KEMPER SYSTEM

# THE DUCK

Liquid Waterproofing and Roofing Systems UK Issue 5

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Liverpool (UK)

## KEMPEROL® Protects Royal Liver Building

**Part of Liverpool's UNESCO designated World Heritage Maritime Mercantile City, the Grade I listed Royal Liver Building is one of the city's 'Three Graces' and an iconic waterfront landmark.**

The building's imposing façades are crowned by a cupola in each corner, each forming the roof of a feature boardroom office below. The huge clock towers either side of the building mirror this pattern, with a 'mini' cupola on each of their four corners. All 12 cupolas direct the eye upwards to the summit of the building where a verdigris Liver Bird perches eternally on each of the final, central cupolas.

With Cunard, one of Liverpool's greatest companies, celebrating its 175th anniversary this year, it was time to refurbish the distinctive cupolas of one of its most famous buildings in the world in time for a celebratory flotilla. Kemper System's 1K-PUR cold liquid-applied waterproofing system was selected to complete the challenging scheme.

### Limited Access

The cupolas are of concrete construction and have been protected by various waterproofing systems over the years but water ingress was becoming an issue and in some areas the concrete was failing and had to be repaired to return the surface to its original domed shape.

Roofing contractor, K Pendlebury & Sons Ltd were appointed by main contractor Quadriga Ltd, specialist restoration contractors, to carry out the challenging task of working at height on the roofs in an exposed waterfront location.

Comments Neilan Symondson from Pendlebury: "Scaffolding was erected on a small area of the roof at a time and an upgrade to localised areas of the roof beneath each cupola, along with a larger stretch on the Strand elevation, was incorporated into the scheme to capitalise on the accessibility we had to those locations while the scaffolding was in place.

"For these areas, we installed an inverted insulated roof build up, using Kemper System's V210 cold applied waterproofing system to waterproof the substrate, followed by insulation and then paving.

"The Kemperol 1K-PUR we used for the cupolas works in the same way, with a combination of liquid resin and reinforcement fleece, but it is much more viscous that the Kemperol V210, making it more suitable for the cupolas' vertical surfaces."

### Specialist Approach

Pendlebury selected the Kemperol 1K-PUR systems following trials carried out prior to commencing the project to ascertain the best approach to delivering the project with the level of finish required by the building's management company, CBRE, and English Heritage while managing the time constraints of the project.

The challenging weather conditions of the building's waterfront location and the need to identify a system that was suitable for the varying surfaces on and around the cupolas also influenced the specification. The method of fleece application and ease of use of the Kemperol system was ideally suited to meeting these criteria on a scheme that involved working up to 14 storeys high.

The installation team began the restoration of each cupola by repairing each concrete structure using Kemper System's primer mixed with quartz sand to make a mortar that could be used to build up the eroded areas.

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**in this issue:**



ecobuild
design | construct | perform

New York (USA)

## KEMPER SYSTEM Answers Towering Challenge In New York

**After nearly a decade of construction, the $3.9 billion One World Trade Center (1 WTC) opened its doors in 2014. The challenges involved with roofing/ waterproofing a high-rise are magnified with height, and at an official height of 1,776 feet, 1 WTC (formerly Freedom Tower) offers some valuable lessons.**

With most new construction the building envelope, including the roof, is completed first. In this case, the main roof was one of the last structural items to be completed. (See "From the ground up.") Steve Guarino, general superintendent for waterproofing contractor, The Jobin Organization, Inc. (Farmingdale, NY), shared some experiences working on the iconic structure while, as he puts it, "A billion eyes were watching."

The Jobin Organization, originally established as Jobin Waterproofing, Inc. in 1968, is a powerhouse in the New York construction market in areas such as roofing, waterproofing, exterior restoration and construction management. The company is a KEMPER SYSTEM certified applicator and has completed scores of projects with the cold liquid-applied reinforced membrane systems.

### Flexible solution

The main roof is about 19,000 square feet. "One of the primary reasons we won the bid with the KEMPEROL® system was all the exposed steel and many penetrations.

There were maybe 300 or 400 penetrations on the main roof. That included the structure for the three cooling towers above us, the spire, as well as the everyday vent pipes, drains, conduits, plumbing and other piping.

There were no areas bigger than about 10 ft. x 10 ft. without some penetration." Steve Guarino, general superintendent, The Jobin Organization, Inc.

The Jobin Organization ran a 15–20 person crew on the job. "There were so many configurations that needed waterproofing – curbs, drains, HVAC, beams, nuts and bolts, and around the base of the spire. There was so much steel, sometimes we were bumping heads with our hardhats."

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## Royal Liver Building

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The large cupolas have a two metre high vertical surface before the structure starts to curve and gradually become flat over the top. Pendlebury used a combination of Kemper System's EP5 primer and quartz sand to create a key on the substrate before applying the liquid Kemperol 1K-PUR resin with brushes and rollers. Kemper System's 120g reinforcement fleece, cut to size and shape on site, was then laid onto the wet resin. Finally, further resin was immediately applied over the top to allow complete saturation of the reinforcement fleece in a single wet-on-wet process to provide a totally seamless, monolithic membrane.

For the larger cupolas, the scheme also involved scroll features and termination details and the installation team also painstaking applied the system around the solid granite mini scroll features that surround each of the smaller cupolas.

CBRE's Simon Hepple adds: "In terms of surface area, the Royal Liver Building scheme was not large but was extremely challenging and required both a specialist approach and careful product selection. "Kemper System's Kemperol 1K-PUR was ideal for this unusual project."

### At a Glance:

**Project:** Royal Liver Building
12 x Cupolas + Flat Roof
**Materials:** KEMPEROL® 1K-PUR
(Cupolas) KEMPEROL® V210
(flat area)
**Client:** CBRE / English Heritage
**Contractor:** K Pendlebury

**Bristol (UK)**

# Clifton Suspension Bridge Restoration

**KEMPER SYSTEM's KEMPEROL® cold liquid applied waterproofing membranes have played a vital role in protecting the iconic towers of the Grade I listed Clifton Suspension Bridge in Bristol as part of a refurbishment project.**

The scheme involved repointing and restoration of the sandstone structures, along with cathodic protection for the Bath Stone pillars and painting of the bridge chains.

Specialist contractor, Rateavon Ltd, was appointed to waterproof the towers' platforms and refurbish the gutters for each tower, selecting KEMPEROL® 2K-PUR and V210 to carry out the work.

Rateavon began by removing the existing bitumen coating from the towers' cast iron gutters, using Kemper System's solvent-free KEMPEROL® 2K-PUR to replace it. There are limited falls to the gutters and they are prone to standing water so the KEMPEROL® system was chosen for its durability in these conditions and the longevity it offers with a BBA-accredited 25 year service life.

The contractor also selected KEMPEROL® 2K-PUR for its compatibility with the zinc primer used to prepare the cast iron substrate and ease of application to the vertical surfaces.

For the tower platforms, Rateavon selected **KEMPER SYSTEM**'s KEMPEROL® V210, carrying out the refurbishment as an overlay of the existing mastic asphalt substrate. Used for maintenance access, the platforms sit above the towers' electrical infrastructure, so ensuring a durable and leak-free surface is critical.

Rateavon raised the cable trays on each section of the platforms to enable the application of the KEMPEROL® V210 resin. The resin is cold applied, without the fire risk of hot works, in a single wet-on-wet process that ensures complete saturation of the reinforcement fleece; and cures to form a flexible monolithic membrane that is UV stable and bonds directly to the substrate.

Comments Tom Smidek from Rateavon: "This project combined the challenges of a listed structure, an exposed installation and working at height; and **KEMPER SYSTEM** was able to provide a solution to meet all these requirements.

"The new KEMPEROL® surfaces will provide a long-term waterproofing solution with no risk of uplift and a visual appearance that matches the structures' original design."

### About the Bridge:

The Clifton Suspension Bridge, spanning the picturesque Avon Gorge, is the symbol of the city of Bristol. For over 150 years this Grade I listed structure has attracted visitors from all over the world.

The bridge was designed by Isambard Kingdom Brunel, John Hawkshaw and William Henry Barlow and joins Bristol and North Somerset and is owned and operated by Clifton Suspension Bridge Trust. It first opened to the public on 8th December 1864.

### At a Glance:

**Project:** Tower Platform Refurb
**Materials:** KEMPEROL® 2K-PUR
KEMPEROL® V210
**Contractor:** Rateavon Ltd
**Client:** Clifton Suspension
Bridge Trust

## One World Trade Center New York

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For the main roof, insulation and preprimed cement board are first installed and adhered with beads of foam adhesive. The cement board is staggered in a joint pattern over the insulation and sealed at the seams with beads of NP1 polyurethane sealant. The seams of the cement board are also sealed with 4-inch continuous stripping plies of KEMPEROL®.

The KEMPEROL® resin membrane was specified for the main roof and louvre areas on lower floors that are enclosed on three sides. The liquid-applied resin membrane systems are reinforced with KEMPEROL® 165 fleece and can form around any shape. Penetrations, drains, curbs and perimeters are also sealed with the system and then overlapped by the membrane in the larger expanse to provide durable waterproofing protection.

The work on the main roof membrane began in mid-June 2014 and was completed in mid-October.

At nearly one third of a mile high, the roof weather could be a surprise. "A lot of times when it was a cloudy day on the ground, it could be foggy. Or if it was foggy on the ground, it could be raining when we got to the top. But the heat was not too bad, and there was no sweltering hot weather."

### Getting there

One obvious challenge in waterproofing a high-rise is simply getting materials to the roof. "By the time we got to the roof, the outside hoist had been taken down, which might have saved a little time," Guarino said. "But with the KEMPEROL® system, there's no heavy equipment, so we were OK. The heaviest tool we used was a hand mixer for the resin."

The trek to the 105th floor could take up to two hours because of all the trades on the site. The Jobin Organization crew would bring materials up through the building on the elevator cars, many times on Saturdays and Sundays to have all the required materials ready to go.

"We would take materials from the loading dock to the main floor elevators, up to [floor] 102, and then transfer to 105. The insulation and cement board were loaded on 4 ft. x 4 ft. skids and some stored on 104 during the job." Also easy to transport, the KEMPEROL® resin comes in 2.5 and 5 gallon buckets, and the fleece reinforcement on rolls up to 41 inches wide.

### Job-site coordination

KEMPER SYSTEM specialists were onsite weekly to inspect and advise on the job. In addition, a building envelope consultant photographed progress daily to provide feedback to the A/E/C management team. "Our goal every day was to make it watertight."

There were conversations with the management consultants every morning to make sure everything was running smoothly, Guarino said. But there was no cell phone service available on the roof during construction because of the thickness of the slab, so more urgent messages were often relayed a couple of floors down the old-fashioned way – by walkie-talkie.

"The biggest challenge was coordination on the job site. There were a lot of trades there at the same time, so we had to constantly clear people out of the way. The deck needed to be prepared ahead of us. The concrete was too rough in some areas. Overpours needed grinding and debris removed, or grease needed to be cleaned off.

There was also a crew working above us on the cooling towers, so we needed to inspect if any areas had become wet before the membrane was cured. When things happened, the KEMPER SYSTEM made it possible to redo or repair small areas," he said.

### From the ground up

The waterproofing story at 1 WTC really began at the ground floor, or actually more than 30 feet below it. The Jobin Organization originally submitted bids on the 1 WTC project with KEMPER SYSTEM America circa 2004. Following the resolution of project design and financing issues, construction finally got underway in the spring of 2006.

Ironworkers erected the steel at a fairly steady pace, though heavy winter storms dampened the pace toward the end.

Every tenth floor required temporary waterproofing with EPDM sheet and caulking until a new slab, ten stories above, could be poured. Skyscraper cranes would lift bundles of steel and pallets of materials from the ground up or from one completed section to the next. Month after month, the arm would swing from the outside frame of the building, and deposit bundles stories above.

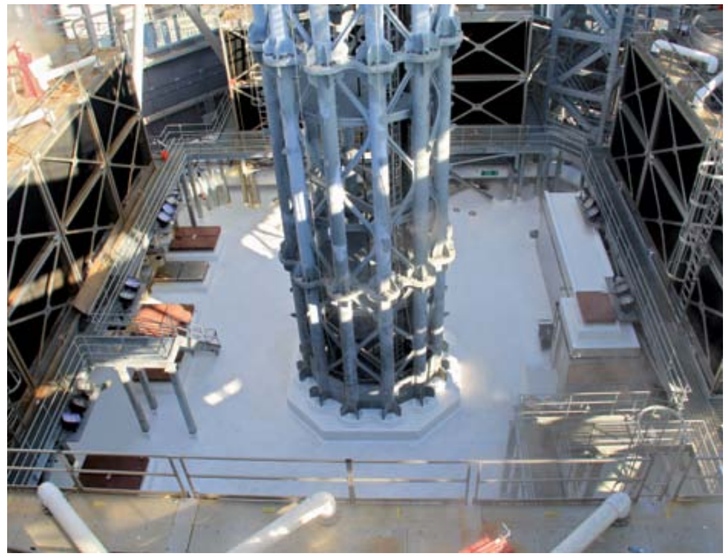
The outside frame of the Tower is very slightly tapered with a notch in at several floors as the shaft rises skyward. The Jobin Organization crew waterproofed the roof perimeter and exposed steel at these levels as well as the top three floors of the main roof – 103 to 105 – which are exposed to the elements.

### Sustainability

KEMPEROL® 2K-PUR resin system is 80 percent from renewable materials, which fit with the overall design goals for the project. Nearly 75 percent of 1 WTC is made from recycled or ecofriendly building materials, and the building's green design earned LEED Gold Certification.

### At a Glance:

**Project:** 1WTC - 1,800m²
**Materials:** KEMPEROL® 2K-PUR
**Client:** Port Authority of NY/NJ
**Architects:** David Childs
Daniel Libeskind (2002)
**Contractor:** Jobin Organization
**Main Contractor:** Tishman Construction



**Shaoshan (China)**

# Mao Zedong Memorial Museum

**Mao Zedong (1893-1976), chairman of the Communist Party of China and the father of Maoism, was without doubt one of the most important and best known politicians of the last century.**

Time Magazine lists him in its compilation of the 20th century's 100 most influential people. Even long after his death, the first president of the People's Republic of China is still respected and revered. His birthplace, Shaoshan, a village in the central Chinese province of Hunan, has become a place of pilgrimage for Chinese and foreign tourists alike. To mark the 115th birthday of the revolutionary leader, the Mao Zedong Memorial Museum opened in Shaoshan in 2008. On display across 19,000m² of floor space are 1,008 relics which Mao once used. Today, the museum is a highlight for every visitor to Shaoshan.

The architectural ensemble is a collection of several interconnected buildings of varying height. The museum's intricate design led to the roof leaking after just a few years. The existing expansion joints were therefore sealed with KEMPEROL® V210 during a refurbishment project. The permanently elastic, liquid-applied waterproofing is able to accommodate and compensate structural movements.

**Horsham (UK)**

# Roof Refurbishment Success At Royal And Sun Alliance

**KEMPER SYSTEM's** KEMPEROL® **V210 has been used yet again to repair the roof of Royal & Sun Alliance's headquarters in Horsham following the success of a project to refurbish the building's balconies last year.**

Within the central part of the building there were three individual roof areas, covering a radius of 400m². These areas were overlaid to address leaks in the existing single ply membrane. Roofing contractor, All Angles Roofing, carried out the six-week project on behalf of principal contractor, RCL Services, including repairs to the existing insulation. The scheme follows on from three previous projects, spaced over two years, to repair three balcony areas, covering a total of 710m², on the same building where water ingress was putting refurbished areas below at risk. Several attempts to repair the roof with other systems had failed to address the issue, but Royal & Sun Alliance has no further leaks thanks to the KEMPEROL® V210 overlay.

All Angles Roofing having cleaned and prepared the existing roof surface applied KEMPER SYSTEM's D primer. The installation team then laid the KEMPEROL® V210 resin in a single wet-on-wet process that ensures complete saturation of the reinforcement fleece. Once cured the resin forms a seamless, elastomeric waterproof membrane that bonds directly to the substrate.

Comments Mike Baulu from All Angles Roofing, "We have carried out numerous programmes on this building over the past few years and the balcony areas had proved a particular challenge.

"A year after being refurbished using KEMPEROL® V210, the balconies are performing well with no signs of any leakage, so R&SA had no hesitation in using the same system for this new roof area."

## At a Glance:

**Project:** 1,110m² Refurbishment
**Materials:** KEMPEROL® V210
**Contractor:** All Angles Roofing
**Client:** Royal & Sun Alliance




**Blackpool Pleasure Beach (UK)**

# Just The Ticket To Ride

**When a site is open seven days a week and welcomes thousands of visitors each day to enjoy its 41 rides, carrying out roof refurbishment schemes can be a challenging business.**

For the estates team at Blackpool Pleasure Beach, however, maintaining the 42-acre attraction's enduring popularity relies on high standards of maintenance across all the structures on the site, including rides, amusements and food and drink outlets.
Within that ongoing maintenance schedule is the need to ensure that all roofs are in an excellent state of repair and this has led to two recent roof overlay schemes at the 'Valhalla' and 'Alice in Wonderland' rides. In an environment where visitors travel from miles around, carrying out the work with as little disruption as possible and without business interruption was vital, leading to specification of KEMPEROL® V210 cold-applied liquid waterproofing membrane, which requires no hot works and has a BBA-accredited service life of 25-years.

## Valhalla

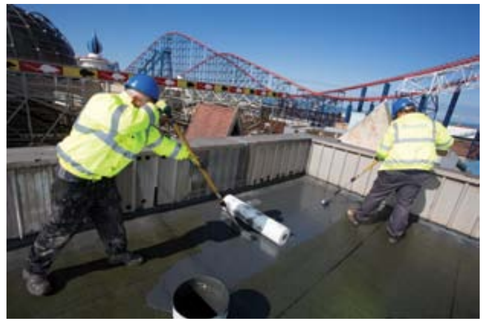
The first of the two roofing schemes to be delivered by roofing contractor, Castle Roofing, was 'Valhalla', a Viking-themed indoor water ride. The ride is one of the most popular attractions at Blackpool Pleasure Beach, taking visitors on a journey through Norse mythology.

While few visitors leave the ride without a soaking, they queue under a roofed area in front of the ride located next to an artificial rock face featuring a 'waterfall' dispensing 12,000 gallons of water per minute. The constant water falling onto the queuing area roof is far in excess of what any roof would normally have to deal with, which had led to failure of the existing waterproofing membrane, causing it to leak.

The roof needed a robust waterproofing membrane with no vulnerable seams and no risk of water penetration and the KEMPEROL® V210 system was ideal for such a demanding installation because it bonds to the substrate to form a seamless, monolithic membrane that is completely impervious to water.

Before work began, the flow of water was switched off to create a dry working area. Castle Roofing installed the KEMPEROL® V210 as an overlay system, which reduced the programme and minimised disruption by avoiding the need for any strip out.

The Castle Roofing team first cleaned the existing substrate and then prepared it using KEMPER SYSTEM's D primer. The KEMPEROL® V210 resin was then cold applied with rollers in a single wet-on-wet process, with resin applied to the roof, reinforcement fleece laid into the wet resin and more resin applied immediately on top to ensure complete saturation of the fleece, removing any creases or air bubbles as the application progressed. The system was then allowed to cure, creating a seamless waterproof membrane.



## Alice in Wonderland

A popular family attraction, dating back to the 1950s, the 'Alice in Wonderland' ride was suffering from water ingress in some areas where the surface of its existing felt roof had split.

The KEMPEROL® V210 installation for this roof was also carried out as an overlay project to minimise disruption.

Castle Roofing cut out areas of the felt roof surface that had de-bonded from the substrate, filling these sections with a repair mortar made from KEMPER SYSTEM's D Primer and KEMPERDUR® KR Quartz. These areas were allowed to cure, creating a continuous surface onto which the KEMPEROL® V210 system could be installed.

The roofing system was then installed in the same way, with resin, reinforcement fleece and more resin applied in a single wet-on-wet process and allowed to cure. The system was ideal for the details and upstands on the roof as it can be applied to match the exact contours of the substrate and has excellent adhesion, even to vertical surfaces.

Throughout both projects, Castle Roofing worked around Blackpool Pleasure Beach's opening hours to minimise disruption, because there is no such thing as a quiet time of year at Blackpool Pleasure Beach.

The KEMPEROL® V210 enabled the contractor to work on small sections at a time and manage the programme around the Pleasure Beach's operational demands, while providing a robust, durable and flexible waterproofing solution.

## At a Glance:

**Project:** Roof Refurbishment
**Materials:** KEMPEROL® V210
**Contractor:** Castle Roofing
**Client:** Blackpool Pleasure Beach



Saltdean **(UK)**

# Repairs, Refurbishment And Water Ingress By The Sea


**The Grand Ocean Hotel in Saltdean, near Brighton, epitomises a bygone era of glamourous seaside elegance. First opened in 1938, the Grade II listed building's crescent-shaped white façade makes it a classic of Art Deco architectural design.**

Once a popular honeymoon destination owned by Billy Butlin it is now the central building from which a development of luxury apartments takes its name. The scheme has seen the refurbishment of the original structure and construction of four new build blocks designed in keeping with the former hotel.

## Integrity Issues

Problems with the integrity of the waterproofing system that was originally specified for the project became apparent even before the scheme was completed, leading to a change of both roofing contractor and, eventually, roofing system.

Both the existing hotel building and the new builds have flat roofs and a cold liquid-applied waterproofing membrane.

## Inverted Refurbishment

The originally-specified membrane had been installed beneath the insulation as an inverted roof build up for the new apartment blocks. Cawston Roofing removed the paving slabs and green roof medium along with the insulation and, where possible, this was stored for re-use.

The company then prepared and cleaned the roof surface and, in the areas around the upstands where the failed membrane had not bonded, the team pulled off the damaged membrane. The existing insulation, slabs and green roof medium were then reinstated to complete the roof.

## Hotel Roof

The damage caused by the failed waterproofing membrane on the roof and balconies of the former hotel building was even more significant because the original roof build-up was not inverted.

The balconies were tackled first, with strip out of the entire roof build-up. Here, not only had the originally-specified membrane failed, but the insulation below it had begun to rot too.

Having completed the strip out, Cawston Roofing allowed the concrete substrate to dry on each balcony and the decision was taken to reinstate the build-up for each balcony as an inverted warm roof.

New insulation had to be cut to size and shape and this was done while the KEMPEROL® V210 membrane was being installed so that the balconies could be completed as quickly as possible.

The team then moved onto the 8,500m² former hotel roof, which comprises five 'fingers' with a central core. Water ingress around the roof outlets meant that the recently installed warm roof insulation was already sodden and the roof had to be stripped back to the vapour barrier.

To aid water run-off in the future, KEMPER SYSTEM designed a tapered KEMPERTHERM® insulation scheme, introducing a slight pitch to each section of roof. Cawston Roofing pre-primed each piece of board in an on-site workshop during the winter months to aid faster installation once the weather improved.

When weather conditions did improve, the KEMPERTHERM® sections were fixed to the substrate and joint sealed before application of the KEMPEROL® V210 membrane began.

## Holiday Heritage

Thanks to the replacement of the originally-specified waterproofing system with KEMPEROL® V210, the building not only provides a stylish address on the coast that is warm and dry for residents but also protects a slice of the UK's holidaymaking heritage and an iconic listed building.

## At a Glance:

**Project:** 8,500m² Roof and Balcony Refurbishment
**Materials:** KEMPEROL® V210
**Contractor:** Cawston Roofing
**Client:** Explore Living

Hamburg **(Germany)**

# The City's "Balcony" Professionally Sealed

**The Hamburg Michel is one of the Hanseatic city's most famous buildings. The 132-metre-high spire of the protestant St. Michaelis Church has been a highly visible landmark for ships sailing up the River Elbe for hundreds of years. The observation deck at a height of 106m is popular with locals and tourists alike and provides a fabulous panoramic view across the city. The specialist roofing contractor Bade Dächer was appointed to re-waterproof the roughly 100 square metre "balcony" using KEMPEROL®. An anthracite-coloured KEMPERDUR® coating was chosen as the heavy duty wearing layer, which has to withstand the footfall of more than one million visitors a year.**

## Waterproofing 106 metres above ground level

The church, which was finished in 1669, is considered one of the finest baroque churches in northern Germany. The original building was destroyed by fire (lightning strike) in 1750 and its replacement suffered the same fate in 1906 after a fire started during construction work on the roof. The Michel was then built for a third time. Although it kept its familiar outer form, the original timber structure was replaced with a steel and concrete design. The red brickwork of the baroque church gives it its characteristic look.

Master roofer Hermann Bade, whose 94-year-old family-run business specialises in complete solutions for historic and modern buildings, was entrusted with carrying out the project. The company is a member of the German cooperation "100 Top Dachdecker" (100 Top Roofing Contractors) and is certified by external bodies to ensure "the outstanding quality of our work is always maintained".

Due to the complex round shapes and many structural details it was decided to use liquid applied waterproofing as it offers long-term sustainable performance even in confined spaces and on almost any substrate. Furthermore, KEMPEROL® is a cold applied liquid waterproofing, meaning there were none of the risks associated with hot works. Consequently, it minimised the risk of fire.

## Observation deck had to remain open

It was also important for the client that the observation deck remained partially open due to the large number of people wishing to take in the fantastic view across the city. The idea was that visitors could still climb to the top of the church and enjoy the breathtaking scenery without too many restrictions even while the works were being completed. This was why the final decision fell in favour of solvent-free KEMPEROL® 2K-PUR. The odourless product can be applied in sensitive areas with a fair bit of visitor foot traffic without any unpleasant odours.

The roofing specialists carried out the refurbishment project progressively during May and July. The parish requested a break in work over the Whitsun holidays. Luckily, longer periods of downtime are not an issue for the liquid applied waterproofing. New KEMPEROL® can be applied to a cured layer of KEMPEROL® without any negative impacts.

Site preparation initially required the milling of the old bituminous substrate, followed by the application of KEMPERTEC® EP-Primer to enhance bonding and then the scattering of KEMPERTEC® Natural Quartz NQ 0408. KEMPEROL® waterproofing was carried out in line with the standard procedure: a waterproofing layer of KEMPEROL®, with a reinforcement fleece and a hard-wearing sealing coat of KEMPEROL®. Since KEMPEROL® achieves a full-surface bond with the substrate, it forms an impenetrable surface after fully curing. This surface is additionally characterised by its permanent elasticity.

## Heavy-duty wearing layer for over one million visitors

While the waterproofing protects the church against penetrating water from above, the top coat protects the sealant against mechanical loads. The vast number of visitors to the observation deck each year meant that a heavy-duty wearing layer was required.

Hermann Bade and his team therefore applied KEMPERDUR® TC Coating, another solvent-free system, to the fully cured waterproofing layer. The universal wearing and protective layer is designed for surfaces subjected to high mechanical stresses such as car park decks, entrances, covered walkways, balconies or, as in Hamburg, observation decks.

The surface was resealed with KEMPERDUR® Deko Transparent and then scattered liberally with anthracite coloured Colour Quartz, grain size 04 – 08 mm. The final task was to sweep off any excess quartz sand and to re-coat the surface with KEMPERDUR® Deko Transparent.

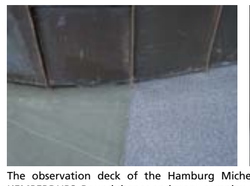
The finished surface structure is as follows:

- Bituminous substrate (milled)
- KEMPERTEC® EP-Primer
- KEMPEROL® 2K-PUR Waterproofing
- KEMPERDUR® TC Coating
- KEMPERDUR® Deko Transparent
- KEMPERTEC® CQ 0408 Colour Quartz
- KEMPERDUR® Deko Transparent

The Michel reopened with unrestricted visitor access and new waterproofing in mid July of the same year.

### At a Glance:

**Project:** Observation Deck, 100m²
**Materials:** KEMPERTEC® EP-Primer
KEMPEROL® 2K-PUR
KEMPERDUR® TC Coating
KEMPERDUR® Deko Transparent
KEMPERDUR® CQ 0408 Colour Quartz
**Contractor:** Bade Dächer
**Client:** St. Michaelis Turm GmbH



The observation deck of the Hamburg Michel was effectively waterproofed using KEMPEROL® and given hard-wearing-coating using KEMPERDUR®. Round shapes and many complex details-ideal for the application of liquid applied waterproofing



**Kent (UK)**

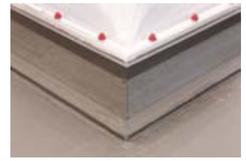
# Odourless Roofing Solution For Kent Schools

**Two schools in Kent will be making a more watertight start to the new term thanks to roof refurbishment projects using KEMPER SYSTEM's solvent-free KEMPEROL® 2K-PUR waterproofing system.**

St Columba's Catholic Boys' School in Bexleyheath and Ashford Oaks Primary School in Ashford have both invested in upgrades to their roofs, installed by specialist roofing contractor, Capital Roofing.

A 14-week programme at St Columba's has involved overlaying the entire existing roof surface with a warm roof build up from KEMPER SYSTEM to improve the building's thermal performance and provide effective waterproofing.

Capital Roofing used the existing mineral felt and spray applied rubber surface as a vapour control layer, making minor repairs and preparing the surface before installing KEMPER SYSTEM's PIR insulation board.



KEMPER SYSTEM's KEMPEROL® 2K-PUR odourless, solvent free waterproofing system was then used to complete the roof overlay scheme. Capital Roofing applied KEMPERTEC® D primer before applying the cold-applied liquid resin. The system's reinforcement fleece was cut to size and shape on site to ensure accurate detailing around skylights, gutter details and curbs. The resin was applied in a single wet-on-wet process before the system was allowed to cure, creating a tough, flexible monolithic membrane that cannot delaminate and bonds directly to the substrate.

At Ashford Oaks Primary School, the recently completed scheme involved the roofs to the school's main hall and adjoining classrooms. It is the second project to be completed by Capital Roofing at the school as part of a phased programme and follows the success of a scheme to renew the roof areas above the kitchen, dining hall and reception area using KEMPEROL® 2K-PUR.

The project was carried out while the school was fully operational and KEMPER SYSTEM's solvent free KEMPEROL® 2K-PUR provided significant advantages because it is both odourless and suitable for overlay directly onto the existing single ply surface.

Following installation of the KEMPEROL® 2K-PUR, maintenance walkways were added, with Capital Roofing using KEMPER SYSTEM's TC resin and quartz aggregates, followed by a sealant, to create an anti-slip surface in designated areas.

Comments Terry from Capital Roofing, "Using the KEMPEROL® 2K-PUR to refurbish the schools' roofs means that the schools can carry on as normal with minimal waste removal or nuisance odours to disrupt staff or pupils, and without the fire risk of hot works."

### At a Glance:

**Project:** Roof Refurbishment and Warm Roof Upgrade
**Materials:** KEMPEROL® 2K-PUR
**Contractor:** Capital Roofing
**Client:** St Columba's Catholic School and Ashford Oaks Primary School

**Cheadle (UK)**

# KEMPER SYSTEM Roof Will Mature At Cheadle Care Home

**Residents at a new care home in Cheadle, Cheshire, will be able to enjoy the greenery of the building's parkland setting on their roof terraces thanks to a green roof installation from KEMPER SYSTEM.**

Constructed and operated by Care UK, Abney Court is located in the historic grounds of Abney Hall and will provide round-the-clock residential and specialised care, including provision for residents with dementia, palliative care and end of life care.

The contemporary building features a flat roof and a balcony at first floor level and KEMEPR SYSTEM's solvent free KEMPEROL® 2K-PUR cold liquid-applied system has been used to provide the waterproofing membrane for all areas of the roof and balconies.

The root-resistant and U/V stable waterproofing system also forms an integral part of the green roof build up installed on selected areas of the roof terraces as a feature that connects the new development with its natural surroundings.

Comments Stuart Hicks from KEMPER SYSTEM: "The effectiveness of the KEMPEROL® 2K-PUR waterproofing membrane used to create the watertight barrier between the roof substrate and the green roof system is the most critically important element of the specification. The membrane is flexible enough to cope with any post build 'settlement', tough and durable enough to cope with the planting medium and has a sufficiently long service life to make the green roof viable."

Comments Kevin Cawston from Cawston Roofing: "The use of areas of green roof on this very modern building has created a synergy between the care home and the grounds.

"Using the same waterproofing membrane for the green roof build up as we did for the rest of the roof made management of the installation much simpler and the planting will provide a living feature that changes with the seasons."

### At a Glance:

**Project:** New Build Green Roof
**Materials:** KEMPEROL® 2K-PUR
**Contractor:** Cawston Roofing
**Client:** Care UK

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**Dudley, West Midlands (UK)**

# KEMPEROL® Preserves Tectons At Dudley Zoo

**Dudley may not be a location that would spring to mind when making a list of the world's most remarkable architectural landmarks but it has some hidden treasures so precious that they were granted World Monuments Fund status in 2009.**

**The structures in question are the Tecton buildings at Dudley Zoological Gardens (DZG). There are 12 of them in total, each designed by Bethold Lubetkin and his Tecton practice. They are the world's largest single collection of Tecton buildings and some of the few remaining UK examples of this innovative and influential architectural movement from the 1930s and 1940s.**

Explains recently retired DZG CEO Peter Suddock who led the programme: "Tecton was a radical architectural movement that used pre-stressed concrete to create striking curved structures. When Dudley Zoological Gardens was first planned and built, this radical, ultra-modern approach to design and construction enabled the architects to work with the challenging slopes and underground limestone caverns on the site to create a visitor attraction full of visual appeal that looked completely new and exciting."

Over the years, trends in zoo best practice have meant that some of the structures are no longer in use as viewing enclosures. Time has also taken its toll on the wear and tear too. The DZG Tectons were put on the World Monuments Fund's watch list of world class buildings threatened by neglect, demolition or disaster in 2010.

## Impact on Entry

Among the Grade I and Grade II* Tecton structures that have so far been refurbished at Dudley Zoological Gardens, under the watchful eye of English Heritage, are the entrance canopy and ticket kiosks, concession stands, and the impressive 'Bear Ravine' which was once used to allow zoo visitors to view the bears from above at close range.

One of the main priorities of the refurbishment programme is to protect the structures from water and environmental damage due to rainfall, which led to the specification of a cold liquid-applied waterproofing system from KEMPER SYSTEM.

Explains Stuart Hicks from KEMPER SYSTEM: "As a result, the KEMPEROL® system and aggregates used for the entrance canopy, kiosks and the Bear Ravine provide the least obtrusive solution to ensuring long-term protection for the structures without any significant changes to their appearance."

The first project of the refurbishment programme to be delivered was the entrance canopy, undertaken by G Cooper Ltd, which consists of five horizontal 'S' shapes, each overlapping the one before to create a wave like ripple that announces the word 'ZOO' in big white letters below.

## Just the Ticket

The KEMPEROL® system was also used to waterproof the roofs of the four ticket kiosks that are located beneath the entrance canopy, which were originally constructed without any waterproofing protection at all. This was because the structural concrete was perceived to be robust enough to withstand weather conditions, especially given the shelter afforded to the kiosks by the entrance canopy. However, the risk of leaks to buildings of such architectural significance, which are built from concrete that is now almost 80 years old, prompted DZG to incorporate the ticket kiosks into the roofing programme.

The entrance canopy consists of five horizontal 'S' shapes, each overlapping the one before to create a wave like ripple.


KEMPEROL® provides the least obtrusive solution to ensuring long-term protection for the structures without any significant changes to their appearance. The liquid system is ideal for following the individual contours of the concrete surface.


The ticket kiosk was originally constructed without any waterproofing protection at all.

Specialist contractor, Dent Roofing, was tasked with carrying out this aspect of the project, installing the KEMPEROL® system to two kiosks at a time in a phased programme to enable the Zoo to keep the remaining two kiosks operational and thereby avoid any business interruption during the works.

## Bear Ravine

Dent Roofing has also been responsible for waterproofing the Bear Ravine; a much larger and more complex structure which has not been used as an animal enclosure for several years.

The design of the Bear Ravine includes a central bear pit with a raised walkway and viewing platform that also forms a partial roof to a largely open building. This is accessed by a set of concrete stairs. There is also a viewing pier that extends out at a right angle beneath the main walkway.

Julian Dent from Dent Roofing explains: "The curved lines that make the Bear Ravine such an iconic structure also make it a challenging waterproofing project. Fortunately, the liquid KEMPEROL® system is ideal for following the individual contours of the concrete surface and we simply used smaller brushes to apply the resin to awkward corners."

Once the waterproofing system to the walkway and staircases of the Bear Ravine was complete, the Dent Roofing team applied a quartz aggregate laid into the coating to create a non-slip surface.

Julian continues: "KEMPEROL® 2K-PUR provides a high level of waterproofing performance, and is BBA-Accredited with a 25-year service life, ensuring that the Bear Ravine is protected and preserved for the next generation just as effectively as the Tecton structures at the Zoo's entrance."

## At a Glance:

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|---|---|
| **Project:** | **Entrance Canopy, Kiosks and Bear Ravine** |
| **Materials:** | **KEMPEROL® 2K-PUR** |
| **Contractor:** | **G Cooper Ltd and Dent Roofing Ltd** |
| **Client:** | **Dudley Zoological Gardens English Heritage** |


The impressive Bear Ravine was once used to allow zoo visitors to view the bears from above at close range.