

**CASE STUDY**

# **PARDAK®60**

**THE EMIRATES ARENA AND  
SIR CHRIS HOY VELODROME, GLASGOW**





# A MAJOR CONCOURSE PODIUM SERVED BY AN IMPRESSIVE PAIR OF STAIRWAYS

**Zootjens was responsible for the detailed design, supply and implementation of the main entrance concourse for a major venue in Glasgow - the only completely new sports facility for the 2014 Commonwealth Games. The new, raised podium concourse is served by two prominent staircases - also manufactured and supplied by Zootjens - rising up from parking and transport facilities.**

## **INTRODUCTION AND CONTEXT**

Designed by architects 3DReid, the new complex essentially comprises two parts, divided by a central hub which is served by the new concourse.

The Arena provides a 200m running track with hydraulically operated raised track bends, seating for around 5,000 spectators, 60m hurdles track, associated 100m warm-up track and throwing and jumping areas. It can also be used for a variety of other sports, with telescopic, movable seating platforms allowing flexibility to ensure that spectators are close to each activity. Next to the Arena space is an adaptable Sports Hall.

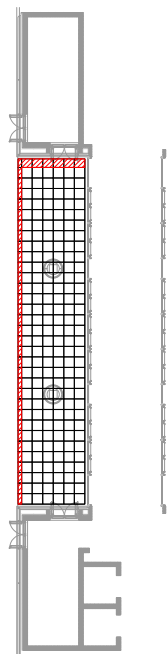
The Velodrome contains a 250m high-banked timber cycle track with 2,000 seats, standing room for 500 more spectators and additional temporary seating used for the Commonwealth Games. In addition to cycling events, the Velodrome infield floor area is designed to accommodate roller sports, BMX bike and other events.

The Hub, between the Arena and Velodrome, comprises a shared public area with Box Office, bar and catering, as well as other facilities such as a conditioning suite, physiotherapy, doping control and elite athlete and team changing rooms.

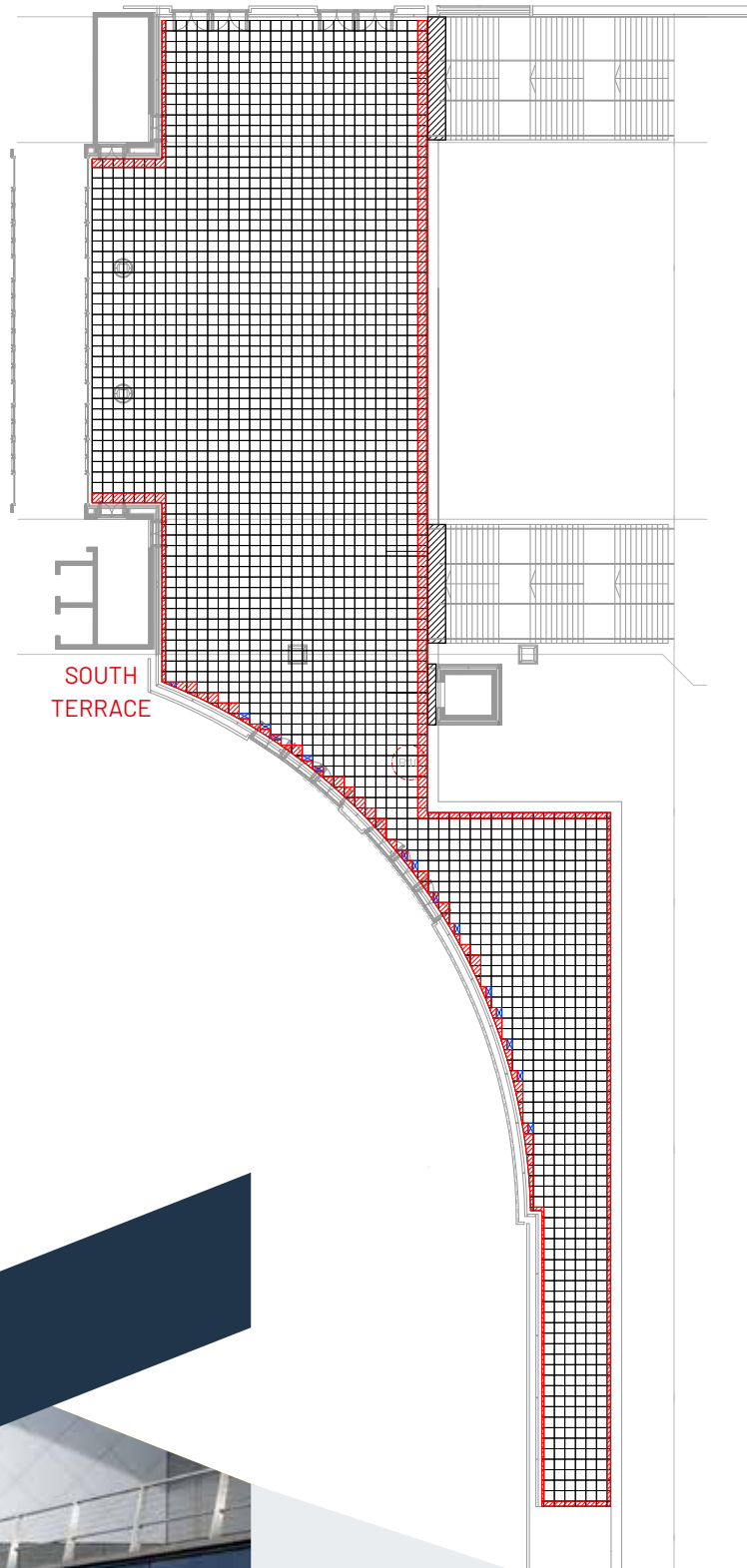
During the 2014 Commonwealth Games, the Velodrome hosted the Track Cycling competition events and the Arena will host the Badminton competition, with seating arranged to provide close to 7,000 seats. After the Games, the complex now provides both a centre for sporting excellence and a community sports facility for the long-term.

## **THE CONCOURSE TERRACES**

Architects 3DReid considered their biggest design challenge to be: "integration of the various sports facilities into a single sports complex and creating suitable access, while also providing appropriate security, for the various users of the building in its variety of configurations and occupancies over the course of any given day." The building's central Hub area with its external paved podium concourse is central to its success.



NORTH  
TERRACE



SOUTH  
TERRACE

□ Pardak@60

▨ Pardak@60 cut slab

▨ Pardak@60 half slab



Visitors are greeted by an impressive pair of staircases rising up from the hard-landscaped forecourt to the podium level Concourse, either side of the lower entrance to the Hub. The main South Terrace provides a generous, open area serving the upper entrance to the Hub, between the Arena and Velodrome. The much smaller North Terrace also serves the Hub at this level, linked to the South Terrace by a level podium deck to the west.

**THE WESTERN ACCESS WAY  
IS CLEARLY DIFFERENTIATED  
FROM THE TERRACES BY  
CONTRASTING 'FADED SAND'  
COLOURED 'PARDAK®60'  
PAVING.**



Both terraces are paved with Zoontjens 'Pardak®60' paving system, based on a 600 x 600mm grid of 80mm thick concrete slabs. Here, a high-quality 'Marble White' aggregate finish was specified: washed and etched, and consisting of variable coloured grey black and white aggregates on a grey matrix. The slabs comprise a 'face mix' on an un-pigmented concrete backing, containing recycled aggregate, secondary processed recycled binders and reclaimed water.



Use of the Pardak® system enabled an attractive rooftop area, suitable for service vehicles and emergency access as well as extensive pedestrian traffic, to be constructed with lower whole-life costs and protection of the underlying roof construction. The slabs sit on pressure distributor pads, creating a void beneath the paving system for rapid removal and collection of water, meeting

SuDS requirements. At the same time, imposed loads are transferred through to the sub-structure without impairing the waterproofing of the roof construction below. High strength extruded polystyrene assists in protecting the membrane, as well as providing thermal performance for the building beneath.

## THE PARDAK® SYSTEM

Originally developed in 1987 in the Netherlands, the precast concrete slab based Pardak® decking system is principally for roofs accommodating intensive car traffic and parking, with applied loads of up to 35 kN. Around 1.5 million square metres of this system have now been installed around Europe. The system uses dry, prefabricated construction techniques for fast, safe installation, unaffected by most weather conditions. A reinforced version is also available to accommodate emergency vehicle access.

The system consists of high quality, vacuum-formed concrete slabs supported on pressure distributor pads with adjustable tensioning elements. The pressure distributor pads can sit directly on appropriate inverted roof insulation - so eliminating any cold bridging - and the flexibility of the system compensates for uneven surfaces. The compressive strength is at least 65N/mm<sup>2</sup> which significantly increases over the years. The underside of each slab is cast with rebates of different depths that receive the pressure distributors.

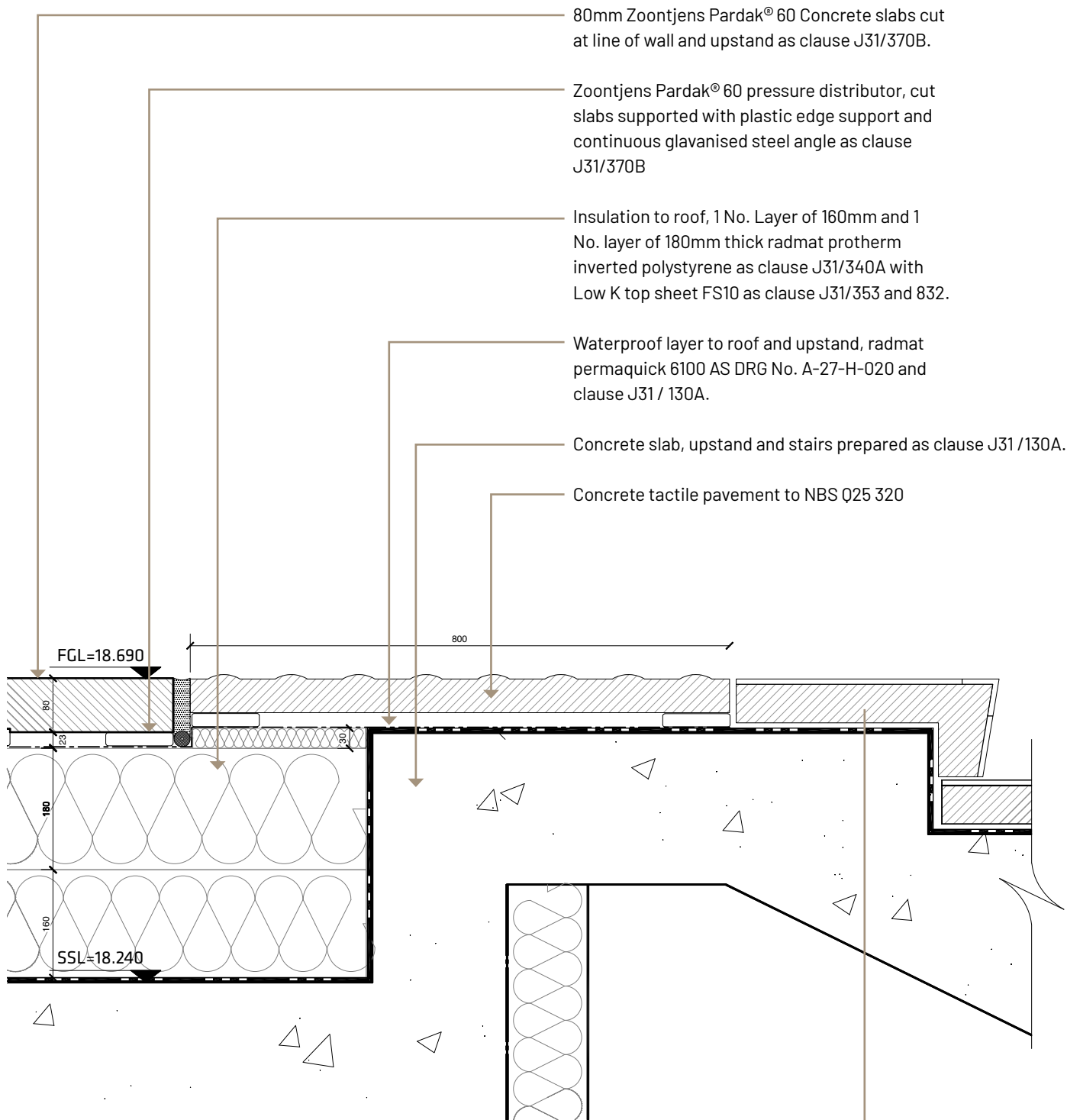
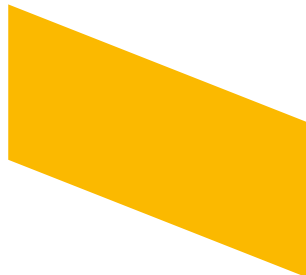
To assist with the Sustainable Drainage System (SuDS) strategy on the Glasgow project, pre-formed slots between installed slabs allow water to move rapidly off the surface without the need for falls, into the void below. Here, water runoff can be attenuated before discharge, as a part of SuDS. The surface remains free of water - and ice in cold weather - making it safe for both vehicles and pedestrians. The void below can also accommodate service cables with straightforward access when needed. The paving system protects the waterproofing membrane from UV, structural and other damage, while keeping it accessible, as individual slabs can be removed easily. In fact, the system can be rapidly dismantled if necessary.

Although intended for extensive pedestrian use, the Glasgow concourse is suitable for service vehicle use and emergency access as well. Pressure distributors absorb and distribute the vertical and horizontal forces that occur when a vehicle passes over the surface. They also reduce contact noise of the vehicle tyres and allow rapid water drainage to outlets, via the cavity below the concrete slabs. Pressure distributors fit into the quadrant-shaped corner rebates on the underside of the slabs.



## THE MAIN STAIRWAYS

In addition to the podium paving, Zoontjens was also responsible for realising the architect's vision for the two main stairways. Here, specially designed, bespoke step units were manufactured for the concrete stairs, using the same high-quality 'Marble White' finish to match the Pardak paving slabs. Contrasting strips were inserted close to step edges and concrete tactile paving slabs added to top and bottom of each staircase to alert blind and partially sighted people.



Section through top of external staircase, showing special nosing unit by Zoontjens to match the Pardak® terrace paving.  
Drawing: 3DREID



## WHAT IF THE WORLD WERE TWICE AS BIG?

It can be, as far as we're concerned. Our world, twice as big. A world that we are helping to design and construct perfectly with our roof slab systems. Our many years of experience have made us the number one expert in rooftop paving. For sustainable roofs, livable roofs for socialising.

We interact with architects and contractors every day. With roofers and project developers: Creators and constructors. We listen to them, work with them and advise them. That's why we're the number one party with the best rooftop vision. It's our higher ground.

[zoontjens.com](http://zoontjens.com)

Case study produced by: Hodsons Ltd. [www.hodsons.com](http://www.hodsons.com)

Cover Photo: McAteer Photograph

Photos: Chris Hodson

Drawings and images courtesy of: 3DReid

