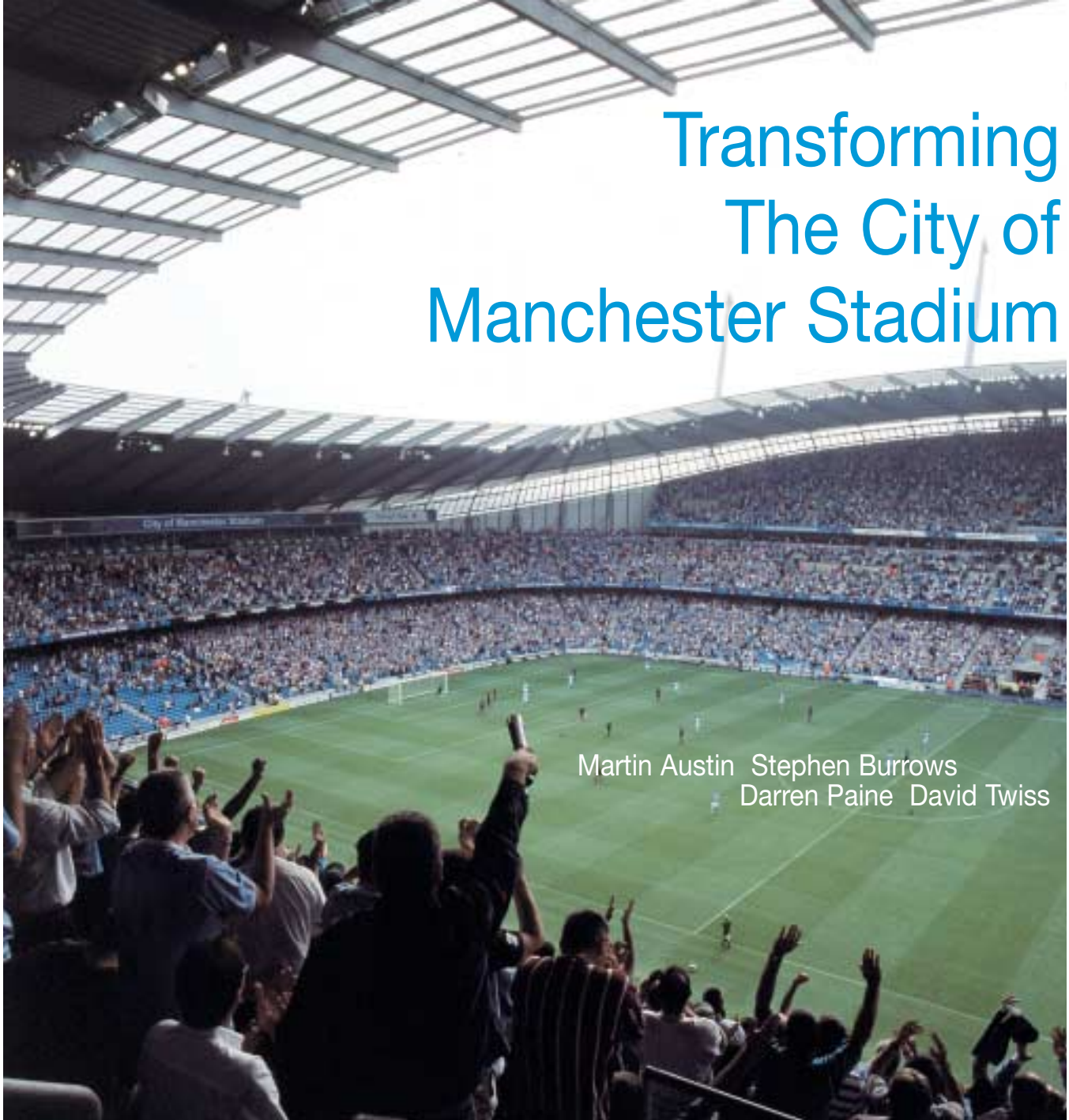


Transforming The City of Manchester Stadium



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1. The first full match: the friendly between Manchester City and Barcelona on 10 August 2003.

Imagine this as a brief:

'Take a 41 000-seat athletics stadium and transform it into a 50 000-seat football stadium in nine months. Also remove the track and seat the spectators close to the pitch so that sightlines are excellent. Oh and by the way, fit it out in full for use as a top English Premiership venue.'

*Impossible? No, but quite an achievement –
and that is what has happened at the City of Manchester Stadium.*

Introduction

The trigger for the creation of the City of Manchester Stadium was a single event, the XVII Commonwealth Games in 2002. Nonetheless, the terms of its creation¹ required it to become a legacy for the City of Manchester that is viable, iconic, and a catalyst for regeneration. The Games themselves took only 10 days in July/August 2002, but for at least the next 60 years the Stadium will be used by Manchester City Football Club, as well as acting as a 'neutral' venue in major cup competitions, and for occasional concerts.

The building was certainly iconic for the Games, but that very iconic nature was one of the things that underwent conversion. For example, the economics of the Games spectacle were driven by television, so there was the need

and opportunity for 'smoke and mirrors', as the opening and closing ceremonies and track finals were witnessed predominantly from home armchairs. UK Premier League football clubs, on the other hand, rely far more heavily on ticket sales for their income, which meant that some temporary facilities acceptable for the Games would not be acceptable for the Club.

Secondly, the regeneration potential of the Stadium could only be fully realised by making it a destination in itself within the City. Non-game day visitors are vital to attract the private sector investment needed to create the jobs, homes, community facilities, and programmes for sustainable urban regeneration of what was a deprived area of the city. Over the past year it has proved itself successful in this aim as well.



2. Arup Associates' architectural vision of the City of Manchester Stadium as a football venue.



3. The day after the Games concluded, transformation began.

4. Temporary seating being removed, 22 August 2002.

The task

The 2002 Commonwealth Games was an enormous success for Manchester and for the UK. 3679 athletes from 72 nations competed in 17 different sports across a total of 38 venues in and around Manchester, of which the largest was the Stadium. 900 000 tickets to events were sold, and 200 hours of live TV coverage were beamed globally from up to 38 BBC cameras. But the day after the Games finished the builders moved in and were soon removing the track (Fig 3).

Perhaps the most obvious element of the conversion from athletics to football was removal in less than six weeks of the 14 000 seats that occupied the northern part of the Games Stadium (Figs 4 & 5). Construction of the permanent North Stand began immediately and progressed rapidly (Fig 6).





5. left: Removal of temporary seating, 2 September 2002.

6. below: Progress on the North Stand, 21 January 2003.



Less immediately visible but equally challenging was the change from an athletics field to a football pitch. Athletics and football can only occupy the same stadium at the same level if the football spectators are seated a long way from the pitch. At Manchester this would have meant a million spectators per annum for the next 60 years having to accept poorer viewing positions because of a 10-day event in 2002.

This was unacceptable, so the football pitch was created 6m lower than the athletics field (Fig 7). This required the removal of 90 000m³ of material, equating to one lorry-load every two minutes of the working day during the excavation period. But the result is an intimate, even intimidating, gladiatorial arena embodying the atmosphere of a football club in contrast to the carnival style that was so clear during the Commonwealth Games.

The third, less obvious, major conversion concerned the need for the Club to derive revenue from its supporters. To maximize game day proceeds, there had to be tickets at all pricing levels with further opportunities for impulse buying. From the outset, Manchester City FC wished to transfer its existing business to the new Stadium and enhance it at all pricing levels. Furthermore, the venue has to have non-game day commercial uses far in excess of those on offer at Maine Road (the Club's former stadium) both to attract revenue for itself and meet the City Council's regeneration aspirations.

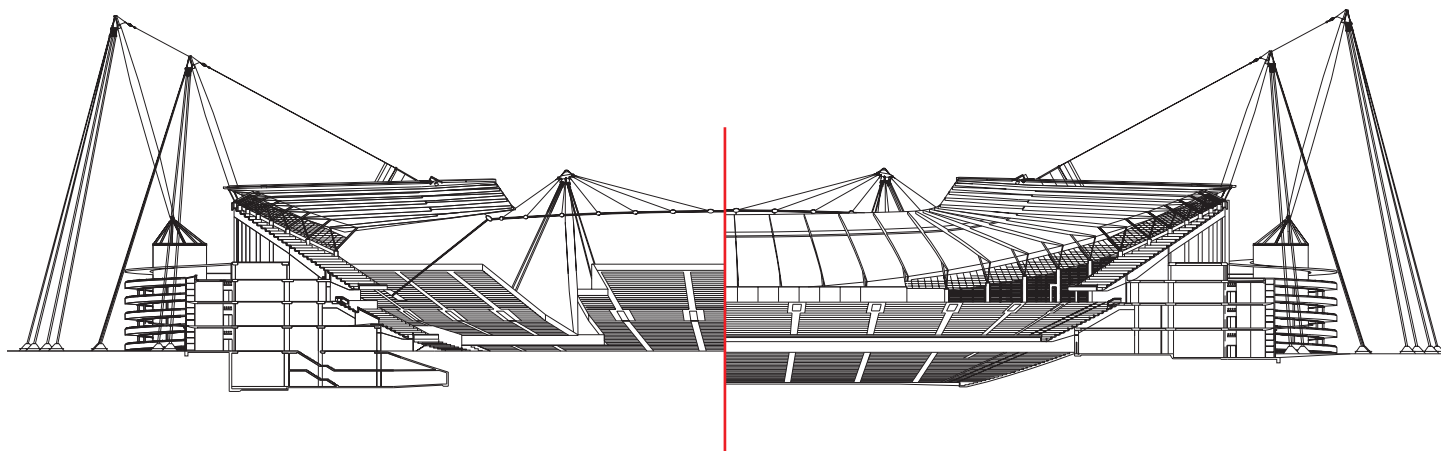
All this was also done within the nine-month construction programme by converting the shell used for the Games into corporate hospitality, concessions, restaurants, conference areas, shops, and kitchens for the Club's use.

The team

The military-style operation to complete the conversion relied heavily on co-operative and co-ordinated design and construction. Yes, the team knew this was to happen after the Games, and yes, it was planned for, but everyone also knew that in any interdependent activity, each party relies heavily on the other and so it proved here.

The team had two clients, Manchester City Council and Manchester City Football Club. There were two architects, Arup Associates and KSS Architects Ltd, and two contractors, for the shell conversion and for fitting out. There was, however, one engineer: Arup.

Since the Stadium had been originally built, some subcontractors had changed hands, some had new staff, some were not in sound financial shape, whilst some were as before. The common theme, however, was the drive and commitment shown by everyone in the team to make this conversion a success, and it is of enormous credit to all involved that this was achieved.



7. West-east section through the Stadium for athletics (left) and football (right), showing the lowered pitch level.

8. The curved bowl geometry generates spectator comfort and excitement.



The bowl

There were four key items in the conversion; the bowl, the roof, the Club facilities, and handover.

Within the bowl, the key issues were the pitch, the terraces, and the Club facilities.

Pitch

Clearly the playing surface is of vital importance to the Stadium's success for football. A good playing surface requires care and attention throughout its life, but without sunlight, airflow and temperature/water control it has been proved in many stadia that grass will cease to grow uniformly. Minimizing the risk of a poor surface was a key driver in the design decisions from the outset.

To maximize the amount of sunlight falling onto the playing surface, a 10m wide strip of translucent polycarbonate is provided in the roof on all four sides of the pitch. The cable net structure only intrudes minimally into this band and thus creates very little shadow on the grass.

The use of this material, often as a retrofit on stadia with grass growth problems, is well established but was not the entire solution for the City of Manchester Stadium.

The issue of airflow across the playing surface was solved innovatively. One would have thought that lowering the playing surface to some 6m below outside ground level would prevent airflow over the grass. And indeed it does pose a challenge, but the benefits far outweigh the problems. Sinking the bowl provides a lower profile stadium with the opportunity for a main concourse accessing the rear of the lower tier.

Not only does this give clear at-grade stadium access, but also creates the visual impact of looking down onto the action from the concourse - such a feature of Greek and Roman amphitheatres. When this geometric feature is combined with the toroidal roof form, the corners provide an opportunity for an adjustably perforated wall, allowing the Club to change the airflow across the pitch depending upon wind direction. This 'windy wall' is a unique feature of the building (Figs 8 & 9).

Finally, the surface itself. Grass grown from seed is known to be a much better playing surface than turf, because the surface is joint-free and thus more receptive to players' twisting and turning movements.

However, sowing a grass surface requires the seed to be planted at specific times of the year, and so a further key programme constraint emerged.

Football is a winter sport, and it rains in Manchester! So heating and draining the playing surface were also key factors. The pitch design includes below-surface heating and drainage pipework to enable the groundsmen to achieve an excellent playing surface. Its performance over the first five months of this season show that it is indeed in fine condition.

Terraces

Three of the four permanent stands were completed above ground for the Games, but none of the lower terrace was installed. After excavation of the athletics field was completed, construction of this lower tier was commenced. On three sides this tier, which seats 20 000 people, was simply cast onto a profiled and prepared earth surface, but on the west side it forms the roof of the players and match officials' facilities in the previously constructed basement.

Club facilities

Although the basement, which extends below the West Stand, was constructed for the Games, it was only a shell. In football mode this space contains the main kitchen, press rooms, player facilities, officials facilities, player warm-up, ground staff storage, and even a jail! Perhaps the most challenging aspect of its conversion was the kitchen installation, which provides meals for up to 6000 people on a match day. All meals are served in the two hours prior to the game commencing, resulting in not only a major cooking facility but also a significant logistical exercise for the staff.

The roof

Clearly a key element of the Stadium design is the cable net roof. The cable net itself was already erected in time for the Games and the temporary North Stand was fitted around the permanent masts and tie down cables. In fact, during the Games, the cable net was directly over the athletics track surface, which required Arup to obtain for the client a dispensation from the International Association of Athletics Federations.

Following the Games, the roof was completed by adding the rafters, purlins and cladding to achieve the final form and the intimacy that is such a feature of the building. This may appear a relatively simple task but cable nets are by their nature flexible structures, and joining two parts of a three-sided stadium together, and some considerable time after it was originally built, was not without its challenges. The sequence of loading and adjustment was carefully assessed and co-ordinated to ensure that the final shape meets the geometric aspiration. This involved considerable skill, expertise, and co-ordination between builder and designer.

Awards

2003

British
Constructional
Steelwork
Association
Structural Steel
Design Awards:
Winner

Building
Services
Awards:
Major Project of
the Year

Institution of
Structural
Engineers:
Structural
Special Award

Institution of
Civil Engineers:
Brunel Medal

Institution of
Civil Engineers
North West:
Merit Award

Manchester
Civic Society
Renaissance
Award:
Joint Winner

Association for
Project
Management
Project of the
Year:
Finalist

2002

British
Construction
Industry Award
Major Project
Category:
Highly
Commended

City Life:
Building of
the Year

Leisure Property
Forum Awards:
Major Leisure
Regeneration:
Winner

MSA Design
Awards:
Special Award

Club facilities

Fitting out a 50 000-seat football stadium in which some systems were already commissioned and had been used for the Games was also a feat of engineering and construction co-operation.

The Club commissioned KSS Architects Ltd to lead this fitout design for it and this involved all internal areas of the building. This £15M contract included the full mechanical, electrical, and public health engineering design for fitting out six hospitality suites, kitchens, pantries, Club administration offices, and concourse food, bar, betting and merchandizing concessions.

The services were designed to accommodate typical match days, with the suites providing banquet-style dining with restaurant menus, while on non-match days they have considerable flexibility to accommodate dinner dances, weddings, business conferences, etc. Decorative lighting themes were chosen for each suite to suit the aesthetics of the space, each being served from a dedicated mechanical plant. The electrical services were provided as a seamless extension to the base scheme services. Plasma TVs throughout the suites add to the spectator match experience. All services were fully co-ordinated within the base scheme services risers and plantrooms.

The fitout also included provision of communication cabling for voice/data services throughout the stadium and a fully automatic 'smart card' access control system for all spectators. The system is fully integrated with the ticketing system and has facilities for e-purse, cashless vending, and loyalty schemes.

Handover

Moving a football club from A to B is no small task, and to teach it how the new stadium operates at the same time adds further layers of complexity.

Arup recognized this and, to help the process, did two more key things: organized the relocation logistically, and helped to train the Club's staff in the building's operation. Arup's partner company, Rossmore Dempsey, is a management consultancy specializing in people-led process change, and its planning of the relocation followed the military precision of the construction operation.

Credits

Clients:
Manchester
City Council
Manchester City
Football Club

*Structural, mechanical,
electrical, public health,
civil, fire, acoustics,
geotechnical, transport
planning engineer:*
ArupSport and Arup
Associates

Simone Altmann, Martin Austin,
Mike Banfi, Fergus Begley,
Angela Bennett,
Gavin Blakemore, Mark Boyle,
Tony Broomhead, Nik Browning,
Mike Buckingham, Peter Budd,
Stephen Burrows, Peter Caller,
Graham Campbell,
Tristram Carfrae,
Eddie Carmichael, Bob Carville,
Richard Carroll,
Kevin Connaughton,
Ann Corrigan, Ben Cox,
Colin Curtis, Keith Dakin,
Paul Entwistle, Elsie Firth,
Michael Fyles, Penny Garrett,
Graham Gedge, Richard Greer,
Wendy Grant, Malcolm Gresty,

Enamul Haque, Dennis Harrison,
Richard Henderson,
David Hughes, Paul Hughes,
Ian Humphreys, Naushad Islam,
Andrew Jefferison,
David Johnson, Rich Johnson,
Lindsay Johnston, Lee Jordan,
Ulkem Karaca-Buckley,
Mike King, Phil King,
Chris Lambell, Andrew Law,
Tammi Lawrie, James Leahy,
Charles MacDonald,
Vivien McCullough, Will McLardy,
John McDonald,
Kate McDonald, Roger Milburn,
Richard Morris, Paul Murphy,
Donie O'Loughlin, Darren Paine,
Raj Patel, Dipesh Patel,
Annelise Penton, Judy Pierce,
Neil Phipps, Rachel Pickford,
Terry Raggett, Stuart Redgard,
Roland Reinardy, Marcel Ridyard,
John T Roberts, Ian Rogers,
Diane Scanlon, Mark Scull,
Martin Simpson, Jim Smith,
Caroline Sohie, Lexy Stevens,
Jeffrey Teerlinck, Patricia Thorpe,
David Twiss, Eugene Uys,
John Waite, Lisa Walker,
James Ward, Trevor Wheatley,
Gary White, Michael Wilton,
Andrew Woodhouse, Jason Yi

Design team collaborators:
AMEC Developments Ltd
C2C
Gillespies
KSS Sports and
Leisure Design
Manchester Engineering
Design Consultancy
Sports Turf
Research Institute

Quantity surveyor:
Davis Langdon & Everest

Construction manager:
Laing O'Rourke

Steelwork subcontractor:
Watson Steel Ltd

*Services and fitout
subcontractor:*
Haden Young

Illustrations:
1, 8: Denis Gilbert/VIEW
2, 7: Arup Associates
3-6, 9: Laing O'Rourke Ltd.

Training the Manchester City FC staff in the building's use permitted a smooth handover, facilitated licensing throughout commissioning, and culminated in the Club being ready to hold its first match in the Stadium against FC Barcelona on 10 August 2003 (Figs 1 & 8).

Conclusion

The aspirations of both clients for the City of Manchester Stadium were for a high class, sustainable facility that is economically reliable and a catalyst for regeneration. These aspirations have been met in full and often exceeded. The City of Manchester Stadium is now considered to be one of the best stadia in Europe, with its conversion from athletics to football completed on time and on budget despite the scale and complexity of the task.

Reference

(1) AUSTIN, Martin, *et al.*
Designing the City of
Manchester Stadium.
The Arup Journal, 38(1),
pp25-36, 1/2003.

9. Essential completion, June 2003.

The translucency of the roof and the closed corner vents contribute to spectator comfort as well as promote conditions for pitch growth.

