metal matters
issue4: summer2008

contents

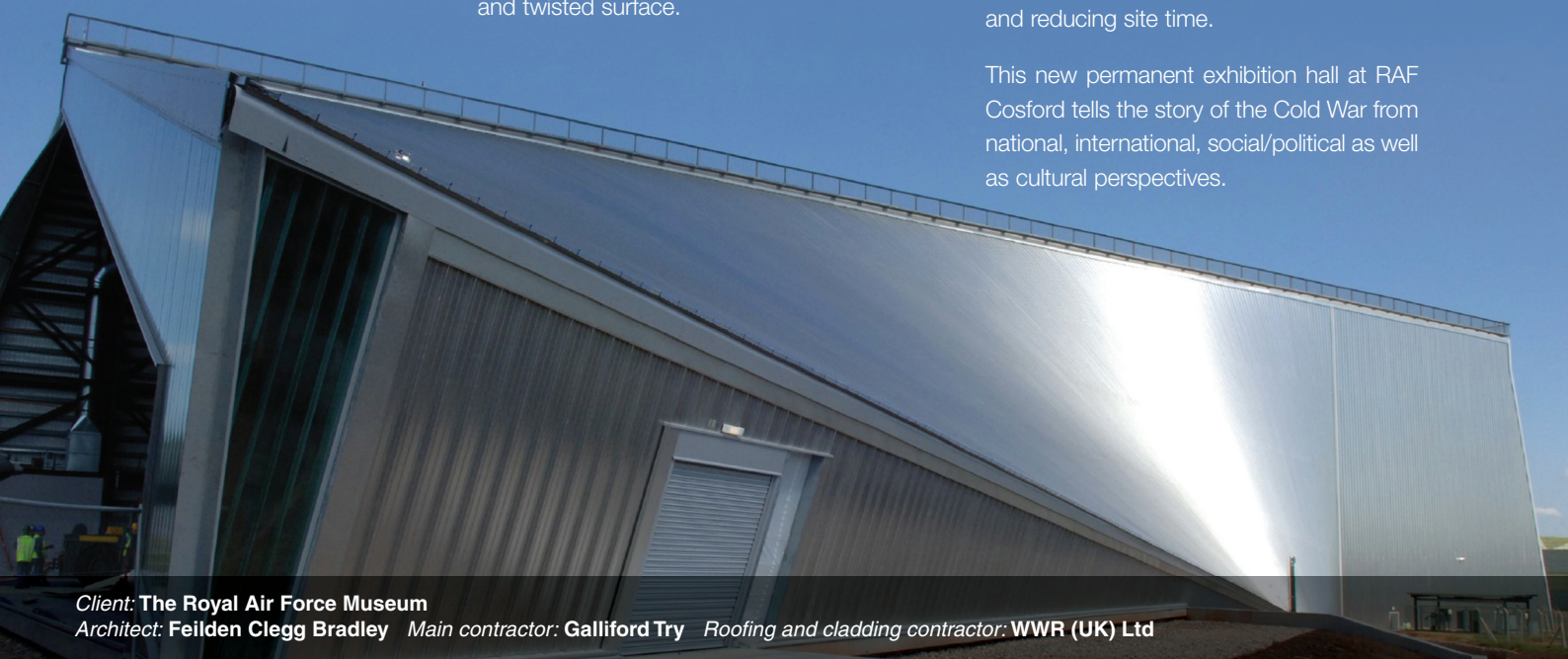
a new twist on roof design

Many new building designs incorporate some form of curved roof; yet the roof for the new National Cold War Exhibition at the Royal Air Force Museum in Cosford must be one of today's most outstanding and innovative concepts. This striking design is based on enormous twisted roof planes of shining metal in Kalzip aluminium standing seam sheeting over steel decking, fastened with SFS intec's austenitic stainless steel fasteners.

The design of the museum envelope comprises two opposing triangular structures, which seemingly rise from below ground level at opposing corners to meet along a ridge. The Kalzip roof system had to follow the ever-changing pitch of the structural steel members which swing out from the vertical spine wall to 30 degree angles so creating a continuously curved and twisted surface.

A nine metre long full size mock-up of one bay was created at an early design stage to allow experimentation to determine the best method of fixing the structure. The continuously varying angles were accommodated by using saddles attached to the steel structural members, and decking sheets fixed to the saddles with SFS SDK3 fasteners. Because of the dynamic loading on the whole structure it was critical that the performance of these small components in achieving a secure installation could be guaranteed. Over this was laid a vapour control layer, and then Kalzip stainless steel halters fastened with SFS SDK3 fasteners designed to eliminate over-tightening of the aluminium sheeting. Using self-drilling SFS fasteners meant that the decking and sheeting were each fixed in a one shot operation, to the correct depth and torque requirements; thus both simplifying the task and reducing site time.

This new permanent exhibition hall at RAF Cosford tells the story of the Cold War from national, international, social/political as well as cultural perspectives.



Client: **The Royal Air Force Museum**
Architect: **Feilden Clegg Bradley** *Main contractor:* **Galliford Try** *Roofing and cladding contractor:* **WWR (UK) Ltd**

lessons in sustainability

Two UK schools are proving a blueprint for sustainability by saving energy and even selling it back to their providers … with a little help from MCRMA member, Kalzip.

Sandbrook Community Primary School in Rochdale and Levenshulme High School in Manchester are models of modern academic thinking, where a school not only has to perform for the benefit of its students but also for the community and the environment.

Sandbrook is a £6 million replacement for two primary schools; as the first of the new schools to be constructed in Rochdale borough, and to comply with the LEA's sustainable policy, full advantage had to be made of renewable resources, sustainable materials and low energy features to help reduce its carbon footprint.

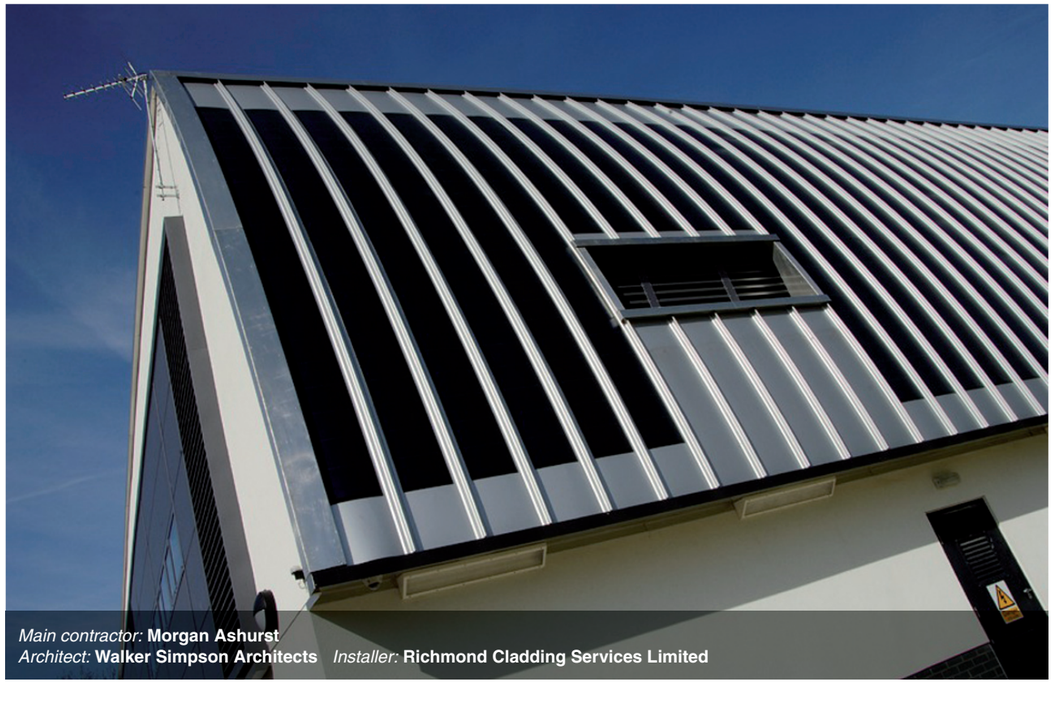
Architects at the Impact Partnership designed a single storey, steel framed building to take full advantage of natural light and ventilation, with a south facing front façade providing solar shading and harnessing power from the sun to provide heating, lighting and hot water.

The 200 square metres assembly hall roof captures solar energy to provide electricity generated via an 8.7 kW Kalzip AluPlusSolar integrated photovoltaic roof system as well as the heating of hot water through passive solar panels.

The makeup of the roof material – factory laminated photovoltaic panels - also provides the necessary insulation and acoustic values while allowing the roof line to have a slight barrel form to enhance aesthetics. Some 3,000 square metres Kalzip standing seam in sustainable aluminium has also been used over many other roof elements.

A display panel in the school's entrance foyer, indicating the amount of electricity currently being generated, cumulative watts to date and CO_2 savings, helps incorporate the school's sustainability features into the science curriculum as part of learning about energy.

Main contractor: **Birse Build Limited**
Architect: **Impact Partnership** *Installer:* **Richmond Cladding Services Limited**



Main contractor: **Morgan Ashurst**
Architect: **Walker Simpson Architects** *Installer:* **Richmond Cladding Services Limited**

Students at Levenshulme High School share their £2.2 million leisure centre with the local community and the 1,500 square metres, steel framed 'Energy Box' as it is more commonly known, sits on a former tennis court at the top of the playing fields and provides a striking contrast to the traditional red brick façades of the existing school buildings.

The distinctive 6.7 kW Kalzip AluPlusSolar system installed on the southern elevation provides around 4,500 kWh of 'clean' electricity per year - a carbon saving equivalent to more than 2.5 tonnes of CO_2.

The renewable energy harnessed from the sun is first used inside the new leisure centre to power lighting and electrical equipment, then any surplus is fed back into the National Grid and the centre's utility bill is credited. A meter recording the amount of energy being generated by the cells is located in the reception for the public to see.

Sustainable facts

- The energy required for heating, lighting and powering equipment in an ordinary school classroom releases about 4,000 kg of CO_2 every year – enough to fill four hot air balloons 10 metres in diameter.
- UK schools spend about £450 million on energy every year – three times as much as they do on books and about 3.5% of their budgets.
- Some schools spend four times more per pupil than similar schools in the same region. The difference is often to do with how effectively schools manage their energy use.
- Surveys show that through simple low cost and no cost measures, schools can reduce their fuel bills by up to 10% while also reducing their CO_2 emissions.

it's all in the detail

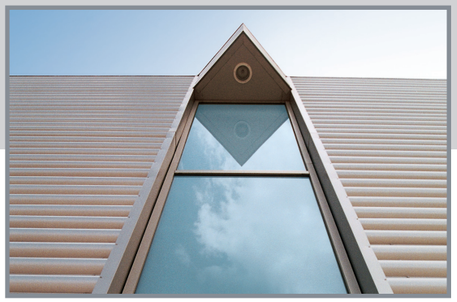
Good detailing on a project can considerably enhance the appearance of a finished project. Whilst much attention is paid to the design of the basic metal roof and wall construction, vital junctions, fixings and the appearance of fabrications can be overlooked. Yet, in fact, on many buildings it is the fabrications that people notice first.

As these photographs illustrate, correctly specified architectural fabrications provide striking visual effects on a building.

Wings, fins and aerofoils

These describe variations of bullnose fabrications which instead of containing simple circular radii, have variations for different visual effects.

Window surrounds



Window surrounds manage the interface between cladding and window frames. They can be used for purely functional purposes but can also provide a striking visual feature.

Curved fabrications

These are used to provide the end detail to a curved roof. The range of applications is extremely wide however, the curved fabrication invariably makes a strong aesthetic statement.

Fascia and soffit systems

Fascias are used on vertical faces and soffits for the underside of horizontal faces. These items are often treated as cladding, however they are mentioned here because they are often used to create architectural features to complement or contrast with the main cladding system.

Bull noses

In this example, circular curved fabrications are used to create a rounded feature on a building; they are often used on the eaves.

Architect & Engineer: **Arup Associates**
Main contractor: **Larsen & Toubro Ltd** *Roofing contractor:* **Moorjani Caribbean (Barbados) Limited**

a canopy for all seasons

Some 2,100 square metres of profiled polycarbonate rooflights were supplied for this impressive canopy roof of the Worrell, Weekes and Walcott Stand at the Kensington Oval cricket ground in Barbados. The rooflights are designed to provide carefully controlled daylighting conditions for spectators and were specified in translucent opal to create a gently diffused daylighting environment. The 1.5mm thick sheets were manufactured in a 60mm deep profile for extra strength which allows for wider spans between purlins and less steelwork being required.

As well as creating an iconic structure for the Barbadian cricket ground, the roof of the stand was designed to create a safe, functional environment with unobstructed viewing. Completely covering the stand's seating, the complex canopy protects spectators from the Caribbean's extreme weather conditions, namely strong sun and heavy rain and is able to withstand the viciously high winds experienced during the hurricane season.

The Marlon CS Longlife polycarbonate rooflights were manufactured by Brett Martin and they have a co-extruded UV-protection layer which minimises the harmful effects of the sun and increases longevity by protecting the sheets from discoloration and degradation. Available in site assembled or factory assembled form and manufactured to match a wide range of profiles, Marlon CS Longlife sheets can be supplied in clear, embossed and various tints for controlled levels of daylight transmission.

gutter free design for scottish sawmill

Thanks to the clever roof design of the Kenmuir Sawmill there is no longer a problem with blocked gutters. Sawmills traditionally generate a great deal of fine sawdust which tend to clog up guttering systems. However, this new sawmill on the outskirts of Dalbeattie in south west Scotland has been cleverly designed without using gutters. Instead, the rainwater runs off the roof, round the curved eaves and down into a special pebble-covered soakaway system to an underground drainage system before being filtered though on-site reed beds.

Steadmans manufactured and supplied all the building envelope materials for Howie Forest Product's impressive new £15 million sawmill.

Supplied in AS35/1000 profile, the Plastisol colour-coated sheets included over 6,000 square metres of factory made LPCB Approved PIR core insulated panels and nearly 4,000 square metres of single and twin skin cladding sheets, complete with spacers and mineral wool insulation for site assembly.

The roofing sheets are in Goosewing Grey whilst the external vertical cladding sheets and wall panels are in a contrasting Olive Green specified to blend with the surrounding countryside. Steadmans also supplied 600 crimped curved eaves sections (each 2 metres long) plus 1,300 linear metres of bespoke flashings such as barge boards, soffits, gutters, corners, ridges, window sills and jambs all matched to the roofing or vertical cladding colours.

manchester feels the chill

The eye-catching design of Manchester's latest landmark attraction – Chill Factor[e] – features over 5,000 square metres of two different types of Kalzip aluminium cladding: Kalzip perforated facades and Kalbau profiled sheets.

Chill Factor[e] is the UK's newest and longest indoor ski slope - at 180 metres - which towers 100 feet above the city's M60 orbital motorway next to the Manchester Ship Canal.

Kalzip aluminium perforated facades wrap a striking semi-translucent veil around the emergency staircase below the main 15° slope, transforming a functional component into an architectural asset. Spectacular even in daylight, the introduction of lighting behind the perforated facade in the evening adds a totally new dimension to this imposing yet highly distinctive building envelope.

The 570 square metres of Kalzip perforated facades encasing the staircase include sheets that have been crimp curved to a tight radius to soften the corners of the structure. The Kalzip perforated facades provide a lightweight, low maintenance and practical solution that allows fresh air and natural light in to create a comfortable interior whilst protecting externally from the elements and helping to reduce wind load.

An additional 4,500 square metres of Kalbau stucco-embossed profiled sheets clad the upper elevations of the project which also contains a beginners' slope, a 60 metre luge and an 'Alpine Village' – complete with 2,000 tonnes of snow!

Main contractor: **Sir Robert McAlpine**
Architect: **Faulknerbrowns Architects** *Roofing and cladding contractor:* **Lakesmere Limited**

fire panels add value

Metal cladding panels offer many benefits, not least in terms of fire resistance. For the re-development of Wembley Retail Park, situated directly opposite the national stadium, Promfire panels were specified by architects Corstorphine & Wright. The architects chose Arcelor's Promfire panels to transform the appearance of the existing buildings and to enhance their fire performance in line with the latest Building Regulations.

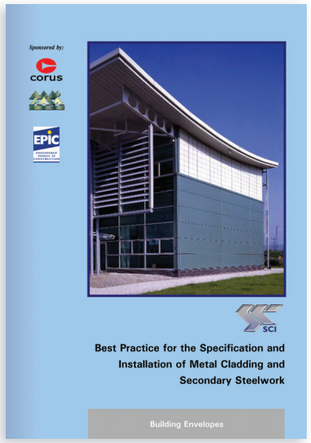
Promfire panels are manufactured from Euroclass A1 rock mineral wool insulation sandwiched between two coated steel sheets, the panels are rated Class 1 surface spread of flame to BS476: Part 7:1987 and Building Regulations Class 0. Promfire has been awarded certification to LPS1208 by the Loss Prevention Certification Bureau. This certification provides additional reassurance to product specifiers in search of a cladding solution with a guaranteed two-hour fire resistance.

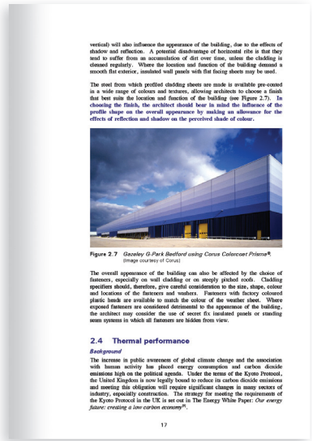
The panels chosen for Wembley Retail Park are 1,000mm-wide, 120mm-thick in smooth flat external white Hairexcel Granite. The nine metre long panels were secret-fixed to the existing cladding rails vertically, rather than the usual horizontally. The buildings were stripped back to their steel frames, leaving the original cladding rails in place. The 11 metre high facades were then installed with brickwork up to two metres topped by the Promfire panels running vertically to eaves level. This cladding configuration was adopted for both practical and aesthetic reasons; this method of installation reduced manual handling and reduced the number of 'top-hat' joints required and it also gave a better finish, looking clean and pleasing to the eye.

Situated directly opposite the new national stadium, the retail park has been extensively re-modelled as part of a £10million wider plan to regenerate this part of north London. The project involved the comprehensive reconstruction of the existing buildings on the site and a complete re-imaging of the whole development.

Client: **The Junction Limited Partnership** *Architect:* **Corstorphine & Wright**
Main contractor: **McLaren Construction** *Roofing and cladding contractor:* **FK Roofing Services Limited**

understanding the total building envelope





This guide, aimed at specifiers, designers and site erectors, is intended to achieve the widest possible dissemination across the many disciplines and trades involved in the production of the building envelope. It is hoped that this approach will promote a greater understanding of the issues faced by the various members of the construction team and lead to greater co-operation on site and in the design office.

This publication gives guidance on the specification and installation of the common types of profiled metal cladding system currently in use in the United Kingdom. These systems include insulated panels and built-up systems for roofs and walls. The publication also gives guidance on the specification and installation of the supporting purlins and side-rails, and considers how this secondary steelwork interacts with the cladding to produce a safe, functional and efficient structure.

Best practice for the specification of cladding and secondary steelwork can be downloaded from the floor/deck section of the MCRMA web site at **www.mcrma.co.uk**

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update

A calculated guide

Conventions for calculating U values, f-values and ψ-values for metal cladding systems using two-and three-dimensional thermal calculations has been produced as a direct result of the necessity to save energy use in buildings.

This energy saving requirement has resulted in a need for more sophisticated methods for calculating heat loss and surface temperatures and this MCRMA guide gives the information needed to carry out these calculations. It is designed so that users of different packages can achieve consistent results when starting from the same construction data. The guide illustrates the procedures to be used in calculating ψ and f-values and typical values for a range of both twin skin and composite constructions as recommended on the MCRMA web site where the guide can also be downloaded.

Web wise

Keep in touch with the latest developments in metal cladding by visiting the MCRMA web site where you will find a comprehensive range of 3D interactive constructional details. Details are available for both composite panels and built-up systems and they can be downloaded in both CAD and pdf file formats.

The constructional details are supported by the full range of MCRMA technical design guides, together with supplementary articles and bulletins on a variety of topics and issues all of which are available for download – so whatever your question, you're sure to find the answer in our publications.

In addition, the web site contains profiles of all MCRMA member companies with direct links to their web sites.

THE METAL CLADDING & ROOFING MANUFACTURERS ASSOCIATION LIMITED

18 Mere Farm Road · Prenton · Wirral · Cheshire CH43 9TT

Telephone: 0151 652 3846 · Facsimile: 0151 653 4080
mcrma@compuserve.com · www.mcrma.co.uk