wales. The main building opened in 1972, replacing an older county school. Since then expansion has seen a number of interconnected buildings developed, including an indoor swimming pool, sports hall and gymnasium. In recent times, the school has found itself in a poor state of repair. A government announcement called for a cut in building demolitions to save carbon, instead prioritising retrofit and reuse of buildings over knock down and rebuild; Pen Y Dre was identified as an ideal project. The project aims to produce no operational carbon, using photovoltaic panels, air source heat pumps, and advanced insulation. Aimed at transforming existing school structures to meet modern standards, the scheme is partially funded by the Welsh Government, as part of its Sustainable Communities for Learning Programme.

Morgan Sindall Construction was appointed the primary contractor for Pen Y Dre High School by Merthyr Tydfil County Borough Council in September 2021, which once complete will be the first major school refurbishment project delivering net zero carbon in operation in Wales, with a 20% reduction in embodied energy, transforming the 1970s building into a state-of-the-art educational facility whilst maintaining its operational status throughout the three-year construction programme. The decision to refurbish rather than rebuild was driven by environmental considerations, with the refurbishment approach delivering four times less carbon impact than a new build whilst preserving valued facilities including the school's swimming pool, two dining halls, and two sports halls.

Beton Bauen joined the project in 2023, as a specialist subcontractor, with a focus on the concrete structures whilst supporting the client's longevity and sustainability objectives.

Project Details

Project Title:	Pen Y Dre High School
Sector:	Education
Project Value:	£1.2 Million (Approx.)
Project Duration:	2022-24
Our Client:	Morgan Sindall Construction
On Behalf of:	Merthyr Tydfil County Borough Council; Welsh Government; Sustainable Communities for Learning
Other Partners:	Darlow Lloyd Construction; Fosroc; Cambria Consulting; CMB Engineering; Lawray Architects

Cyngor Bwrdeistref Sirol Merthyr Tudful / Merthyr Tydfil County Borough Council
Yn gweithio ar Ran Llywodraeth Cymru / Working on behalf of the Welsh Government
Cymunedau Dysgu Cynaliadwy / Sustainable Communities for Learning
MORGAN SINDALL CONSTRUCTION
CAMBRIA Constructive Thinking
lawray architects
FOSROC
DLC
CMB ENGINEERING

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Project Services

SERVICES DELIVERED DURING THIS PROJECT

- COVER METER SURVEY
- CONCRETE REPAIR & PROTECTION
- RESIN INJECTION
- SPECIALIST COATINGS
- STRUCTURAL WATERPROOFING & TANKING

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Project Description

Beton Bauen Project Contribution

Pen Y Dre High School is a refurbishment project delivered by principle contractor Morgan Sindall over 6 phases and is aimed at transforming existing school structures to meet modern standards, rather than demolish outdated structures. The project focuses on retrofitting and upgrading existing buildings to reduce embodied carbon that comes with demolition of concrete structures. Beton Bauen specifically joined the project in 2023, as a specialist sub contractor, with a focus on the concrete structure included in Phases 3 & 4 of the works. Our works included:

- Structural surveys and concrete testing while working with the structural engineer, Cambria (hammer tap testing, Ferroscan cover scanning)
- Concrete repairs using a full Fosroc repair and protection system to the concrete frame
- Waterproofing to lift and sump pits using a Flexcrete tanking system
- Resin injection to the swimming pool area
- Ongoing works involving another phase of concrete frame refurbishment

Solution Methods & Methodology

Quality assured, with a technical knowledge of specialist repairs, Beton Bauen worked in close collaboration with Fosroc and other manufacturers to implement an industry-leading system. The school would remain in use throughout the entire refurbishment and Beton Bauen would adapt our surface preparation techniques to accommodate pupils and staff onsite. Initially planning to use traditional (mechanical) methods, we instead opted to use high pressure water jetting, in an attempt to contain dust and minimise disruption to any educational activities.

Identifying Products & Materials

Beton Bauen worked closely with product manufacturer (Fosroc) to implement concrete repairs that would also protect the structure for the long-term. Specification combined Fosroc ST05 and Fosroc Protectosil CIT, the latter being an MCI (Migrating Corrosion Inhibitor). Together they provided a technically robust, sustainable repair solution, reducing the need for ongoing maintenance.

Fosroc ST05 is a polymer modified cementitious coating for application to concrete, masonry, brick/blockwork and mild steel. The specialist coating, provided a chloride and carbonation barrier, helping to protect the concrete.

Fosroc Protectosil CIT, is an advanced surface-applied corrosion inhibitor for steel reinforced concrete based on organo-functional silanes. The use of a surface applied corrosion inhibitor is a cost effective method of managing issues caused by reinforcement corrosion. Corrosion inhibitors can reduce the amount of repairs that are undertaken, by managing contaminated, but undamaged concrete.

Fosroc Protectosil CIT is a unique product offering multi-functional steel protection and resistance against ingress. The product is based on silane technology providing very deep concrete penetration, and binding to steel and concrete. This means that the steel is protected by the formation of a bonded chemical barrier on its surface and the concrete is protected by the reduction of moisture uptake and chloride ingress. Overall this extends the life of the structure without the need for complete replacement of the concrete.

Aesthetic Considerations

Whilst the primary focus of the project was for structural performance and longevity, aesthetic considerations were an important aspect of the overall design. Both client and design team were committed to creating a modern, bright, and welcoming learning environment, that would reflect the school's transformation and inspire its users.

Beton Bauen's role was to ensure any visible surfaces of concrete repair were finished to a high aesthetic standard and integrated seamlessly with any new architectural elements. As areas of the buildings had aged and deteriorated differently over time, a key challenge was matching aesthetics across different phases of the project, ensuring continuity of repair finishes. The team implemented a carefully controlled repair/coating process to achieve consistent colour and texture across all exposed surfaces of the refurbished campus.

Health & Safety

Beton Bauen placed Health & Safety at the forefront throughout this project, particularly as works continued throughout the school term/s. Our methods were adapted to ensure the highest safety standards while minimising disruption to staff and pupils.

Dust Management: Traditional mechanical surface preparation was replaced with high-pressure water jetting, significantly reducing airborne dust and protecting both operatives, school staff, and pupils.

Working at Height: Most repairs were to elevated frame areas. Works were carried out from MEWPs with full fall protection, daily equipment inspections, and exclusion zones below. No incidents or near misses occurred.

Workforce Compliance: All operatives completed site-specific inductions, adhered to PPE requirements, and maintained 100% CSCS compliance. Regular toolbox talks reinforced awareness of task-specific risks.

Live School Considerations: Deliveries and noisy works were carefully scheduled to avoid disruption to lessons. Strict segregation of work areas ensured pupils and staff were fully protected at all times.

Concrete Frame: Breakout and repair of the existing frame involved overhead working, plus exposure to vibration and dust. HAVS monitoring, job rotation, and dust suppression were used to control risks effectively.

Health & Safety Outcomes:

- Zero RIDDOR incidents or lost-time accidents
- Minimal disruption to school operations
- Positive feedback from the principal contractor on safety performance.

Environmental & Sustainability

This project was developed with sustainability at its core, focusing on extending the life of an existing structure, as opposed to demolition and rebuilding. By adopting a refurbishment-first approach, the project significantly reduced embodied carbon, with avoidance of new material production and safe disposal of demolition waste.

A key objective was to remain as close to carbon neutral as possible. Once complete Pen Y Dre High School would represent the first major school refurbishment project in operation within Wales to deliver net zero carbon, with a 20% reduction in embodied energy, using innovative retrofitting, renewable energy, and sustainable materials.

Beton Bauen provided a more cost-effective solution where the existing structures did not have to be demolished, leading to less carbon emission and less new material production.

Repairing the concrete frame avoided demolition and rebuild, reducing embodied carbon and prolonging the usable life of the structures. Retaining the existing frame, eliminated the need for new concrete and steel production, both of which have a high carbon footprint.

Issues Encountered

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Project Summary

Pen Y Dre High School stands out as a CRA Award–winning project due to its technical excellence, sustainability-driven approach, and the collaborative effort demonstrated by all stakeholders. Rather than opting for demolition and rebuild, the project showcased how intelligent refurbishment can extend the life of existing structures, dramatically reducing embodied carbon and construction waste. The new design of the three-storey 14,000 sq metre comprehensive will make the school more accessible, removing a lot of steps from the original site and massively improving provisions.

Beton Bauen played a key role in achieving sustainability goals using innovative repair solutions, including the use of advanced Fosroc protection systems and migrating corrosion inhibitors to preserve and strengthen the existing frame. Upfront Embodied Carbon Impact (A1-A5) of the project was calculated as 272 kg CO_2e/m^2, including the required PV array for offsetting electrical consumption. This is significantly below Welsh Government's 2030 target1 of 350kg CO_2e/m^2, which emphasised the importance of refurbishing existing buildings and retaining existing structure.

The project also exemplified best practice in health and safety, with zero incidents reported. Furthermore, all works were completed in an active school environment, yet without disruption to teaching or operations. Beton Bauen's ability to adapt, detailed planning, and commitment to quality, ensured that the project was delivered safely, on time, and to an exceptional standard.

The successful completion of Pen Y Dre High School demonstrates how modern repair techniques can transform legacy structures into high-performing, future-ready buildings. The project embodies Beton Bauen's core value of technical expertise, sustainability, and collaboration - setting a benchmark for refurbishment in the education sector, providing evidence that sustainable construction and refurbishment can go hand-in-hand with technical excellence and social responsibility.

The Pen Y Dre High School Project has gone on to win two prestigious Net Zero Carbon Project Awards, in both Welsh and UK National Construction Excellence Awards. Further recognition for Beton Bauen's involvement has come about as the project has been shortlisted as a finalist for the 2025 CRA Awards in two catergories - the *Sustainability and Social Value Award* and *CRA Small Project of the Year Award*.

"This key milestone at Pen-y-Dre High School marks the culmination of an extraordinary three-year journey. This has been a truly pioneering project - the scale and complexity of delivering such a comprehensive transformation within a live school environment cannot be overstated, and our teams have responded with exceptional skill and dedication throughout.

What makes this project especially significant is the legacy it leaves behind - not only are we creating a world-class educational facility for future generations, but we're also setting a powerful example of how sustainable refurbishment can dramatically reduce carbon impact, preserve valued community assets, and deliver meaningful benefits for the local economy."

Robert Williams, Area Director from Morgan Sindall Construction in Wales

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"I would like to take this opportunity to thank all the team for carrying out a top quality job on Pen-Y-Dre... a very professional company to work with.

Morgan Sindall really appreciate the job you have done and the timescales you have done it in. You made my job easy.

Alan Muprhy, Senior Site Manager (Pen Y Dre), from Morgan Sindall Construction