

Olympic Stadium

Key Benefits of Integration
From an early stage, the team worked to build a joint brand which all the partners would 'sit under', and they are now known as 'Team Stadium'. This collaborative working arrangement was hugely beneficial to the project, and has enabled the supply chain to see themselves as one team and encouraged closer, more collaborative working.
The integrated approach of the team has meant that they were able to absorb changes without affecting the overall programme.
Sustainability is an area of the project where the integrated approach of the team has been vital in helping to achieve the challenging aims set by the Olympic Delivery Authority. The team are performing well against their overall sustainability targets.
The integrated approach of the team facilitated consideration of the 'temporary' aspect of the stadium and meant that decisions made about the legacy of the stadium could be accommodated in a flexible manner.

Introduction

The Olympic Stadium will host the Athletics and Paralympic Athletics events at the London 2012 Games, as well as the Opening and Closing Ceremonies. The Olympic Stadium is a specialist stadium designed to be as sustainable as possible whilst catering for an Olympic event. The £496m project began in 2007 and is due for completion ready for the Olympic Games in 2012.

The Olympic Stadium is located in the south of the Olympic Park on an 'island' site, surrounded by waterways on three sides. Spectators will reach the venue via five bridges that link the site to the surrounding area. Facilities for athletes within the Stadium will include changing rooms, medical support facilities and an 80m warm-up track. Spectator services, refreshments and merchandise outlets will be located outside the venue on a 'podium' that will surround the Stadium, rather than being located within the Stadium itself.

The 80,000 seater stadium is to be significantly reduced in size and capacity post games, to provide a sustainable sports legacy arena. As such, the stadium has been designed to be demountable, so there will be 25,000 permanent seats in the permanent lower tier, with a lightweight steel and concrete upper tier holding a further 55,000 spectators. A 20m-high 'wrap' will encircle the Stadium's upper tier. This innovative design means the upper tier can be dismantled after the Games, and means that decisions made about the legacy of the stadium can be accommodated in a flexible manner.

The Business Case for Integration and Collaborative Working

The business case for integration on this project was clear from the start, as tight timescales meant that to reduce the risk of problems, buildability issues had to be considered at the earliest possible stage. Furthermore, the high profile nature of the project combined with strict cost constraints, plus a challenging brief, necessitated a different, innovative and best practice approach, and so the team recognised that integration and collaborative working would be essential to the success of the project. As such, the team adopted a number of measures which characterise an integrated approach including; early involvement of the team; selection by value; implementation of common processes and tools; measuring performance ; utilising long term relationships and the adoption of modern commercial arrangements.

Furthermore, from an early stage, the team worked to build a joint brand which all the partners would 'sit under', and they are now known as 'Team Stadium'.

Managing Change

On a project of this scale and profile the team have had to be extremely flexible and adaptable to change. Requirements from the Olympic Delivery Authority side have remained consistent but as the London Organising Committee of the Olympic Games (LOCOG) began to ramp up their work, they made some changes to the project scope. As an example of this, it was agreed that the technology needed for the opening ceremony would be installed as part of the construction of the stadium rather than at the end. This additional work was not part of the original project scope, and so led to some delays while the works were catered for. However, the integrated approach of the team to challenges such as these has meant that the team were confident that these changes could be absorbed without affecting the overall programme.

Project Procurement

The high profile nature of the project meant that transparency during the tendering stage was vital. 'Award', an off the shelf evaluation tool, was used at every procurement stage to help establish the evaluation criteria, which were based on seven priority themes, such as health and safety and environment. To bring the team together, the Olympic Delivery Authority arranged for a large scale workshop session to work through the tender documents in detail. Lord Coe, Chairman of LOCOG, and David Higgins, Chief Executive of the Olympic Delivery Authority gave an introductory presentation at the workshop. To encourage high quality tender submissions, it was agreed that an amount would be paid to the successful contractor to cover their costs.

The project was procured on a design and build basis, and 'Team Stadium' were contractually integrated with the design team and the contractors using an NEC3 contract. The project used a target cost contract and there is a pain/share incentive in place.

Early involvement

Buildability was key to the success of the project and early involvement of the supply chain was recognised as being vital to achieving this. Furthermore, it was felt that building a team that had previous experience of building stadia would reduce the risk to the project. As such, many of the team members recruited onto the project had worked on stadium projects previously, including the Emirates and O2 stadia. Many of the project partners had also worked together on previous projects, which helped create a 'one team' atmosphere.

The funders, client, project managers, cost managers, contractors and designers were all brought together with assistance from a consultant project initiation team. From an early stage, the team have worked to build a joint brand which all the partners would 'sit under', and they are now known as 'Team Stadium'. This collaborative working arrangement has been hugely beneficial to the project, and relationships with the supply chain partners have been excellent. Establishment of the 'Team Stadium' brand has enabled the supply chain to see themselves as one team and encouraged closer, more collaborative working. Co-location of the entire team has facilitated this approach, and meant that minor issues could be resolved

quickly and smoothly. Each team member is accountable for their area of work, but there is a no blame culture if any problems or issues arise.

The team acknowledge the importance of communication and team building events in helping to develop an integrated, 'one-team' approach, and they have tried to ensure that there is always an event in the diary. In the past, guest speakers have been invited to present to the team including David Higgins, Tessa Jowell, Gordon Brown and Andrew Burnham, who have also visited the site and talked to the workforce. Social events have been held including charity quiz nights and a team Christmas dinner. Mugs, pin badges and t shirts featuring the company logos have helped to consolidate the one-team ethos. In addition, the team have good relationships with the other teams working on the Olympic Park and visit the other sites. These relationships are reinforced by park-wide initiatives and joint social events.

Maintenance and operational issues were also considered early in the project, and work began on developing facilities maintenance manuals at an early stage to ensure that all relevant information was captured.

Clear communication

Continuous improvement has been encouraged and monthly project team meetings have helped to ensure that communication channels are kept open. A health, safety and environmental leadership team consisting of CLM, the Olympic Delivery Authority and tier one contractors meet regularly to discuss progress against the key theme areas. These then report back to project teams. On the project, worker engagement meetings between the health and safety managers, works management and sub contractors have been held monthly so any issues are discussed in an open setting with a 'no blame' approach. Suggestions for improvement have always been raised up to supervisor level and where possible, taken forward. Specific issues have sometimes required a different communication method, for instance, when asbestos was found on site, all site workers were briefed on the process for removal immediately, followed by a question and answer session.

Focus on, and selection by, value

Contractors were required to demonstrate value for money in terms of materials and labour rates, and external benchmarks were used to test the supply chain. Where possible, smaller packages of work were procured using 'Compete For', an online brokerage system which was used across the programme.

One of the biggest challenges facing the team was the temporary aspect of the stadium. The legacy phase of the stadium remains uncertain, which presented challenges in terms of consideration of whole life value at the procurement stage. However, in some cases the team were able to influence the legacy decisions, and advise that it would be more economical to include features in the design, rather than adding them on at a later stage. This was the case when they came to design the stadium, and as such, the upper seating tiers are designed to be 'dismountable' so they can be removed and reused or recycled after 2012.

The dual nature of the project has meant that different aspects of the building are required to meet different standards. However, the team has found that it can be difficult to source products that are designed for a temporary life and therefore in practice the structural elements of both the temporary and permanent aspects of the building have a design life of up to 60 years. Alternative, temporary products

unconventionally used in buildings are being explored for aspects such as the buildings faster treatment.

Further challenges included the need to 'future proof' the stadium to include future technology developments. It is the first stadium to have opening ceremony requirements built in from the start and consideration has been taken of the lighting and cabling needed for future high definition television requirements. Another challenge for Team Stadium has been procurement of the field of play, which has involved discussions with many different stakeholders. The design and manufacture of an Olympic standard running track and field are highly specialised areas and good quality is essential. All of these considerations were facilitated by the integrated approach of the team.

Sustainability

Sustainability is an area of the project where the integrated approach of the team has been vital in helping them to achieve the challenging aims set by the Olympic Delivery Authority. The Olympic Delivery Authority's 'Sustainable Development Strategy' set twelve park-wide aims covering environmental sustainability issues, such as carbon, water and waste management, and social sustainability issues such as inclusion and accessibility.

The Olympic stadium will be the first venue to be completed on the park and therefore they have been challenged to deliver innovative ways of meeting the sustainability targets. As a response to this, an Environmental Leadership Team was established which includes representation from all the sub contractors and is tasked with helping to drive sustainability throughout the project, and make innovative suggestions for the onsite construction team and project management team.

To meet the stretching targets set in the Olympic sustainability strategy, the team have had to invest in developing new products and processes. For instance, a new kind of PVC product is in development which will have a low carbon impact. Other innovations included investigating the possibility of reducing hydro carbons in the chiller units to reduce carbon emissions, and a prototype roof made from recycled material was developed but unfortunately was found not to be sufficiently fire proof.

The team don't believe that the focus on sustainability has added to the capital cost as they recognise that sustainability is a holistic issue and therefore direct comparisons cannot be made between sustainable and non sustainable building elements.

The team are performing well against their overall sustainability targets and more information about achievements in specific areas is below.

Transport

Deliveries have had to be very tightly controlled to minimise congestion around the site. Trucks making deliveries to the site are held at points on the M11 to reduce queues at the gate. In addition, alternative methods of delivering materials and removing waste have had to be used. 50% of deliveries are being brought in by rail, and further freight is being delivered by boat. As well as logistical benefits this also has a major impact on carbon emissions.

CLM - the team comprised of people from all three consortium members, being Laing O'Rourke, Mace and CH2M Hill International, as well as their second-tier

partners - employed a park wide logistics team to reduce vehicle movements and ensure the smooth running of the site. A consolidation centre has been employed and deliveries require 24 hours notice. Once onsite, all deliveries have a defined route to the main gate and open dialogue and communications have been employed to enable smooth running of the site.

Materials

There is a park-wide target for 25% of all materials (by weight) to contain recycled content. The team saw the biggest opportunity for recycled content to lie in the use of recycle aggregate in concrete. So far, they are on target and have managed to reach 40-50% recycled aggregate and cement replacement. In some cases, disused railway sleepers have been broken down for use as aggregate. Further materials that have a high percentage of recycled content include blockwork and plasterboard. In addition, granite copings that were previously used on a London dock were salvaged and stored for use on this site. One of the biggest achievements of the team was the identification of unused gas pipes which could be incorporated into the compression steel truss.

As well as ensuring maximum percentage of recycled content, the team are also working with the BREEAM assessor to measure the embodied energy of the products that are used on site.

The team are confident that the individual building materials are either recycled or contain a high degree of recycled content. For instance, some of the steel tubing is recycled stock, the concrete has a recycled aggregate content of 20% and they are hoping for a large percentage of recycled content in the stadium seat material. However they have found it difficult to calculate the total extent of recycled content within the whole stadium.

As well as recycled content, the team are also focussed on the recyclability of the building elements. Once the Olympic Games have finished, a large section of terracing and seating will be 'demounted' to be re-used. Discussions have been held with various cities that may wish to purchase the demountable part of the stadium if they are awarded the next Olympic Games.

Carbon

Sir Robert McAlpine is developing a carbon calculator to measure the carbon resulting from the development. A number of measures are in place to try and reduce the amount of carbon produced, and a carbon base line is being established for deliveries to site.

There is a park-wide target for 50% of deliveries to be made by either rail or water. Two wharfs have been constructed to service the park and in addition, Team Stadium has built a small, temporary mooring point on their site. Access to the site is very strictly controlled and the team had to go through rigorous security procedures to gain permission to receive deliveries by barge. The Environment Agency and British Waterways were consulted extensively. The team persevered, and any potential barriers were overcome. This approach has significantly reduced the number of vehicle trips, leading to a huge reduction of carbon emissions.

Sustainable Procurement

A short précis of the Olympic Delivery Authority's sustainable development strategy document is sent out with all tender documents. All prospective sub-contractors are then asked to provide evidence of how they will meet the sustainable development targets. In addition, the sub contractors have to complete an environmental assessment form and environmental compliance schedule outlining how they will minimize waste and how they will conform to the site waste management plan.

Waste

Waste management is being addressed at a project level rather than a programme level. On the stadium project, minimisation of waste has been considered at all stages. For instance, reusable fixings, such as bolts, have been included to ensure that the stadium can be easily deconstructed and reused or recycled at the end of its life. In addition, the team are currently investigating opportunities for reusing the excess toilet blocks which will no longer be needed once the Olympic Games have taken place. Where possible, demolition waste has been reused on site, for instance:

- The buildings demolished on site have been reused as fill for the new development.
- Contaminated soil has been washed on site in a 'soil hospital' and reused on the stadium site or elsewhere in the project.
- Cobblestones found on site have been reused and aggregates have been used as part of the pre cast terracing.

Waste Minimisation

Team Stadium are keen to minimize all waste and have worked with sub contractors to reduce the amount of packaging delivered to site. For instance, the blocks and bricks are delivered on wooden pallets that are returned to the supplier for reuse. In addition, blocks are delivered wrapped in metal bands rather than shrink wrap which reduces the amount of waste on site. The next challenge for the team is to minimize the amount of packaging that is used to protect the seats. Once the seats have been installed they need protection from the weather and from the site work that will continue around them but the team will try and reduce the need for individual cardboard boxes for each seat. To reduce the amount of plasterboard waste, the team have set up a cutting room. This means that offcuts can be clearly identified and reused. Any waste plasterboard is then chipped to increase the volume of material in each skip.

Designing for Deconstruction

As the legacy phase of the stadium remains unconfirmed, it has been constructed so that parts of it could be easily demounted if necessary. Everything above the podium level can be unscrewed and unbolted. All the toilets have been manufactured in pods and can therefore be reused.

Reuse

The scope for the bricks changed which meant that some bricks that had already been laid had to be removed. The team identified this as an opportunity to provide work experience for local students. A group of students that had been excluded from mainstream schools were invited onto the site to help dismantle the walls. They then took the unwanted bricks for use in their training courses.

Recycling

All waste is segregated on site and 96% has been recycled. There is one waste contractor which services the entire park. This means it can be difficult for Team Stadium to measure exactly how much waste is leaving their site specifically.

Measurement

As part of the tender process, sub contractors are asked to estimate how much waste they will produce. These figures are then collated on a spreadsheet to total forecast waste figures and these can eventually be compared against actual waste figures.

Water

Excessive water on site has stopped work on occasion and the team have worked hard to reduce this to an absolute minimum. After discussions with the Environment Agency, the team were able to discharge the excess water using a 'siltbuster'. Through extensive testing the team found that this water had a high ph level. A soakaway was discussed but the Environment Agency expressed concerns. To overcome these problems, the team used 'pillow tanks' which are collapsible and able to store water onsite. The water that is collected goes through a ph dosing kit and siltbuster and can then be used to damp down the site. Excess water can be treated and discharged into the water ways. This water treatment has meant that water that was previously tankered off site can be put to good use thus reducing vehicle movements. Excess water can also be transferred to the onsite lagoons for use in other parts of the site.

Biodiversity

A hawk has been brought on to the site to deter any potential nesting birds.

Social Sustainability

The Olympic Delivery Authority has diversity targets in place and local labour has been employed where possible. To ensure that the final development is accessible to the local community faith groups, family group, athletes groups, accessibility groups and women's groups were all consulted at the planning stage and the designs were adapted accordingly.

Team Stadium have taken part in an Olympic park wide initiative to give local disadvantaged or disabled children the opportunity to attend a week long course at a local sports facility at Stoke Mandeville. The Stoke Mandeville stadium has a special link to the Olympic Games as it hosted the first ever Paralympics. The team have also engaged in fundraising activities such as a sponsored 10km run.

The site achieved a score of 32/40 in their first assessment for the Considerate Constructors Scheme. They endeavour to keep dust and noise levels to a minimum.

Learning and Skills

Team Stadium believe that a happier, better skilled workforce is more productive and works together better and have initiated a joint venture with Construction Learning World to provide opportunities for all those working on site to improve their skills. Numeracy, literacy and English as a foreign language classes are provided on the site with the aim that when the stadium is complete, site workers will leave better skilled and more qualified than when they started. Take up of these courses have been excellent, for instance, all of the canteen workers have signed up to the English

as a foreign language courses. The team were given a commendation by SHEL T for their training initiative.

Local Labour and Apprentices

Team Stadium have used the Olympic Park brokerage service to recruit 17 local workers 16 of whom are still engaged on the site. They have exceeded their 3% apprentices target and have increased the target to 4.5%.

Common processes and tools

The team were co located at the earliest possible stage. The client, contractor and designers have been located in one office since June 2007. The team feel that co location has been vital to developing a 'one team' atmosphere and mutual trust. The team agree that "everyone will get better results if they work together".

A single document management system is now in use across the Olympic park. A document management system was already in place for the Stadium project so the team have continued to use this rather than the Parkwide System. They feel that the new system was developed in isolation and did not take into account the successful features from existing systems. Sub contractors have been given access to the Team Stadium system which does not require them to purchase any new software.

Measurement of performance

Many of the supply chain partners have been procured using the Compete4 system. The software allows the team to map where the contractors are based so they can be compared against local labour targets.

There has been a large focus on health and safety on the project and the team have tried to find innovative ways of communicating health and safety information including quizzes, tool box talks etc.

CLM and the ODA both have high level defined key performance indicators and an incentives system is aligned with these. All parts of the supply chain are aware of the headline project objectives and are required to work towards them. Overall project objectives are set along topics such as health and safety but individual targets within these have also been devised.

Modern commercial arrangements

The project was procured on a design and build contract, and 'Team Stadium' were contractually integrated with the design team and the contractors using an NEC3 contract. The project used a target cost contract and there is a pain/share incentive in place.

It was considered to be commercially advantageous to employ project insurance as it was easier to manage with less bureaucracy. The insurers that provide the project insurance are invited on to site four times per year. The project team and insurers are happy with the project insurance and have not had to make a claim. The project has employed full open book accounting between the client and the tier one contractors however, a single project bank account was not deemed necessary and, instead an 18 day payment period between client and contractor was employed.

Knowledge Transfer

There are many forums established to facilitate learning between projects across the park. Park wide health and safety forums are held regularly and cross park meetings are regularly held at every level from CLM project manager, to director, to environmental manager meetings.

A team from the project visited the Beijing Olympics so that any lessons from that project could be taken forward. In addition, the International Olympic Committee provided top tips from previous Olympic games.

Health and Safety

Team Stadium have made Health and Safety an absolute priority and have the following stated objectives:

“When the Olympic Flame is lit in 2012, we will be proud to say, for the first time in the modern history of the games, that the London Olympic stadium was constructed without the loss of a single life.”

“Team Stadium is committed to everyone working on the Olympic Stadium going home safe and without injury”

To achieve these objectives, they have brought together an integrated supply chain Health and Safety leadership team consisting of 24 senior representatives from each member of the supply chain including:

- Imtech Meica
- Byrne Brothers
- GBG Scaffolding
- CLM
- Crosby Electrical
- E&S H&V
- Fastglobe Mastic
- Severfield Rowan
- Galostar
- Team Stadium
- Watson Steel Structures
- Clipfine
- T. Clarke
- Keltbray
- Prater Roofing
- ODA
- PJ Carey
- Senator

This integrated team approach helps to bind the team even more closely together and shows that they are working towards one collective objective. The Health and Safety Leadership team have a clear and public remit:

- To provide the vision and champion the elimination of all worker injury.
- To support the individual and organisational commitment to eliminating injuries.
- To continually enrol sceptical groups and individuals into the possibility of everyone going home safe every day.

- To surface and address the perceptions, assumptions and beliefs held by Managers, Supervisors and employees that cause them to act, or not act, in ways detrimental to safety.
- To create an environment where individuals are equally respected for who they are as people, as well as how good they are at their jobs.
- To develop and implement a plan to change the culture of the organisation in support of everyone going home safe every day.
- To manage the culture change in a manner which builds on the existing safety infrastructure.
- To enrol and direct employees in their roles and responsibilities in support of the plan.
- To establish a mechanism for capturing and documenting key processes, experiences and lessons learned that can be used within future process implications within the Project Leadership team
- To develop and implement a system for regularly gathering and reporting both qualitative data relative to progress towards the elimination of all worker injury.

Members of the leadership team meet regularly with groups of twelve workers at a time to engage with them about health and safety issues and to ask the workers about their experience on site. In addition, the team also have a Time for Safety briefing once per quarter to gather the whole site team together to discuss and communicate any onsite health and safety issues.

Team Stadium demands strict minimum training standards for supervisors working on site. Not common in the UK construction industry, all supervisors are required to have SMSTS, IOSH or equivalent supervisors' qualifications. In addition, each supervisor is required to take the Team Stadium Supervisors induction written test paper and is encouraged to attend the SHELТ supervisors' course on Leadership and Communication. All site operatives are also invited to attend a half day behavioural safety course.

As a result of this relentless focus on health and safety the accident rates on the Olympic Stadium are low. As well as reportable accidents and minor injuries, the team encourage site workers to report near misses. As some workers can be reluctant to report the near misses, the team provide various incentives. For instance, for every near miss recorded £1 is donated to charity. In addition, a monthly award is given for the best near miss report.

In recognition of the innovative and successful approach to health, safety and the environment the team were given the 'Commitment to Exemplar Performance' award at the ODA annual HS and E Awards Dinner. Their tower crane rescue team also achieved a SHELТ innovation award.

Occupational Health

Good welfare facilities for site workers have been considered a priority with onsite showers and good food provided. As well as this, all site workers were given the option of a health screen prior to starting on site and occupational health campaigns have been held to raise awareness of the dangers of high blood pressure, sexual health etc. To enable clear communication the team have engaged with a local training supplier to provide English as a foreign language classes for site workers.