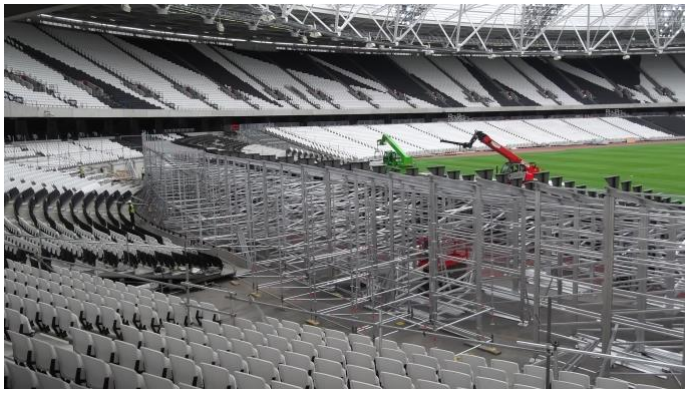
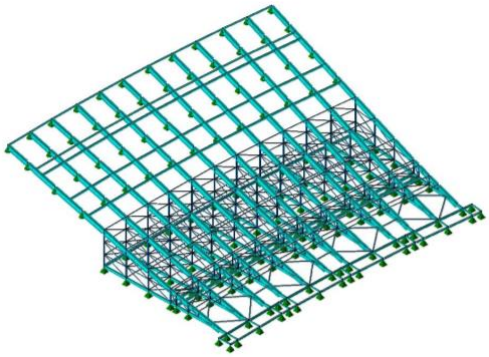
Nolan Associates
consulting civil and structural engineers

# London Olympic Stadium Transformation

## Project Details





Nolan Associates where appointed as structural engineers by Alto Group to design the retractable grandstand lower tier seating system as part of the legacy conversion of the London Olympic Stadium

## The Structure

The development involved transforming the lower tier seating bowl by installing a retractable seating system which can be used for both athletics and pitch sporting events. The stadium will eventually be handed over to West Ham United Football Club from 2016 onwards, for use as their permanent football ground, with the provision of also being used for additional athletics or pitch sporting events in the future.

The lower tier will have a capacity of approximately 20000 and an overall capacity of 54000 when used in pitch mode.

The structure comprises the construction of moveable grandstand modules and seating overbuilds, built from structural aluminium extrusions bolted and braced together to the North, East, South and West of the stadium. The structure has been designed for three modes of transformation, these being transition, athletics and pitch.

### Transition Mode

In this mode the stands are driven forward in faceted sections on motorized wheels, ready to be transformed into pitch mode. The East and West stands have am 8.8m rear raker section which has been designed to cantilever during transition. The front 7 seat section has been designed so that it is removable which allows for greater flexibility for use of the stands for different pitch events.

### Athletics Mode (Retracted)

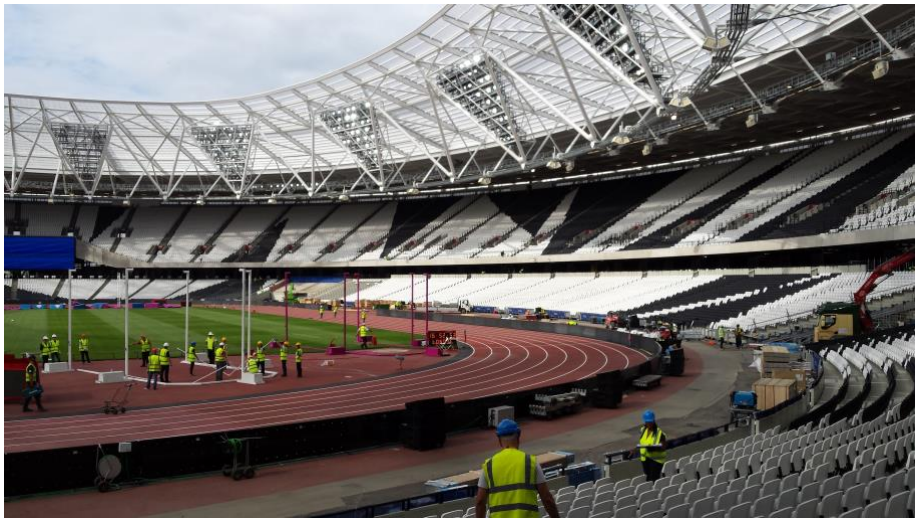
In this mode the rear cantilever section to the East and West stands oversails the existing concrete terracing and is supported off leg jacks onto the upstand sections of the terrace units. All the main vertical posts are supported off leg jacks under the base frame in the permanent case when used for Athletics events.

Pitch Mode (Extended)

After transition, 2 no frame lines are dropped down from the rear cantilever section (hinged in storage mode within the depth of the raker) and braced to form a tower support structure to the rear, effectively changing the cantilever to a continuous beam. To finish the transformation, walkways, bridges, disable access platforms and mid tier infill sections are constructed from demountable aluminium components bolted together which can be taken down when transforming back to athletics mode.

All the stands are braced in both longitudinal and transverse directions, using a combination of picture frames and snap on braces. The picture frames are made up from aluminium extruded box section profiles which are pre-bolted together to form a braced frame and fixed to the columns to tie the transverse frames together to form a module. The snap on braces are bespoke trapezoidal aluminium extruded sections which snap on and clamp to a prefixed bolt to the face of the column sections. The snap on braces can be released and detached from the columns via a spring mechanism when transforming the stadium.

All the stands are supported off baseplates onto the existing concrete surface with no foundations.



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| Main Client | LLDC |
| Main Contractor | Balfour Beatty |
| Main Architect | Populous |
| Grandstand Seating Contractor | Alto Seating |
| Grandstand Seating Architect | LE1 Architects |
| Cost | £15 Million |