

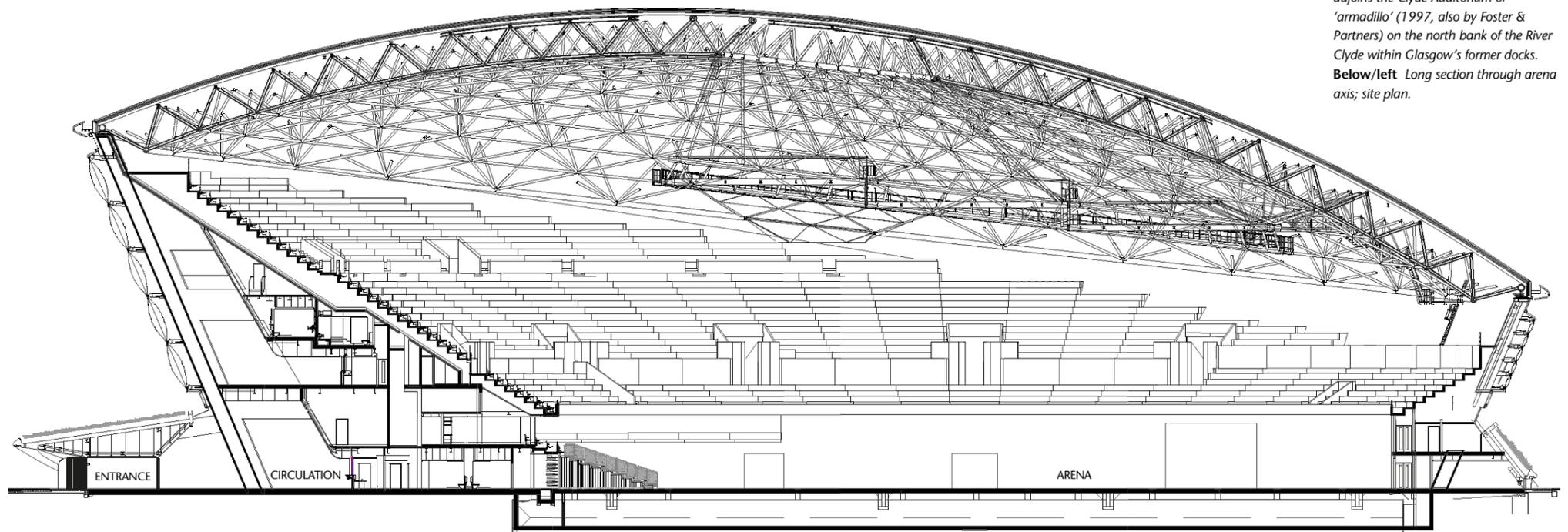
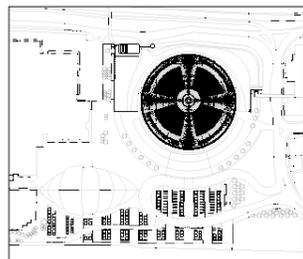


BUILDING ■ Full circle: Foster & Partners' SSE Hydro arena in Glasgow

Foster & Partners returns to Clydeside, 16 years after completing the 'Armadillo', to build an adjacent 'Spaceship'. Critique: Johnny Rodger. Photos: Nigel Young.

Traditionally when the players came to town to entertain they found a spare bit of land on the urban limits where they could be daring, edgy and give the townsfolk a splash of colour. It's not too much of an exaggeration to say that this is essentially what's happening with the Hydro, a new 13,000-seat music venue completed by Foster & Partners on Glasgow's Clydeside.

Nicknamed 'The Spaceship' by locals, the 45-metre-high auditorium beams colour out across the grey skies of Glasgow. In the post-industrial city, of course, it's not always necessary to go right to the edge of town to find accommodation for such a massive venue: any old brownfield site might be redeveloped as a cultural district, and the advantage of the filled-in docks on the banks of the Clyde is that in a dense urban environment like Glasgow, you're only



Above The SSE Hydro, Scotland's largest purpose-built public event arena, adjoins the Clyde Auditorium or 'armadillo' (1997, also by Foster & Partners) on the north bank of the River Clyde within Glasgow's former docks.

Below/left Long section through arena axis; site plan.

plan

a five-minute taxi ride from the city centre. The growing high-tech media and leisure quarter on the Clyde spans the river and is already home to a whole toybox of 'iconic' forms, from David Chipperfield's huge ribbed silver box for BBC Scotland (2006) to Foster & Partners' SECC Conference Centre or 'Armadillo' (1997), Richard Horden's upended wing of the Glasgow Tower (2001), BDP's titanium segmental spheroid Science Centre (2001) and, nearby, Zaha Hadid's Riverside Museum (2011).

The Hydro adopts a dominant pose amongst its fellows on the north bank. Foster & Partners' earlier project, the 3000-seat Armadillo, was not sited on a plinth, and consequently slumps and fudges its meeting with the ground. No such mistake was made

plan

Plans The arena has capacity for 12,000 seated or 13,000 with standing in the performance bowl, and includes 11 hospitality boxes, two large VIP suites and a club seating level. As well as accommodating a wide variety of concerts and stage sets, the SSE Hydro will host netball and gymnastics during Glasgow's 2014 Commonwealth Games. The seating bowl is enclosed by a lattice steel roof and wrapped in translucent ETFE cushions. The 1,400 tonne steel diagrid roof, one of Europe's largest free-spanning roof structures, is raised on a circular array of angled concrete fins which also support a tilted seating bowl, designed to provide the best possible viewing angles from every seat.

plan

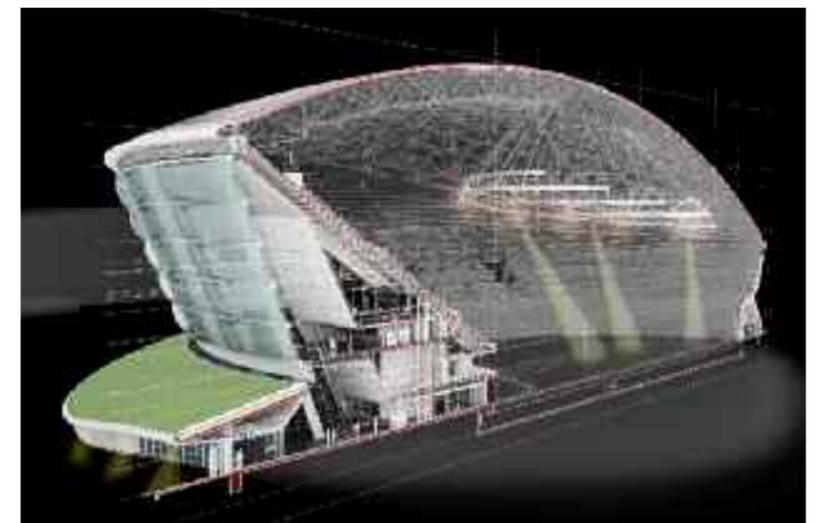
with the Hydro, which sits up like a tipping cup on a green-planted encircling bank – the saucer – which keeps the raised form distinct and in the round above the surrounding edifices.

The structure itself is efficient, with tilted in-situ concrete fins supporting a crescent-shaped deck of seating within the circular perimeter. This arrangement means that a greater proportion of seats in the middle face square onto the stage, and fewer, at the points of the crescent, wrap around the stage area. This stage area is separated from front-of-house by two large stage doors on the west and east sides. We see again here the advantage of such a site for this type of venue, for full-size articulated trucks can



drive through these portals to deliver sets right onto the stage. That's not the sort of thing that can be done in a bijou Edwardian Frank Matcham theatre in a city centre.

The skeletal concrete structure is clad in a wall of ETFE cushions, which are kept inflated at a low pressure by fans. On concert evenings these walls are fully illuminated by an array of LED lights said to have a range of 12.8 million colours. The lighting system is programmable and dimmable so that any incoming act can apply its own 'branding' colours. For the viewer on the outside, the concert is visually 'trumpeted' across the city. For the concert-goer, however, mounting the stairs and standing in the foyers between the back of the seating decks and this translucent wall, it means bathing in the luminous display and participating in the visual build up to the performance itself. It could perhaps be described as the modern technological equivalent of the experience the fin-de-siècle listener would have had in



Above/right The circular plan and tilted form of the arena provide optimal viewing for each seat location within the compact envelope. The top-hung stage lighting rig was developed with production crews. Weighing 260 tonnes, its size and circular form allow maximum flexibility. Unlike its neighbour, the Clyde Auditorium or SECC, which has accommodated conferences and a wide range of musical and stage events, the Hydro is a dedicated space for music performance, with the capability of putting on a different event every night.



Lluís Domènech i Montaner's Palau de la Música auditorium in Barcelona, where the music is enhanced synaesthetically by garish moving reflections from the coloured glass and majolica tiling.

The Hydro is built on a 26-hectare site which formerly contained parking areas for the SECC Conference Centre. The parking facility is now housed in a new multi-storey car park. This structure was part of an overall masterplan, but nonetheless the stacking of these vehicles brings us to the question of access, and of how well the leisure and media facilities are knitted into

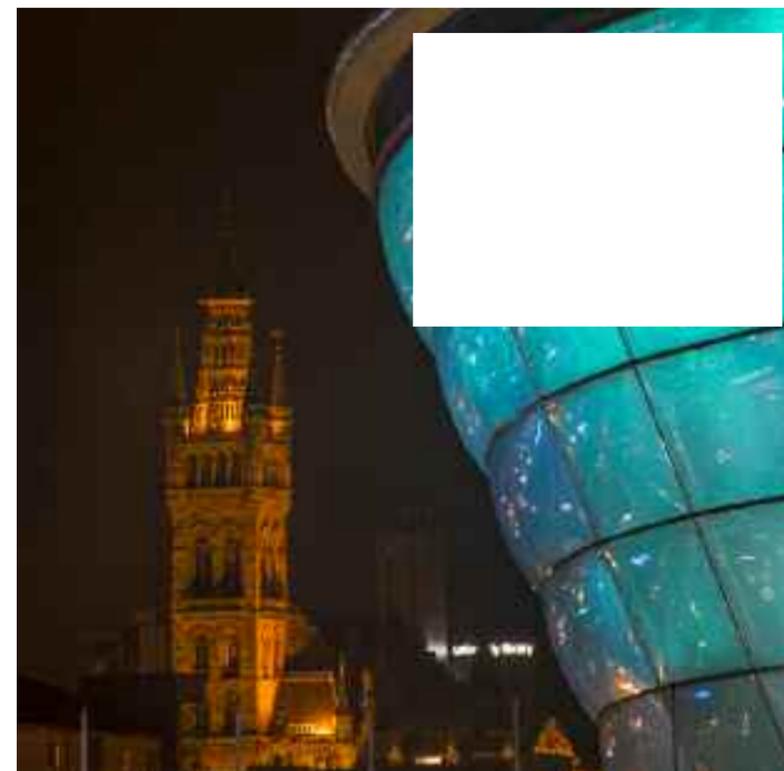
Left/below Seating tiers are arranged on concrete terraces, with the lower level retractable. The inaugural concert was by Rod Stewart on 30 September (ph: Marc Turner).

Below Circulation spaces run around the southern perimeter of the performance bowl. The building combines natural and mechanical ventilation – fresh air is drawn in above the entrances and vented at a high level.



Right Canted concrete fins, tied together by horizontal steel rods, support the seating tiers, the steel roof structure and the facade framework for the inflated ETFE cushions. The ETFE fabric is printed with a frit pattern to reduce glare. On the southern side of the building, the facade is more transparent to draw in natural light and reveal the structure, and the movement of people within, to viewers on the outside.

Below The SSE Hydro is integrated with the district-wide public transport, with a raised walkway to the exhibition centre station and a doorstep bus stop. A new multi-storey car park complements the extensive surface parking in the vicinity. The surrounding landscaping provides a new civic amenity – the building is set back from the river to frame a new public space between the arena and conference centre. A low concrete bank curves around the base of the arena, concealing catering and support spaces and providing a landscaped plinth.



the existing city. Clearly such large venues need to be able to accommodate people drawn from beyond the city and the region, so is it just a question of urban planning? The usual criticism of the area is that as an isolated and windswept park dotted with such perfectly formed protruberances, the zone doesn't participate in or communicate fully with the grammar of Glasgow's built form or the vibrancy of its street life. It is true that there is a good underground rail link to the quarter, but despite its proximity to the city centre few people would be encouraged to walk or cycle up the desolate streets leading past motorways and industrial scale showrooms. On the other hand space needs to be made not just for huge venues and the kit involved, but for the safe management of vast numbers who come some distance to attend. To find room for this so near to a city centre is an achievement in itself.

Johnny Rodger is Reader in Urban Literature at the Glasgow School of Art, a regular critic and author of fiction and non-fiction books.



Arup writes In terms of the roof design, the aesthetic required a 'spiral' structure that could achieve a clear span of 125 metres. The solution was to provide a structure that acted as a dome in the final condition, but as a series of beams during the construction phase. Using a 'performance-based dynamic assessment', which considers 'accelerations' of the structure, savings were made by avoiding unnecessary structural reinforcements.

Services allow the arena to be rapidly reconfigured while minimising energy consumption and responding to the demands of the various spaces. Central boilers, water tanks, chillers, electrical switchgear and the standby generator are housed in an adjacent energy centre.

The use of a full 3D model enabled prefabrication and off-site manufacture to be optimised, improved installation quality and reduced materials use. The model was used to coordinate service routes within the complex geometry and associated structure. Services were designed to

withstand the structural movement associated with the live loads imposed by a large capacity audience. The main air-handling plant, located in two double-height plant rooms, was installed in a matter of days. The mains distribution runs around the arena were also prefabricated as were services within the other eight mechanical plant rooms. Two electrical rooms, technical rooms and a series of distributed electrical and technical rooms provide system resilience and flexibility to accommodate changing needs over time. Fresh air supply to the main bowl seating can be zoned to suit varying capacities of crowds. The service tunnel beneath the arena bowl also provides flexible distribution of power to serve performance, exhibition and event requirements. A water supply beneath the bowl can deliver an ice/water mix for performances on ice.

The use of translucent ETFE allows the facade to 'disappear' to show the activity within, or host video or Gobo (Goes-before-optics) projection as required. The

facade LED scheme features 16 million colour combinations, and uses colour change, movement and projection to achieve different effects. The system uses additive colour mixing rather than subtractive (as at the Allianz Arena in Munich by Herzog & de Meuron), so only the colour required is produced rather than using filters to subtract unwanted colours.

The auditorium has one of the largest LED schemes in Scotland, though at the early design stages the technology was not sufficiently developed to light the arena bowl successfully. The lighting consumes a fraction of the energy of a traditional solution and greatly reduces heat generation, allowing ventilation and cooling loads to be minimised both in capital and running costs.

The project, handled out of Arup's Edinburgh and Glasgow offices, was led by project director Martin Surridge and project manager Ian Lumsden, with David Brodie (mechanical), Douglas Wylie (electrical designer), Patrick Elsdale (lighting).



Left The translucent ETFE facade incorporates an LED lighting system that can be programmed to form part of a performance or event.

Below The Hydro is next to the Clyde Arena, until now Glasgow's sole venue for large-scale music performances.



Project team

Architect: Foster & Partners; design team: David Nelson (above), Spencer de Grey, David Summerfield, Ben Scott, Chris Connell, Mike Jelliffe, Claire Donnelly, James Edwards, David Gillespie, John McCulley, Scott McQueen, Gregor Milne, Mouzafer Ntagkala; structural, services, m&e, environmental & transport engineer, planning, fire consultant: Arup; project manager: Turner & Townsend; qs: Gardiner & Theobald; planning consultant: Keppie; planning supervisor: Halcrow; acoustic consultant: Sandy Brown Associates; AV consultant: Shen Milsom & Wilke; contractor: Lend Lease.

Selected suppliers and subcontractors

Steel frame, lighting rig: Martifer; energy centre structural steel: Hescott; intumescent paint: Stopfire; aluminium extract duct: Metaltech; concrete frame: Heyrod Construction; precast stairs and terracing: Solway Precast; mastic to precast: Pro-Sealant Solutions; perimeter bullnose: Techrete; brickwork, blockwork: Lesterose; ETFE cladding: Novum Structures; access systems: OCS Safety; bank roofing, cladding to BOH wall: Topek (BUR); bank roof landscaping: Blackdown Horticultural Consultants; irrigation: Souter Sports; moveable walls: Style Scotland; internal glazed screens: Gray & Dick, WorkSmart Interiors; plastering, rendering: George Rome, G&R Ross; partitions, ceilings: Roskel Contracts; ceilings: Lindner, Texaa ceilings: Veitchi Interiors; resin and terrazzo flooring: Duracryl Flooring, Isocrete (Flowcrete); doors and ironmongery: Fitzpatrick Doors (SIG); roller shutters: Ascot Doors; architectural metalwork: Miller Fabrications; entrance doors: Door & Shutter Services; decorations: Baxter & Gillespie; tiling: A De Cecco; roof lining: Kalzip; roof structure, steelwork, cladding: Martifer; green roof: Bauder; internal furniture, FFE: MJM; ETFE facade lighting: Martin Lighting; digital projectors, screens, totems: Sony; drylining: British Gypsum; precast terracing: Solway; mansafe systems: Latchways; seats: Figueras; washbasins: Armitage Shanks; taps: Dolphin; cubicles, sinks, splashbacks: Interplan; internal glazing systems: Optima; foyer dry-shake finish: Sika; carpet: Westbond; ironmongery: Allgood; door: Fitzpatrick; ceiling baffles, tiles: SAS; escalators, lifts: Kone; retractable seating: Steeldeck; drapes: Acre Jean; signage: Astley Signs; blue paint: Lucas; entrance matwell: Emco; entrance and VIP doors: DSS; external fencing: Lang & Fulton; paving: Marshalls; front-of-house fencing, perimeter cladding: Metaltech; render: Sto; movable wall panels: Dorma; loading-bay door: Skyfold.