

Pell Frischmann

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London Stadium Relocatable Seating

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Feasibility Study Executive
Summary

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1. Introduction

1.1 Scope of the report

The scope of this document is to provide a summary of the outcomes of the investigation to establish the feasibility of an alternative solution to the current relocatable seating system that would enable a quicker and lower cost transition between football and athletic modes. The initial study, presented in the Feasibility Study report issued on May 2017, has been expanded in sufficient detail on structural, civil and MEP engineering, to allow the cost consultant to prepare a preliminary costed budgets for each of the proposed technical options and to account for the existing constraints, including potential demolition of the lower concrete tiers and relocation of plant rooms and key utilities.

Therefore, this document has to be read in conjunction with the following reports and sketches:

- A. 13303-PF-ZZ-XX-RP-S-0001 Rev.C “LS Relocatable Seating, Feasibility Study”, by Pell Frischmann
- B. 13303-PF-ZZ-XX-RP-S-0003 Draft – “Technical Options Comparison Table”, by Pell Frischmann
- C. PF-KA-13303S0002 Rev.A “Proposed Relocation Option Permutation” by Pell Frischmann
- D. 1609-50-RPT-01 Isse No.05 “London Stadium, MEP Services Diversions Assessment”, by Desco
- E. “London Stadium Relocatable Seating, Cost Model”, by Corefive

1.2 Glossary of terms

The terminology listed below is recurrent in this document and in the aforementioned associated reports. For the purposes of this document, the following definitions apply:

- s.43 [Redacted]
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- s.43 [Redacted]
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 - s.43 [Redacted]
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- s.43** [Redacted]
- s.43 [Redacted]
- [Redacted]
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- **s.43** [Redacted]
- **s.43** [Redacted]
- **s.43** [Redacted]
- **s.43** [Redacted]

2. Design Brief

2.1 Objectives and key parameters

The London Borough of Newham appointed Pell Frischmann to undertake an investigation to establish the feasibility of an alternative solution to the current relocatable seating system that would enable a quicker and lower cost transition between football and athletic modes, to target the following key operational requirements:

- Target transition time - 7 days or less (per transition)
- Target transition cost - £300k (per transition)

The Capital Expenditure required to achieve the brief's targets has not been defined or limited, and it will be considered by the interested parties in relation to the whole scheme, with due consideration to the time scale of the possible upgrade and to the efficiency of the upgraded transition procedure.

The Feasibility Study was completed in 8 weeks, from the appointment to the submission of the final report.

After a preliminary and introductory site visit on November 15th 2016, a kick-off meeting between Pell Frischmann and the LBN's representative was held on February 3rd 2017, during which the following key aspects of the brief were indicated:

LBN also clarified that the study was not meant to be a review into the current system, even though the current system constraints and operational experiences should be considered to inform a solution.

Pell Frischmann's engineers visited the site on several occasions (08/02/2017, 17/03/2017 and 23/03/2017) and a project workshop with all the involved parties was held at Pell Frischmann premises on March 16th 2017.

2.2 Background Studies

The need for multi-purpose venues is a technical and financial challenge which has been addressed on many occasions and in different locations, and it has been approached and solved in a range of different ways, even though a number of common issues and design criteria can be identified in all the cases we studied.

The analysis of the different situations, requirements, and adopted solutions around the globe provided a valuable knowledge for the development of the feasibility study Pell Frischmann carried out and which is described in this document.

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3. Existing Constraints

3.1 Operational experiences

The relocatable seating currently operated in the London Stadium reflects, at least in principle, the original concept design of the redevelopment, although it is not capable of the desired fully automated features.

The lateral East and West stands are moved in segments using air skates and fork-lifts, while this technique is used only on a portion of the North and South stands. All the additional seats, the disabled platforms, the walkways and the rest of the accessory elements are demountable and stored outside the venue when not needed. Their installation requires transport to site, partial assembly on the pitch side, and lifting into position using mobile cranes.

The retractable portion of the stands is built with aluminium modular components, which are used also to support the additional seats. Walkways, on the contrary, use scaffolding-type elements, producing on site a mix between two different systems. The number of elements used to assemble the demountable portions is relevant, and each element requires to be manually bolted to the adjacent ones. In addition, there is a number of bespoke elements to complete the finishing.

The retractable stands were designed to be moved using low pressure wheels and slide on channels recessed into the ground, using a hydraulic system. The system was tested off site in standard theoretical conditions, but proved itself inefficient when applied on the stadium premises, mainly due to the combination between the lack of directional control of the unit in transition and the uneven surface of the track. It has been replaced with air skates, to lift the single module, and fork-lifts to move it into position.

All these factors added complexity to the transition procedure and the logistics associated, yielding to longer than expected transition periods and to the consequent combination of increased transitions costs, due compensations and loss of revenue.

3.2 Key challenges

The transition procedure in place in the London Stadium is affected by a number of issues that limits its efficiency, yielding to extremely long and costly transitions between the football and athletics modes.

The main challenges to be considered in developing alternative options to the current system, are:

- Large number of different components with a substantial lack of standardisation
- Use of a mix of different systems.
- Segments are lacking intrinsic stability and, therefore, ballast is required to ensure stability during transitions
- Storage outside the venue is required when the seating stands are in the retracted position

The field situation has been made more complex because of:

- Original hydraulic system did not perform as expected
- The lack of directional control of the unit in transition
- The uneven surface of the track does not facilitate the transition

The combination of all this issues resulted in increased complexity of the transition procedure and logistics, with the following consequences:

- Numerous required operators and therefore a high incidence of labour
- Bespoke instructions for each section
- Increased need for equipment
- Transport to and from the venue of the demountable elements

- External allocated storage space for the demountable elements
- Other site constraints to be considered in developing this option study are:
- Modification programme constrained by committed events
 - Stadium concourse level and general arrangement
 - Extent of roof coverage

4. Proposed Relocation Systems

4.1 Key Criteria

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4.2 Proposed Options

- 4.2.1 s.43 [Redacted]
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4.2.5 s.43 [Redacted]

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4.5 Comparison Tables


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4.5.1 Applicability

TECHNOLOGY OPTIONS	
Bobby Moore Stand (North Stand)	
Sir Trevor Brooking Stand (South Stand)	
East Stand (Additional Seating)	
West Stand (Hospitality Area)	

Table 4.5.1 s.43



4.5.2 Site constraints

NR	
1	
2	
3	
4	
5	

Table 4.5.2 **s.43**

4.5.3 Invasiveness

NR	OPTION	NO DEMOLITIONS	LOWER TIER PARTIAL DEMOLITIONS	LOWER TIER EXTENDED DEMOLITIONS	EXCAVATIONS	NOTES
1						
2						
3						
4						
5						

Table 4.5.3 **s.43**

4.5.4 Pros and Cons

NR	OPTION	PROS	CONS
1	S.43		
2			
3			
4			
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5. The next design stage

5.1 Recommended actions

The purpose of the next stage should be the detailed evaluation of the different options to identify which one is more efficient for the London Stadium and, therefore, which one should be developed into detailed and technical design and consequently tested, tendered and implemented.

The evaluation of the options is not solely technical; it requires a detailed financial analysis to identify the initial investment required (Capex), the operational performances in term of costs (Opex) and time, the effects of the upgrading the remaining part of the stadium - for example demolition, service and equipment relocations, etc. - and the impact of the construction programme on the utilization of the venue. This process can be done in two phases, shortlisting two options during a preliminary evaluation phase, and choosing the option to develop after a more detailed evaluation. The assessment of the operational costs requires specific studies on site logistics, transition procedures, and planned maintenance.

Since the study should cover occupancy and services matters, and to provide the level of detail required to accurately evaluate the potential solution, the design team may need to be expanded to include an expert in sport venue design and the design scope should be extended to other disciplines normally not involved in the design process, for example experts in logistics, maintenance and temporary structure handling. A detailed and comprehensive design will reduce the risk associated with the site implementation of the system and the associated contingency costs.

If possible, involving the system contractor/operator in the design from the earliest design phases, will be beneficial and will contribute to de-risking the intervention.

We strongly suggest accompanying all the technical evaluations with field tests on all the critical elements of the systems, for example the material to create the flat surface over the track, the manoeuvrability of the segments, the reliability of the technology used to relocate the stands, the lifting equipment, and the training and maintenance requirements, to achieve the transition targets as specified in the client's brief.

For an effective procedure, that minimizes the transition time, crew training is crucial and it should be accounted for in planning the system and its operations. Regular training session, with actual relocation of portions of the stands, should happen in the month preceding the full transitions, in particular during the periods between matches in the football season.

5.2 Suggested Programme

The feasibility study should be followed by a concept design of the different options, to evaluate the best solution for the London Stadium.

The chosen preferred selected solution will be developed into detail and technical design, with regular reviews from all the parties involved, and the aid of field tests to experiment the feasibility of each elements in the context of the specific venue. The outcome of the field tests may require design rethinking or amendments, so finalizing the design in all aspects can take longer than usual and therefore appropriate time resources should be allocated for the design process.

Depending on the solution chosen, phased construction can be coordinated with the football season, minimizing the time during which the venue is not available to host events.

