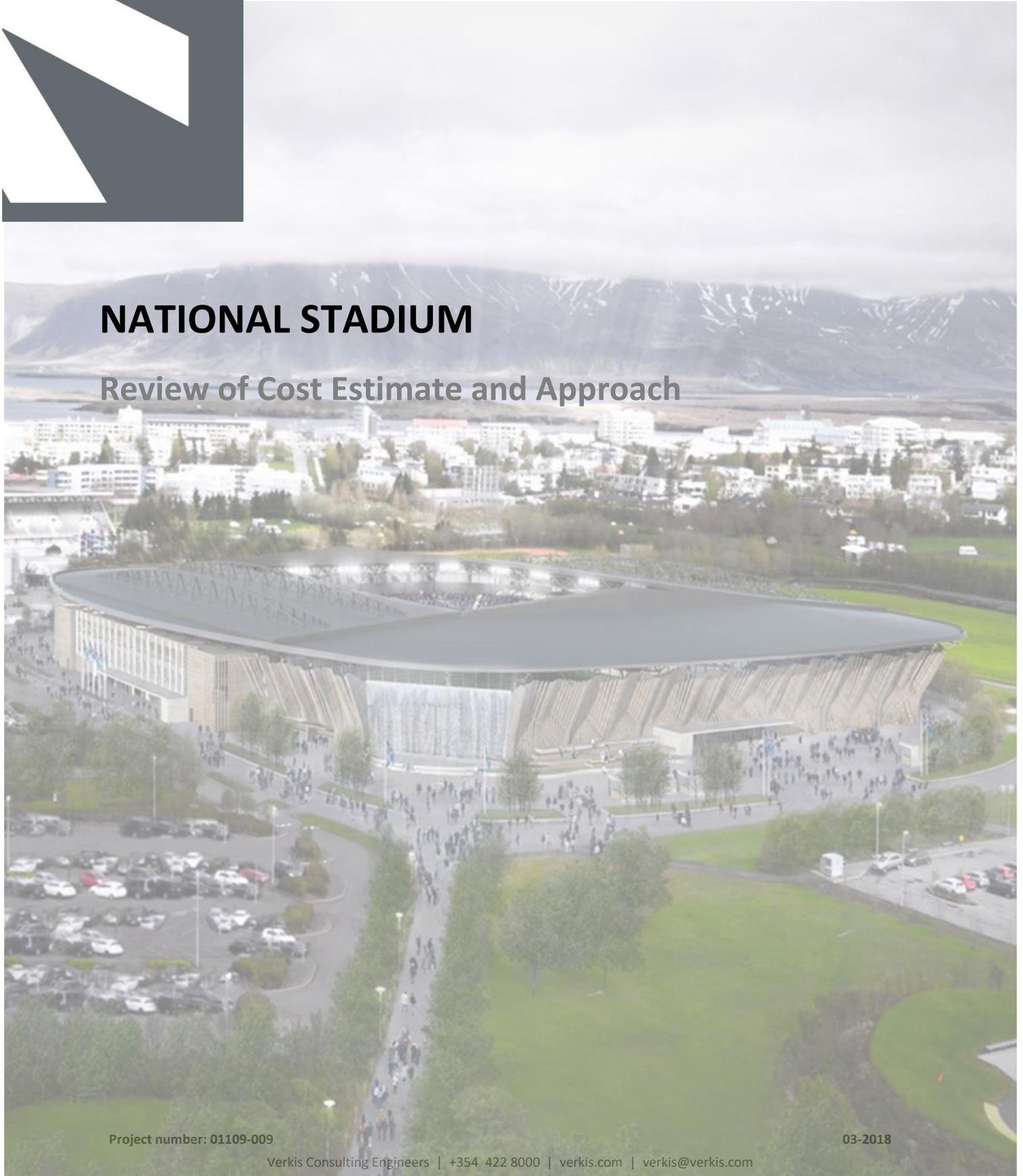




NATIONAL STADIUM

Review of Cost Estimate and Approach





NATIONAL STADIUM – 2018

MEMO

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Abstract

Lagardère Sports (LS) have prepared a feasibility study for the Icelandic Football Association (KSÍ) for a new National Stadium in Laugardalur, Reykjavík.

Verkís has reviewed the available LS presentations and capital cost estimates for the two scenarios addressed by LS, scenario A (open roof) and scenario B (retractable roof).

In general, Verkís finds the LS presentations informative regarding all functional aspects and solutions for the two different scenarios A and B. After review of all available information, it is clear that the main emphasis is on outlining the possible solutions for the stadium. The capital cost estimates are clearly initial estimates and expected to be further developed in future stages of the project.

Scenario A estimated by LS as 43,2 M EUR or 5.000 MISK is an adequate estimate for a low-cost stadium with an open roof and without a surrounding façade. The LS total cost estimate for scenario A equals 2.375 EUR/seat which corresponds well with the result of Verkís research showing a total cost for similar stadiums in Germany and Eastern Europe to be in the range of 1.300-2.537 EUR/seat. This stadium standard is however not in good harmony with the LS presentations which indicate a stadium of UEFA category 4 amenities surrounded by a façade.

Verkís recommends adjusting the estimate for scenario A as follows:

- to include cost for a façade
- to increase the cost estimate for the basic concrete and steel construction

Scenario B for a stadium with a retractable roof estimated by LS as 71,2 MEUR or 8.300 MISK is an underestimate. The LS total cost estimate for scenario B equals 3.627 EUR/seat, while the result of Verkís research shows the total cost for similar stadiums to be more in the range of 5.204-11.424 EUR/seat.

Verkís conclusion is subject to high uncertainty and it is not possible to suggest a definitive revision of the estimate for scenario B at this stage and without further design.

There are several exclusions in the LS cost estimates, which is quite normal. These exclusions will need to be priced in future revisions of the cost estimate.



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1 Introduction

Lagardère Sports (LS) have prepared a feasibility study for the Icelandic Football Association (KSÍ) for a new National Stadium in Laugardalur, Reykjavík. The Icelandic Government and the City of Reykjavík have appointed a committee in collaboration with the Icelandic Football Association (KSÍ) to evaluate the LS proposals for the Stadium.

The committee has requested Verkís to assist in reviewing LS cost estimates and assumptions and to assist in assessing the capital cost of the stadium. Additionally, Verkís is to review items related to the engineering approach to the project and the risk during construction time. Verkís task was limited to mainly reviewing the capital cost estimates of the two scenarios and also to comment on the overall proposed project approach.

Verkís has reviewed the available LS presentations and capital cost estimates for the two scenarios addressed by LS, scenario A (open roof) and scenario B (retractable roof).

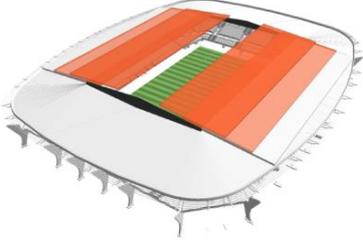
During the review Verkís requested additional information from LS regarding build-up of the cost estimates. One work meeting was held on 28 February 2018 with LS and KSÍ representatives [3]. Additional information was received in form of LS comments to the meeting MOM [4]. Comments were also provided by LS consulting company Institut für Sportstättenberatung (IFS) [5].

Following are our comments and conclusions.

2 Critical Assumptions

Lagardère Sports (LS) have prepared a cost estimate for two different scenarios, A and B. The main assumptions used for these two scenarios are listed in Table 2.1 here below.

Table 2.1 LS main assumptions for scenarios A and B

	Scenario A	Scenario B
Stadium type	<p>Modern football stadium</p> 	<p>Multifunctional arena (iconic landmark)</p> 
Stadium standard	UEFA Category 4 stadium ¹	Top standard for football and event requirements
Roof over pitch	Open	Retractable
Capacity football events	17.500 (all seated)	20.000 (all seated)
Hospitality	New hospitality concept in existing West stand	Dedicated hospitality building at East stand with skyboxes
Event days	Increased number of event days	365 days a year multipurpose usage
Existing athletic track	Removal of athletic track	
Existing main West stand	Continued use, removal of added wings	
Existing East stand	Removed	
Surrounding stadium bowl	New South, North and East stand	
Pitch	Moved closer to existing West stand	
Pitch surface	Natural turf	
Estimated construction cost	5.045 million ISK 43,2 million EUR	8.306 million ISK 71,2 million EUR
Estimated yearly operating profit	90 million ISK 0,8 million EUR	149 million ISK 1,3 million EUR
Return on Investment ²	1,8%	
Payback period ³	55-56 years	

¹ Stadium is claimed to be according to UEFA Category 4, but LS cost estimate is partly based on stadium design for 2. Bundesliga in Germany.

² Time value of money has not been considered in this basic calculation.

³ Time value of money has not been considered in this basic calculation.



Table 2.2 shows the main differences between specific requirements for football stadiums in the German 2. Bundesliga versus requirements for UEFA Category 4 stadiums.

Table 2.2 Comparison of 2. Bundesliga and UEFA Category 4 stadiums

	2. Bundesliga	UEFA Category 4
Capacity	Min. capacity of 15.000, whereof at least 3.000 seats, preferably 4.500	Min. capacity of 8.000, no stands allowed
Roof structure	At least 1/3 of all seats must be covered	All seats must be covered
Minimum average horizontal illuminance	1.200 Eh(lux)	1.400 Eh(lux)
Pitch	Natural turf	Natural turf or artificial football turf with FIFA certification
Hospitality	No hospitality area required	400 m ² and at least 600 seats
CCTV system required	No CCTV system required	Permanent video surveillance inside and outside the stadium with colour monitors in the control room
Ticket system	No electronic ticket system required	Turnstiles and electronic ticket control system to deliver real-time flow rates and entrance numbers



3 Review of LS Cost Estimates

The LS cost estimate includes 18.183 seats for scenario A and 19.933 seats for scenario B. Other LS documentation [8] lists up to 20.968 spaces. The main reason for the difference is a different definition of the individual stands physical battery limits. Table 3.1 lists the capacity for the two scenarios.

Table 3.1 Comparison of capacity

New seats	LS Estimate		LS [8]
	A	B	B
North Stand	3.500	4.000	6.040
South Stand	3.500	4.000	5.580
East Stand	5.250	6.000	6.040
West Stand	2.625	2.625	
Total new seats	14.875	16.625	17.660
Existing (West stand)	3.308	3.308	3.308
Total seats	18.183	19.933	20.968

The above numbers are approximate and some variations are observed in the LS documentation, e.g. the most recent presentation refers to capacity for scenario A as 17.500 and scenario B as 20.000 [6]. LS has informed that the estimates for both scenarios A and B are based on experience from other stadiums in Europe.

The cost is first calculated assuming Germany as location and converted to cost in Iceland by a location multiplier of 1,44:

$$\text{Cost in Iceland} = 1,44 \times \text{Cost in Germany.}$$

The conversion of cost for this type of facilities from Germany to Iceland is subject to considerable uncertainty. Conditions in Iceland vary considerably from conditions in Germany. One important aspect is proximity of suppliers, e.g. suppliers of prefabricated elements which constitute a considerable part of the construction cost.

Verkís asked LS to provide information on specific reference projects. The information received was incomplete. Only names of reference projects were provided and no specific cost information. Verkís therefore had to obtain this information from publicly available sources. This is discussed further in section 4 Comparison to Other Stadiums (Benchmarking).

Price level is 2017.

Exchange rate is 1 EUR = 116,669 ISK.

Verkís has reviewed the LS cost estimates for scenarios A and B.

The review concentrated mainly on the most substantial cost items.



3.1 Scenario A (Open Roof) Cost Estimate

According to information obtained from LS the estimated capital cost is based on experience from similar facilities in Europe. A breakdown was provided [1]. This breakdown is based on unit price for certain items and lump sums for other items.

Not all exclusions are stated in the LS estimate, but have been clarified [3] [4].

The main items in the LS estimate are depicted in Table 3.2 below.

Table 3.2 LS capital cost estimate

Description		LS estimate EUR	Rounded EUR
A1	Demolition and removal	178.560	
A2	Site Preparation & Installation	324.000	
C	Structure	8.568.000	
M&E	Mechanical & Electrical, general	5.013.000	
M&E_e	Mechanical & Electrical, special (event rel.)	2.919.600	
S	Seats	1.323.000	
IF1	Interior finishing, new facilities	0	
IF2	Interior& Exterior finishing, existing facilities	5.616.000	
P	Pitch & landscaping	2.751.120	
	Direct Cost	26.693.280	26.700.000
D	Design (12,5%)	3.336.660	
PM	Project management (5%)	1.334.664	
MA	Marketing	288.000	
MISC	Miscellaneous (10%)	2.669.328	
	Indirect Cost	7.628.652	7.600.000
	Total Stadium	34.321.932	34.300.000
5%	Planning Costs		1.715.000
	Total Construction		36.015.000
10%	Contingencies		3.601.500
10%	Owner Costs		3.601.500
	Total without VAT		43.218.000

Exclusions:

- Value Added Tax (VAT)
- Cost of land
- Public fees (building right, road fee, utilities)
- Roads & parking areas
- Relocation of existing sewer & utilities
- Façade

Price level is 2017.

Exchange rate is 1 EUR = 116,669 ISK.



3.1.1 A1 Demolition and Removal

Estimated cost = 178.560 EUR = 20,8 MISK.

This includes:

- Concrete structures of the North (N), South (S), and East (E) stands
- Concrete structure of extensions of the existing West (W) stand
- Roof structures of the E and W stands
- Pitch and other structures

Verkís estimates the removal work to roughly include removal of 3.000 m³ to 4.000 m³ of concrete and 400 tons of steel.

The cost for this type of work is difficult to estimate and Verkís has not been able to obtain any dependable information on this cost.

This cost is however a small percentage of the total.

3.1.2 A2 Site Preparation & Installation

Estimated cost = 324.000 EUR = 37,6 MISK.

LS definition of Site Preparation includes a.o.:

- Waste handling
- Removal of vegetation and unsuitable materials
- Substructure preparations (pile foundations)
- Relocation of existing main sewer (excluded from estimate)
- Relocation of existing utilities (excluded from estimate)

It has been clarified in meetings with LS that relocation of the existing sewer and utilities is not included in the estimate. The above definition of Site Preparation and Installation includes less scope of work than Verkís is used to. The estimated cost amounts to 1,2% of the direct cost. Considering the limited scope, the estimate seems to be adequate.

Again, this cost is a small percentage of the total.

3.1.3 C Structure

Estimated cost = 8.568.000 EUR = 1.000 MISK.

This includes:

- Earthwork
- Concrete foundations
- Slab on grade
- Concrete superstructure
- Overhanging roof over spectators

The cost is estimated at 400 x 1,44 = 576 EUR/seat or 67.201 ISK/seat.

No further breakdown of this unit price has been provided by LS.

IFS commented that this can be confirmed as a serious assumption for a stadium of 2. Bundesliga standard.

The standard of 2. Bundesliga stadiums is considerably lower than UEFA category 4, which should be the basis of the estimate, see comparison of stadium requirements in Table 2.2.

LS uses the same unit cost for the structure part of both scenario A and B.

Verkís has analysed this cost in some detail as it forms a considerable part of the direct cost and is relatively easy to analyse. A simple structural model was established for quantity development. An estimate was compiled and then converted to cost per seat. The result is presented in Table 3.3.



Table 3.3 Cost per seat

Cost per seat	Verkís ISK	LS ISK
Earthwork	20.000	
Concrete foundations	6.000	
Concrete superstructure	80.000	
Slab on grade	19.000	
Overhanging roof	35.000	
Total cost per seat	160.000	67.201

Verkís estimate is subject to large uncertainty. The difference is however significant and the LS estimate is found to be too low. This can only partly be explained by different conditions in Germany, where pre-fabrication is more advanced and prefabricated elements can e.g. be produced in eastern Europe and transported by road to the final location.

IFS comments refer to 2. Bundesliga facilities where the roof structure is simple and only needs to cover 1/3 of the spectators.

Proposed revision:

Re-estimated cost = 160.000 ISK/seat x 14.875 seats = 2.380 MISK (excluding façade).

Renderings in the LS presentations show an impressive façade around the whole stadium, whereas the estimate does not include any façade.

3.1.4 M&E Mechanical & Electrical, General

Estimated cost = 5.013.000 EUR = 585 MISK.

This includes:

- Sanitary installations
- Electrical installations (excluding floodlight)

The cost for the new seats/spaces is estimated at 150 x 1,44 = 216 EUR/seat or 25.201 ISK/seat. Verkís considers the estimated cost to be adequate.

3.1.5 Mechanical & Electrical, Special (Event Related)

Estimated cost = 2.919.600 EUR = 341 MISK.

It is not possible for Verkís to comment on this cost based on the information provided.

3.1.6 Seats

Estimated cost = 1.323.000 EUR = 154 MISK.

Verkís considers the estimated cost to be adequate.

3.1.7 Interior& Exterior Finishing, Existing Facilities

Estimated cost = 5.616.000 EUR = 655 MISK.

Verkís considers the estimated cost to be adequate.

3.1.8 Pitch & Landscaping

Estimated cost = 2.751.120 EUR = 321 MISK.

Verkís considers the estimated cost to be adequate.



3.1.9 Indirect Cost

Table 3.4 lists the indirect cost as estimated by LS.

Table 3.4 Indirect cost

D	Design (12,5%)	3.336.660
PM	Project management (5%)	1.334.664
MA	Marketing	288.000
MISC	Miscellaneous (10%)	2.669.328

Marketing is not usually included in Capital Cost, usually part of Owner's cost or Operations. This is however an insubstantial item.

The 12,5% for design is normal, but low if design of an "iconic landmark" is the goal.

The 5% for Project management (PM) is adequate as a percentage assuming that the main PM is with the construction contractor.

The 10% for miscellaneous is normal for known but not costed items.

3.1.10 Contingency

The estimate contingency is estimated by LS as 10%.

Verkís would normally expect a higher contingency to be applied at this stage of a project. LS was asked to clarify this and the following clarification was received, see also [4]:

"We consider 5-10% for "miscellaneous", 5% for "planning costs", 10% for "owner costs", and 10% for "contingency" as adequate. Since our approach is different from the traditional approach (see previous comments) we have a much higher cost accuracy. In addition, the 10% owner costs normally include the project management fees (see "employer's costs") and planning costs (below the subtotal). This means we have an additional 10% reserve (to make sure we accommodate for whatever is necessary)."

Verkís does not agree with the statement that that the LS approach is different from a traditional approach. A "Design & Build" approach is quite common for this type of project.

LS has added 10% for miscellaneous before adding contingency. This can at least partly justify a lower than normal contingency amount.

Verkís can't however meaningfully recommend a specific contingency amount due to the fact that LS has not defined what the contingency cost is expected to cover.



3.2 Scenario B (Retractable Roof) Cost Estimate

According to information obtained from LS the estimated capital cost is based on experience from similar facilities in Europe. A breakdown was provided [2]. This breakdown is based on unit price for certain items and lump sums for other items.

Not all exclusions are stated, but have been clarified [3] [4].

The main items in the LS estimate are depicted in Table 3.5 below.

Table 3.5 LS capital cost estimate

Description		LS estimate EUR	Rounded EUR
A1	Demolition and removal	178.560	
A2	Site Preparation & Installation	324.000	
C	Structure	9.602.604	
M&E	Mechanical & Electrical, general	3.670.812	
M&E_e	Mechanical & Electrical, special (event related)	3.027.600	
S	Seats	1.512.000	
IF1	Interior finishing, new facilities	792.000	
IF2	Interior& Exterior finishing, existing facilities	4.392.000	
P	Pitch & landscaping	2.902.320	
R	Retractable Roof	21.600.000	
	Direct Cost	48.001.896	48.000.000
D	Design	3.840.152	
PM	Project management	1.920.076	
MA	Marketing	288.000	
MISC	Miscellaneous	2.400.095	
	Indirect Cost	8.448.322	8.500.000
	Total Stadium	56.450.218	56.500.000
5%	Planning Costs		2.825.000
	Total Construction		59.325.000
10%	Contingencies		5.932.500
10%	Owner Costs		5.932.500
	Total without VAT		71.190.000

Exclusions:

- Value Added Tax (VAT)
- Cost of land
- Public fees (building right, road fee, utilities)
- Roads & parking areas
- Relocation of existing sewer & utilities

Price level is 2017.

Exchange rate is 1 EUR = 116,669 ISK.



3.2.1 A1 Demolition and Removal

Estimated cost = 178.560 EUR = 20,8 MISK.

The estimate is the same as for scenario A, see discussion in 3.1.1.

3.2.2 A2 Site Preparation & Installation

Estimated cost = 324.000 EUR = 37,6 MISK.

The estimate is the same as for scenario A, see discussion in 3.1.2.

3.2.3 C Structure

Estimated cost = 9.602.604 EUR = 1.120 MISK.

LS uses the same unit cost for both scenario A and B, see discussion in 3.1.3.

It was explained in a meeting that this cost includes an overhanging roof in scenario A and that the cost of the retractable roof in scenario B is therefore only the differential cost between B and A [3].

Proposed revision:

Re-estimated cost = 160.000 ISK/seat * 16.625 seats = 2.660 MISK.

3.2.4 M&E Mechanical & Electrical, General

Estimated cost = 3.670.802 EUR = 428 MISK.

LS uses the same unit cost for both scenario A and B, see discussion in 3.1.4.

The only difference in the supporting spaces as compared to scenario A seem to be the Skybox.

Scenario B requires internal lighting in the stands and the unit price per seat would be expected to be higher than in A. Verkís can't however estimate the difference based on the available information.

3.2.5 Mechanical & Electrical, Special (Event Related)

Estimated cost = 3.027.600 EUR = 353 MISK.

It is not possible for Verkís to comment on this cost based on the information provided.

3.2.6 Seats

Estimated cost = 1.512.000 EUR = 176 MISK.

Verkís considers the estimated cost to be adequate.

3.2.7 Interior Finishing, New Facilities

Estimated cost = 792.000 EUR = 92 MISK.

Verkís considers the estimated cost to be adequate.

3.2.8 Interior& Exterior Finishing, Existing Facilities

Estimated cost = 4.392.000 EUR = 513 MISK.

Verkís considers the estimated cost to be adequate.

3.2.9 Pitch & Landscaping

Estimated cost = 2.902.320 EUR = 339 MISK.

Verkís considers the estimated cost to be adequate.

3.2.10 Retractable Roof

Estimated cost = 21.600.000 EUR = 2.520 MISK.

Verkís received conflicting information regarding this cost.



LS informed in a meeting that the cost was based on experience from three existing stadiums with retractable roofs and subtracting the cost for a stadium with open roof.

IFS confirmed that the estimate is comparable to an estimate for another project which however has not been realized.

This method of estimating involves large uncertainty.

For a structure with a retractable roof system a lot of other costs need to be considered such as:

- Structure needs to be closed with a façade.
Included in the estimate are approx. $6.000 \text{ m}^2 \times 200 \text{ EUR} = 1.240.000 \text{ EUR}$ [4].
Verkís considers this amount is too low to close off a whole stadium.
- Ventilation is more complicated.
- Lighting system is more complicated.
- Larger and more complicated support structure for the roof.
- Etc.

Verkís searched for available data on similar stadiums with retractable roofs for comparison. The results are discussed in section 4.2.

The LS total cost estimate for scenario B equals 3.627 EUR/seat while the result of Verkís research shows the total cost for similar stadiums to be in the range of 5.204-11.424 EUR/seat.

Although uncertain this indicates that the LS estimate is too low.

3.2.11 Indirect Cost

Table 3.4 lists the estimated indirect cost.

Table 3.6 Indirect cost

D	Design (8%)	3.840.152
PM	Project management (4%)	1.920.076
MA	Marketing	288.000
MISC	Miscellaneous (5%)	2.400.095

The design, 8%, is a lower percentage than in scenario A, 12,5%, 3,8 MEUR as compared to 3,3 MEUR in scenario A. LS has informed that the design of the retractable roof is largely included in the retractable roof cost.

Project management is 4% in scenario B and 5% in scenario A. Probably due to the same reason.

LS has explained that the cost of the retractable roof has been found by comparing the cost of several stadiums without a roof with the cost of stadiums with retractable roof. The average total cost difference between type A and type B stadiums was used as the cost estimate for the retractable roof. If this is the case and if the cost did include design, the argument is acceptable.

3.2.12 Contingency

The contingency is estimated by LS as 10%.

See discussion under 3.1.10.



3.3 Accuracy

LS does not provide any information on the expected accuracy (upper and lower limits) of the cost estimates.

LS claims to have a higher accuracy than normal due to their approach being different from the traditional approach:

“We consider 5-10% for “miscellaneous”, 5% for “planning costs”, 10% for “owner costs”, and 10% for “contingency” as adequate. Since our approach is different from the traditional approach (see previous comments) we have a much higher cost accuracy. In addition, the 10% owner costs normally include the project management fees (see “employer’s costs”) and planning costs (below the subtotal). This means we have an additional 10% reserve (to make sure we accommodate for whatever is necessary).”[4]

Verkís does not find this approach to be non-traditional. The method of Design & Build has been widely used in Iceland and elsewhere for decades.

The method for estimating the retractable roof by subtracting cost of one type of stadium from another leads by itself mathematically to a large uncertainty.

Verkís considers the LS cost estimate to be comparable to a AACE class 5 estimate with expected accuracy of -30% to + 50%.

This is however subject to revision of the estimates being carried out for the structure and retractable roof as proposed.

Table 3.7 AACE estimate classes

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December 5, 2012

ESTIMATE CLASS	Primary Characteristic	Secondary Characteristic		
	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges ^[a]
Class 5	0% to 2%	Functional area, or concept screening	SF or m ² factoring, parametric models, judgment, or analogy	L: -20% to -30% H: +30% to +50%
Class 4	1% to 15%	or Schematic design or concept study	Parametric models, assembly driven models	L: -10% to -20% H: +20% to +30%
Class 3	10% to 40%	Design development, budget authorization, feasibility	Semi-detailed unit costs with assembly level line items	L: -5% to -15% H: +10% to +20%
Class 2	30% to 75%	Control or bid/tender, semi-detailed	Detailed unit cost with forced detailed take-off	L: -5% to -10% H: +5% to +15%
Class 1	65% to 100%	Check estimate or pre bid/tender, change order	Detailed unit cost with detailed take-off	L: -3% to -5% H: +3% to +10%



4 Comparison to Other Stadiums (Benchmarking)

LS has informed that the estimates for scenarios A and B are based on experience from previous projects. Verkís requested information on specific benchmark projects from LS [3]. Following is a discussion of the information Verkís received from LS [4]. To make the comparison easier, cost comparison of these stadium will be based on cost/seat.

Estimated cost per seat in LS report is shown in Table 4.1.

Table 4.1 LS cost estimate for Option A and B

Stadium	Total cost	Capacity	Cost per seat [EUR]
Scenario A	43,2 MEUR	18.183	2.375
Scenario B	72,3 MEUR	19.933	3.627

4.1 Scenario A – Open Roof Stadium

LS based the basic construction cost on evaluation of the following projects:

- Spardabank Hessen in Offenbach Germany
- Gamla Ullevi in Gothenburg, Sweden
- Groupama Arena in Budapest Hungary

LS did not provide any benchmarking cost information regarding these stadiums.

This list raises concern as it includes the Spardabank stadium, which is of 2. Bundesliga standard where half of the spectators are standing, and the controversial Gamla Ullevi stadium where ¼ of the spectators are standing.

Table 4.2 summarizes the publicly available information on the construction cost of these stadiums.

Table 4.2 Benchmark stadiums LS used for estimating scenario A

Stadium	Total cost [EUR]	Capacity	Cost per seat [EUR]	Opened
Spardabank-Hessen Stadion Offenbach	23.000.000	20.500	1.122*	2012
Groupama arena Budapest	45.000.000	22.000	2.045	2013
Gamla Ullevi arena Gothenburg	33.500.000	15.000	2.233	2008

*) Around half of the capacity is standing spectators.



4.1.1 LS Benchmarked Stadiums – Open Roof Structure

Spardabank-Hessen Stadion (Offenbach, Germany)

A benchmarked stadium by LS for Scenario A (open roof structure) is Spardabank-Hessen Stadion in Offenbach, Germany. It is a multipurpose football arena with an open roof structure. Total seating in this arena is 20.500 for sporting events and Around half of the capacity is standing. The arena opened on 18 June 2012 and cost 23 MEUR.

This is the stadium of Offenbacher Fußball-Club Kickers 1901 e. V. that play in German Regional League Southwest (Fourth tier of the German football league system).

The cost per seat is 23.000.000 EUR/20.500 seats = 1.122 EUR/seat at the price level of 2012.



Figure 4.1 Spardabank-Hessen Stadion in Offenbach, Germany

Groupama arena (Budapest, Hungary)

A benchmarked stadium by LS for Scenario A (open roof structure) is Groupama arena in Budapest, Hungary. It is a multipurpose football arena with an open roof structure. Total seating in this arena is 22.000 for sporting events. The arena opened on 10 August 2014 and cost 40 MEUR.

This is the stadium of Nemzeti Bajnokság I and Magyar Kupa that play in Hungary top division.

The cost per seat is 40.000.000 EUR/22.000 seats = 1.818 EUR/seat at the price level of 2014 in Hungary where labour costs are considerably lower than in Iceland.



Figure 4.2 Groupama Arena in Budapest, Hungary



Gamla Ullevi arena (Gothenburg, Sweden)

A similar project to Scenario A (open roof structure) is Gamla Ullevi arena in Gothenburg, Sweden. It is a multipurpose football arena with an open roof structure. Total seating in this arena is 15.000 for sporting events. The arena opened on 5 April 2009 and cost 335 million SEK.

The cost per seat is $335.000.000 \text{ SEK} / 15.000 \text{ seats} = 22.333 \text{ SEK/seat}$ at the price level of 2009 in Sweden.

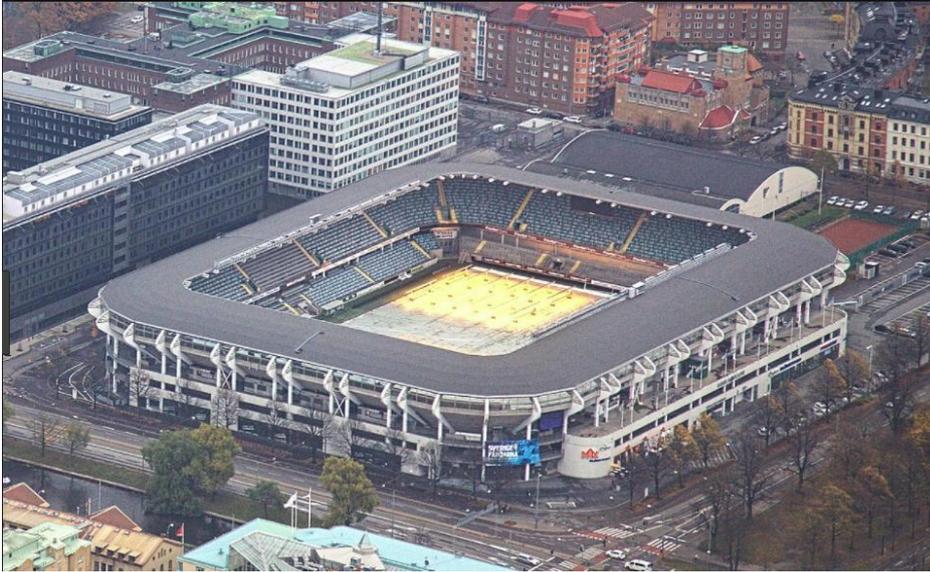


Figure 4.3 Gamla Ullevi arena in Gothenburg, Sweden

4.2 Scenario B – Retractable Roof Stadium

For the scenario B LS referenced the following stadiums with retractable roofs:

- Gelredome/Arnhem/Netherlands
- Veltins Arena (Arena AufSchalke)/Gelsenkirchen/Germany
- Esprit Arena/Düsseldorf/Germany)

LS did not provide any benchmarking cost information regarding these stadiums.

Table 4.3 summarizes the publicly available information on the construction cost of these stadiums.

Table 4.3 Benchmark stadiums LS used for estimating scenario B

Stadium	Total cost [EUR]	Capacity	Cost per seat [EUR]	Opened
Esprit arena Düsseldorf	218.000.000	51.500	4.233	2004
Gelredome Arnhem	75.000.000	21.248	3.530	1998
Arena AufSchalke	191.000.000	54.740	3.489	2001

LS benchmarked stadiums are all more than 14 years old, so Verkís recommends benchmarking also with two recent retractable roofed high quality multi-purpose stadiums that have been built in Stockholm Sweden:

- Tele 2 arena (2012)
- Friends arena (2013)

Table 4.4 Benchmark stadiums Verkís suggests for estimating scenario B

Stadium	Total cost [EUR]	Capacity	Cost per seat [EUR]	Opened
Tele 2 arena - Stockholm	290.000.000	33.000	8.788	2012
Friends arena	300.000.000	50.653	5.923	2013

4.2.1 Benchmark Stadiums – Retractable Roof Structure

Tele 2 arena (Stockholm, Sweden)

A benchmarked stadium by Verkís for scenario B (retractable roof structure) is Tele 2 arena in Stockholm, Sweden. It is a multipurpose football arena with a retractable roof structure. Total seating in this arena is 33.000 for sporting events and 45.000 during concerts. The arena opened on 20 July 2013 and cost 290 MEUR.

The cost per seat is 290.000.000 EUR/33.000 seats = 8.788 EUR/seat at the price level of 2013.



Figure 4.4 Tele 2 arena in Stockholm, Sweden

Friends arena (Stockholm, Sweden)

A benchmarked stadium by Verkís for Scenario B (retractable roof structure) is Friends arena in Stockholm, Sweden. It is a multipurpose football arena with a retractable roof structure. Total seating in this arena is 50.653 for sporting events and 65.000 during concerts. The arena opened on 25 October 2012 and cost 300 MEUR.

The cost per seat is $300.000.000 \text{ EUR} / 50.653 \text{ seats} = 5.923 \text{ EUR/seat}$ at the price level of 2012.



Figure 4.5 Friends arena in Stockholm, Sweden

Esprit Arena (Düsseldorf, Germany)

A benchmarked stadium by LS for Scenario B (retractable roof structure) is Esprit Arena in Düsseldorf, Germany. It is a multipurpose football arena with an open roof structure. Total seating in this arena is 51.150 for sporting events. The arena opened on 10 October 2004 and cost 218 MEUR.

This is the stadium of Fortuna Dusseldorf in the 2. Bundesliga (second tier of the German football league system).

The cost per seat is $218.000.000 \text{ EUR} / 51.150 \text{ seats} = 4.233 \text{ EUR/seat}$ at the price level of 2004.



Figure 4.6 Esprit arena in Dusseldorf, Germany

Arena AufSchalke (Gelsenkirchen, Germany)

A benchmarked stadium by LS for scenario B (retractable roof structure) is Arena AufSchalke in Gelsenkirchen, Germany. It is a multipurpose football arena with a retractable roof. Total seating in this arena is 54.740 for international sporting events. The arena opened in 2001 and cost 191 MEUR.

This is the stadium of Schalke in the Bundesliga (top tier of the German football league system).

The cost per seat is $191.000.000 \text{ EUR} / 54.740 \text{ seats} = 3.489 \text{ EUR/seat}$ at the price level of 2001.



Figure 4.7 Arena AufSchalke in Gelsenkirchen, Germany

GelreDome (Arnhem, Netherlands)

A benchmarked stadium by LS for scenario B (retractable roof structure) is GelreDome in Arnhem, Netherlands. It is a multipurpose football arena with a retractable roof. Total seating in this arena is 21.248 for international sporting events. The arena opened on 25 March 1998 and cost 191 MEUR.

This is the stadium of Vitesse in the Eredivisie (top tier of the Netherland football league system).

The cost per seat is $75.000.000 \text{ EUR} / 21.248 \text{ seats} = 3.529 \text{ EUR/seat}$ at the price level of 1998.



Figure 4.8 GelreDome in Arnhem, Netherlands



4.3 Benchmarking General

When comparing costs of different stadiums several factors need to be considered. The main parameters being:

- a) Capacity of stadium
- b) Category of stadium (quality and design)
- c) Date of construction
- d) Location

Method for scaling:

- a) Capacity

For scaling of cost related to capacity the following universal formula is used.

$$\frac{(Cost)_2}{(Cost)_1} = \left[\frac{(Parameter)_2}{(Parameter)_1} \right]^{0,7}$$

- b) Category

Verkís has no method for scaling of costs based on category or design.

- c) Date of construction

Publicly available cost information usually dates to the time of project completion. When comparing to an estimate reflecting the price level of year end 2017 this needs to be considered as some of the stadiums referenced are over 20 years old.

For extrapolation of the costs Verkís uses the increase in the relevant Building Indexes.

A suitable building index in Germany for stadiums is the building index for industrial buildings and it is used for all the stadiums.

Table 4.5 Scaling of similar stadiums to estimate cost of new Icelandic national stadium

Stadium	Cost/seat [EUR]	Index*	Opened	Cost/seat 2017 [EUR]	Index**
Spardabank-Hessen Stadion Offenbach	1.122	106,4	2012	1.254	118,9
Groupama arena Budapest	2.045	108,3	2013	2.245	118,9
Gamla Ullevi arena Göteborg	2.233	98,8	2008	2.687	118,9
Esprit arena Düsseldorf	4.233	85,2	2004	5.907	118,9
Gelredome Arnhem	3.530	82,2	1998***	5.106	118,9
Arena AufSchalke	3.489	82,7	2001	5.016	118,9
Tele 2 arena	8.788	106,4	2012	9.820	118,9
Friends arena	5.923	108,3	2013	6.502	118,9

*) Industrial building index 4th quarter of building year.

***) Industrial building index 4th quarter of 2017.

***) The building index only goes back to 2000.

⁴ From CAPCOSTS-A handbook for estimating mining and mineral processing equipment costs and capital costs and capital expenditures and aiding mineral project evaluations By Andrew L. Mular and Richard Poulin



4.3.1 Comparison Calculations

To be able to compare the benchmark costs to estimated cost of Laugardalsvöllur National Stadium, it is necessary to both use building index and scale the costs to fit scenario A (18.183 seating) and scenario B (19.933 seating) in 2018.

Table 4.6 presents a comparison of cost per seat for all the benchmarked stadiums after having considered all these factors.

Table 4.6 Scaling of similar stadiums to estimate cost of new Icelandic national stadium

Stadium	Cost/seat [EUR]	Opened	Indexed cost/seat [EUR]	Capacity (Internat. Seating)	Scaled cost/seat [EUR]
Scenario A (open roof) LS estimate: 2.375 EUR/seat					
Spardabank-Hessen Stadion Offenbach	1.122	2012	1.254	20.500	1.300
Groupama arena Budapest	2.045	2013	2.245	22.000	2.378
Gamla Ullevi arena Göteborg	2.233	2008	2.687	15.000	2.537
Scenario B (retractable roof) LS estimate: 3.627 EUR/seat					
Esprit arena Düsseldorf	4.233	2004	5.907	51.500	7.853
Gelredome Arnhe*	3.530	1998	5.106	21.248	5.204
Arena AufSchalke	3.489	2001	5.016	54.740	6.792
Tele 2 arena	8.788	2012	9.820	33.000	11.424
Friends arena	5.923	2013	6.502	50.653	8.602

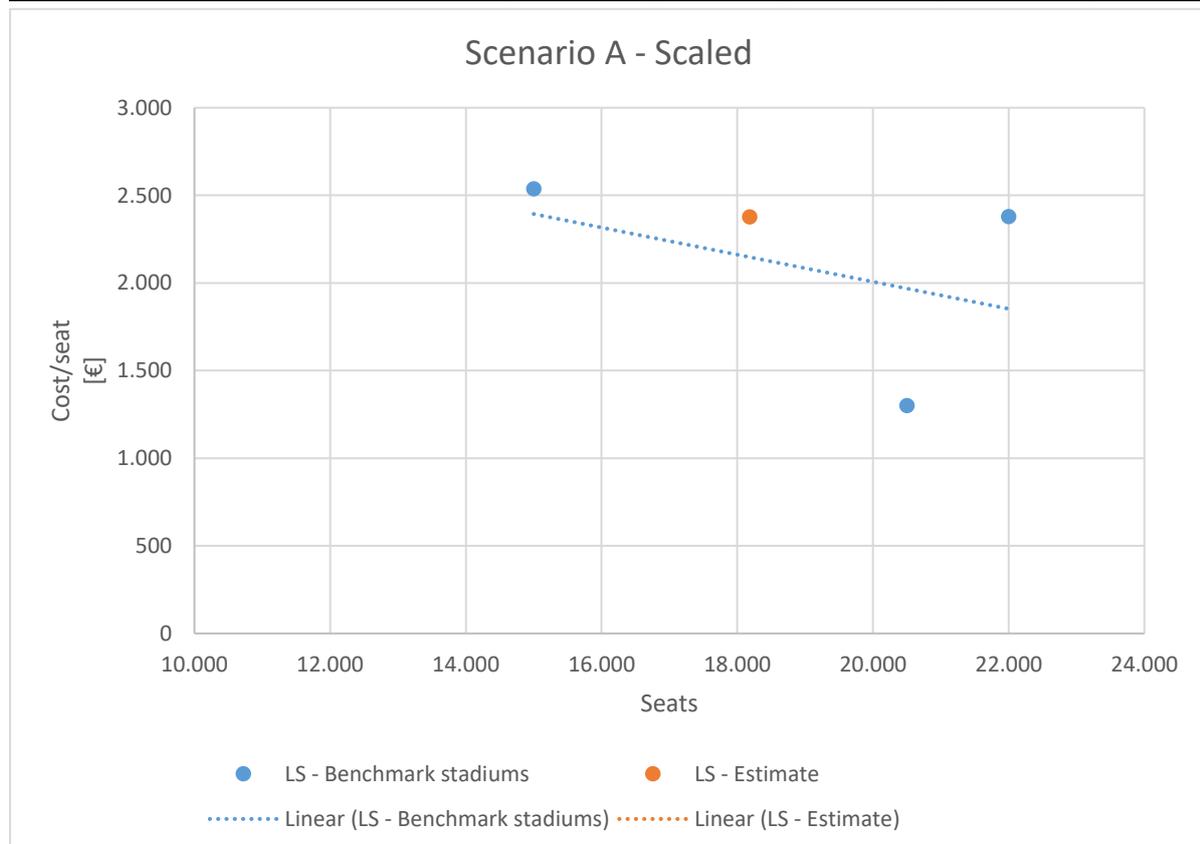


Figure 4.9 Scenario A comparison for the benchmarked stadiums

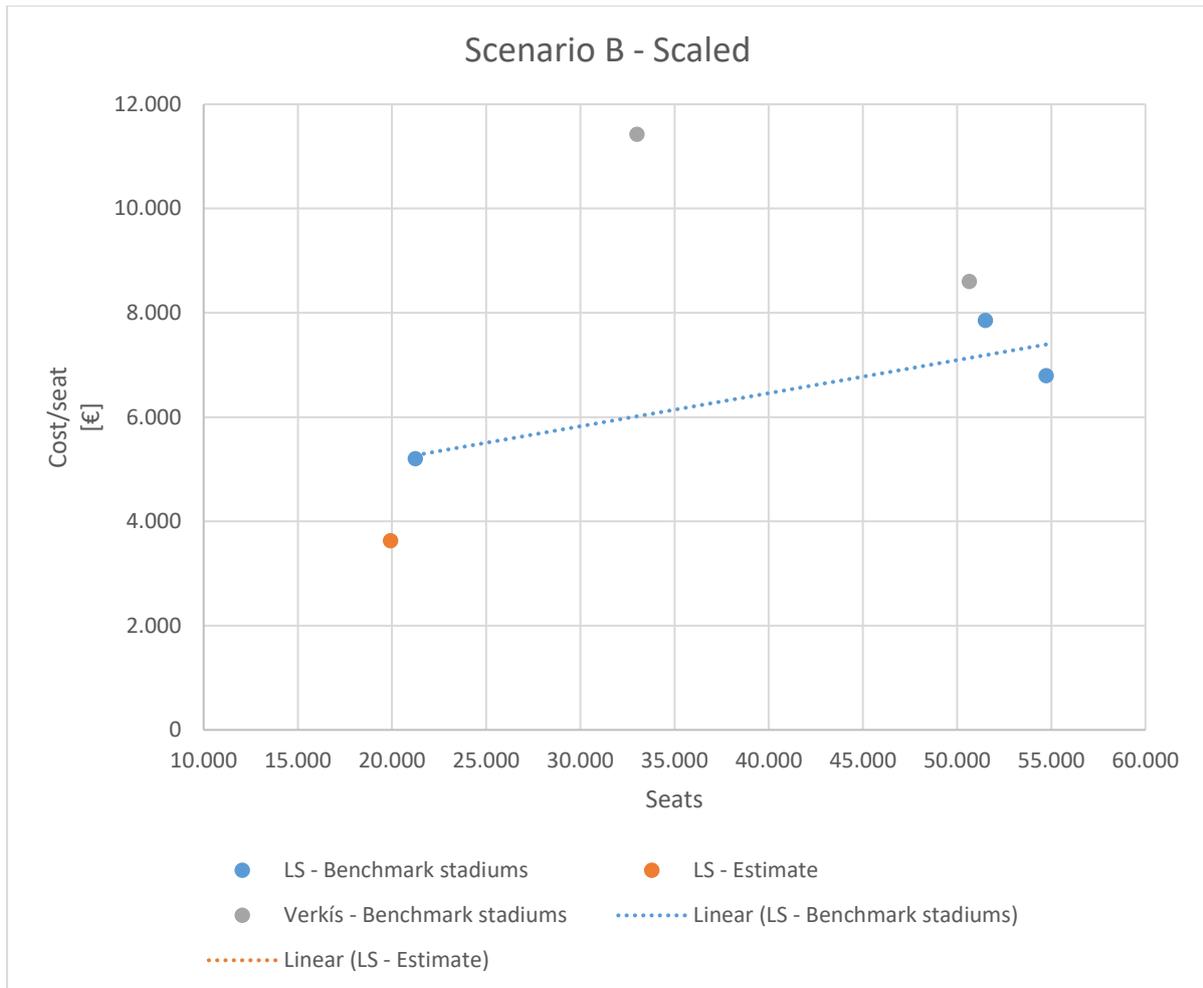


Figure 4.10 Scenario B comparison for the benchmarked stadiums

After comparing the cost per seat for retractable roof stadiums both benchmarked by LS and Verkís, it is rather obvious that the LS cost estimate is considerably underestimated, as Figure 4.10 shows.

5 LS Approach

As Figure 5.1 illustrates, there are mainly three different approaches to managing a project of this size:

- I. Design, construction and operation are all bid out in separate steps
- II. Design & Build -> Operation bid separately
- III. Design & Build & Operate

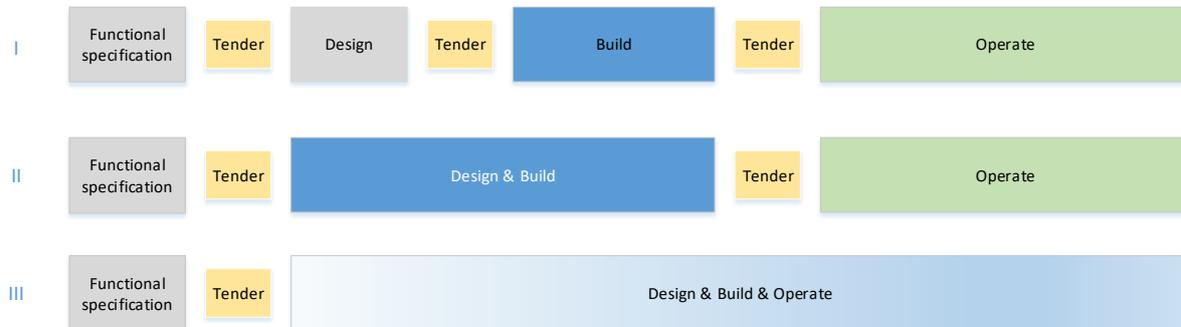


Figure 5.1 Different approaches to project management

LS approach is a typical Design & Build approach (II).

LS assumes that the consultant preparing the functional specification will continue to provide control/management services throughout the whole project (somewhat like Artec in Harpa, but more extensive).

Regarding the operations, LS assumes KSÍ to be the main Operator with several services tendered to others.

The timeline presented by LS seems to assume that the functional specification (full brief) is prepared by LS without tendering these services. Normal time needed for preparing tender documents, tendering and contracting of such specialized services would be at least 4 months.

LS proposes to tender and award demolition works before the Design & Build contract is awarded. This is not advisable as start of demolition work is a point of no return.



6 Other Facilities

In LS cost estimate other facilities than the stadium itself are not addressed, e.g.

- Impact of Laugardalsvöllur on local plan and traffic flow.
- Relocation of other athletic facilities from Laugardalsvöllur
- Relocation of main sewer
- Additional parking spaces or re-structuring of existing parking spaces
- Ring road around the stadium

The only item priced by Verkís is the ring road.

6.1 Impact of the National Stadium on Local Plan and Traffic Flow

LS report states that FIFA calculations for total amount parking spaces are recommended to be around 3.000 pcs and existing parking spaces are 1.800 around Laugardalsvöllur, so if FIFA recommendations are followed extra 1.200 parking spaces need to be added. This is however not mandatory.

6.2 Ring Road Around Stadium

According to LS recommendation a ring road needs to be built around the stadium. A rough estimate for this road is that it is 8 m (wide) x 700 m (length) = 5.600 m² (Total area). This cost is not in LS estimate.

Table 6.1 Cost of ring road

Item	Unit	Amount	Item Cost [EUR]	Total cost [EUR]
Ring road around stadium (8 m wide)	m ²	5.600	495	2.772.000

7 Conclusions

7.1 Scenario A

Scenario A estimated by LS as 43,2 M EUR or 5.000 MISK is an adequate estimate for a low-cost stadium with an open roof and without a surrounding façade. The LS total cost estimate for scenario A equals 2.375 EUR/seat which corresponds well with the result of Verkís research showing a total cost for similar stadiums to be in the range of 1.300-2.537 EUR/seat. This stadium standard is however not in good harmony with the LS presentations which indicate a stadium of UEFA category 4 amenities surrounded by a façade.

Verkís recommends adjusting the estimate to include a façade and also increasing the cost estimate for the basic concrete and steel construction.

Verkís also recommends increasing the contingency to 20% to better reflect the status of the estimate.

7.2 Scenario B

Scenario B estimated by LS as 71,2 MEUR or 8.300 MISK is an underestimate. The LS total cost estimate for scenario B equals 3.627 EUR/seat, while the result of Verkís research shows the total cost for similar stadiums to be more in the range of 5.204-11.424 EUR/seat. Verkís bases this conclusion on comparison with publicly available cost information of existing stadiums and also on a study of the LS cost estimate and the clarifications received. The comparison indicates that the estimated cost is far too low as can be seen in Figure 7.1 . Even the benchmark stadiums referenced by LS are higher.

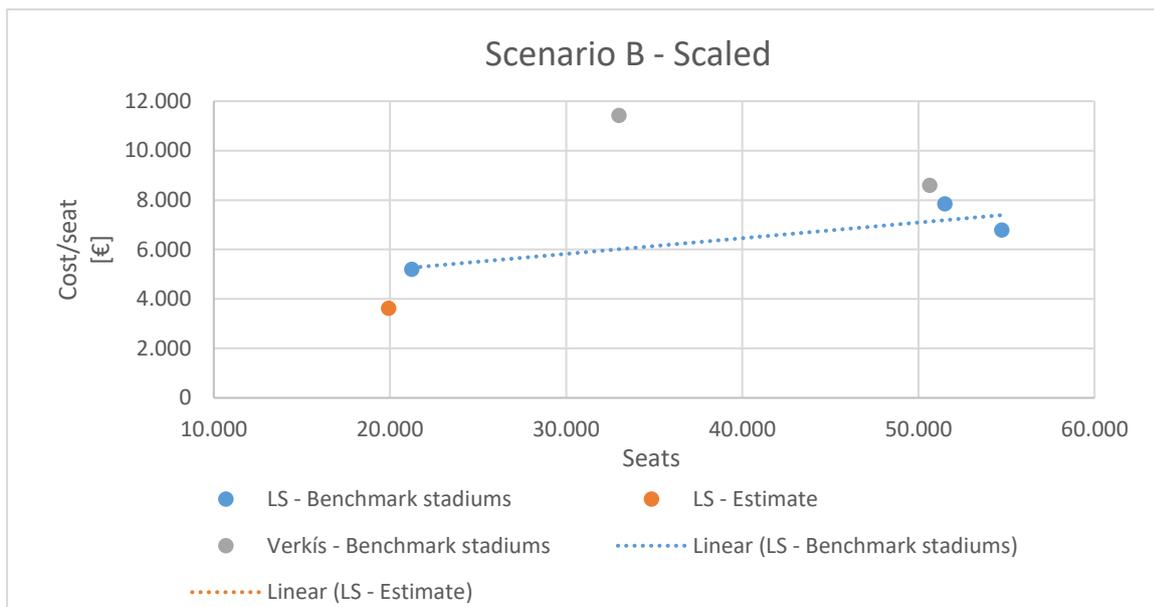


Figure 7.1 Scenario B comparison for the benchmarked stadiums

Verkís conclusion is subject to high uncertainty and it is not possible to suggest a definitive revision of the estimate at this stage and without further design.

7.3 Exclusions

There are several exclusions in the LS estimate, which is quite normal. The most important exclusions, which will need to be priced in future revisions of the cost estimate, are:

- Value Added Tax (VAT)
- Cost of land
- Public fees (building right, road fee, utilities)
- Roads & parking areas
- Relocation of existing sewer & utilities



8 References

- [1] 180215 Design Construction Budget (Scenario A)
- [2] 180215 Design Construction Budget (Scenario B)
- [3] 2018-02-28 MoM LS cost estimate review
- [4] 2018-02-28 MoM LS cost estimate review_LS Comments
- [5] 2018-02-28 MoM LS cost estimate review_IFS Comments
- [6] 18-02-12 Island
- [7] Phase 1_PrePlanning New National Stadium Reykjavik, dated 2016-10-14
- [8] Phase 2_New National Stadium Reykjavik_Pre Tender Phase, dated January 2017
- [9] 170626 draft_presentation Phase 3 ISL, dated 2017-06-27



Appendices

- Appendix 1** 2018-02-28 MoM LS cost estimate review
- Appendix 2** 2018-02-28 MoM LS cost estimate review_LS Comments
- Appendix 3** 2018-02-28 MoM LS cost estimate review_IFS Comments



Appendix 1 2018-02-28 MoM LS cost estimate review

NATIONAL STADIUM 2018

MINUTES OF MEETING

PROJECT NO.: 01109-009

DATE: 2018-02-28

PROJECT PHASE:

NO.: 01

AUTHOR: Susanne Freuler

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COPY TO: Attendees and Guðmundur Kristján Jónsson

Questions regarding LS cost estimate

NO.	SUBJECT	ACTION ITEM	
		BY	NEEDED
1	Cost estimate – general points		
28.2.	<p>The Icelandic government and the city of Reykjavík have appointed a Committee to review the existing alternatives for a new national stadium in Laugardalur. One issue of concern is the capital cost for the planned arena and the risk of the project.</p> <p>The committee has assigned Verkís to review the cost estimate prepared by Lagardère Sports (LS) for scenarios A and B (B with retractable roof). Verkís has been asked to submit a review latest March 15th.</p> <p>First impression (Verkís): the preliminary estimate is too low.</p> <p>The purpose of this meeting is to clarify some issues of concern and the estimate scope.</p> <p>LS informed that the estimate is based on LS experience from comparable projects and not based on detailed quantities and unit prices.</p> <p><u>Post-meeting remark:</u></p> <p><i>As shown in the LS cost estimate breakdown, the LS estimate is based on pricing as in Germany and multiplied by a location factor of 1,44 to account for Icelandic conditions.</i></p>	-	-
2	Construction		
28.2.	<p>The construction cost (excluding M&E) for scenario A 400 €/sp*1,44=576 €/sp seems low (Verkís), assuming ca 1 m²/sp of building footprint.</p> <p>The unit price of 400€/sp x 1,44 includes all the following items:</p> <ul style="list-style-type: none"> - Earthworks 		

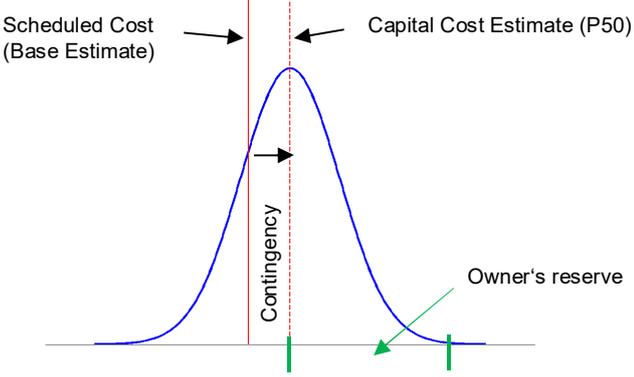


	<ul style="list-style-type: none"> - Foundations (including foundation piles under East stand) - Bottom slab on grade - Prefabricated supports - Elevated prefabricated slabs - Roof (roof extends over the seating area) <p>No separate unit prices are available at this stage.</p> <p>⇒ LS is asked to review how the price is built up (built on experience from 3 different projects) and provide references of these projects.</p>	LS	2018-03-08
3 28.2.	<p>Facade</p> <p>Scenario A: The facade on the outside of the building as shown on renderings is excluded. LS informed however that the only facade included is for the existing KSÍ headquarters. LS explained that a facade is probably not needed in Scenario A and if realised the facade solution will be part of an architectural competition, and therefore it is not included in the cost estimate.</p> <p>Scenario B: The facade all around the stadium is included in the LS cost estimate. Depending on the architect and the secondary support needed, this can be quite expensive and the estimate only allows for a simple facade.</p>	-	
4 28.2.	<p>Retractable roof</p> <p>In the LS report several different types of retractable roofs are shown, the cost estimate is however not built on any specific type of roof. LS compared the cost of several type B stadia to the cost of type A stadia. The price difference between type A and B stadia was used as the cost of the retractable roof. This includes the facade cost.</p> <p>⇒ LS is asked to provide benchmarking information (references to specific projects) if possible.</p>	LS	2018-03-18
5 28.2.	<p>General points on construction</p> <p>Footprint for scenario B is slightly larger. Cost of prefabricated elements is probably considerably higher in Iceland than on the European mainland due to less advanced local prefab facilities and the high cost of transport from overseas. Wind load requirements in Iceland are considerably higher than in mainland Europe.</p>	-	
6 28.2.	<p>Roads and parking spaces</p> <p>Roads around the stadium are not included in the LS cost estimate. 3.000 parking spaces are recommended by FIFA, but not required if public is encouraged to use public transportation. Parking for hospitality is necessary, usually 1 parking space for every 2-4 guests.</p>	-	
7 28.2.	<p>Marketing</p> <p>Verkis: Marketing cost is usually not included in capital cost, rather operational cost. LS: The marketing cost can be considered part of Owner's cost.</p>	-	



<p>8 28.2.</p>	<p>Skyboxes</p> <p>The estimate for scenario B includes € 25 + € 75 = 100 €/m² for “naked” boxes. Skyboxes are usually rented out to corporate companies who want to furnish them according to their own preferences.</p> <p>Access building to access the East side skyboxes is possibly missing from LS cost estimate.</p> <p>East side has allowance for 6.000 seats (exclude hospitality guests)?</p> <p>⇒ LS is asked to check if additional cost is needed or if enough cost is included for construction of and access to the skyboxes.</p>	<p>LS</p>	<p>2018-03-08</p>
<p>9 28.2.</p>	<p>Demolition</p> <p>The demolition cost is the same for scenarios A and B. The existing roof over the West stand needs to be removed in both scenarios.</p> <p>The construction of a new roof over the main part of the West stand might be missing from LS cost estimate for scenario A.</p> <p>Verkís: The total demolition cost of € 22 million seems low.</p> <p>⇒ LS is asked to check if new roof is included over complete West stand or only over wings in scenario A.</p>	<p>LS</p>	<p>2018-03-08</p>
<p>10 28.2.</p>	<p>Relocation of existing track</p> <p>The relocation of the existing track and field facilities is not included in LS cost estimate. The Committee asked Verkís for an estimate.</p>		
<p>11 28.2.</p>	<p>Exclusions summary</p> <ul style="list-style-type: none"> • Facade is excluded in scenario A • All roads and parking is excluded • Relocation of existing track and field facilities • Concrete slab under the new pitch (a value engineering option) • Relocation or other costs of the large sewage pipe • Interior finishing of skyboxes • Value Added Tax (VAT) • Cost of Capital (interests during construction and financing) <p><i>Post-meeting remark:</i></p> <p><i>Also excluded are the following, which were not addressed at the meeting:</i></p> <ul style="list-style-type: none"> • <i>Cost of Land and building rights</i> • <i>Cost of connection to public utilities</i> 	<p>-</p>	
<p>11 28.2.</p>	<p>Accuracy of the cost estimate</p> <p>A: The LS cost estimate includes 10% for miscellaneous, 10% for Owner’s cost and 10% contingency.</p> <p>B: The LS cost estimate includes 5% for miscellaneous, 10% for Owner’s cost and 10% contingency.</p> <p>Scope content of Owner’s cost is not defined.</p> <p>Capital Cost Estimates are often presented as P50 estimates (an estimate with equal probability of over-/underrun). Contingency is included to account for non-identified items and unforeseen but normally expected events or effects leading to a cost increase.</p>		



	 <p>⇒ LS is asked to inform if the estimate as presented is a P50 estimate and if so how does LS evaluate the estimate accuracy (lower and upper limit, e.g. P90).</p>	LS	2018-03-08
11 28.2.	Next phase Verkís will finish the review of the LS cost estimate and submit a report to the Committee by March 15 th . The Committee will take a decision in April on how to proceed.	-	

End of meeting: 13:45h.



Appendix 2 2018-02-28 MoM LS cost estimate review_LS Comments

From: HILLER, Stefan <shiller@lagardere-se.com>
Sent: fimmtudagur, 8. mars 2018 10:28
To: Kristján G. Sveinsson; Örn Steinar Sigurðsson; Kristinn Pétur Skúlason; Susanne Freuler
Cc: ODENTHAL, Christoph; Pétur Marteinsson; Guðmundur Kristján Jónsson
Subject: AW: National stadium Laugardalur, cost estimate

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Kristján,

Please find the following comments:

0. The design in our documents is for illustration purposes only (design will be determined by a design & build competition). We would like to stress the fact, that our approach is different from the traditional approach (design – tender – build). In addition, the goal during the upcoming development phase must be to develop a detailed plot analysis, technical brief, relevant specifications, initial reference design (masterplan, floor plans, cross sections), corresponding budget, contingency which will allow a realistic result.
1. Our budget is based on a technical brief, relevant specifications, quantities and unit prices of existing (comparable) stadia. We have included the inflation so that the final numbers would correspond to current market prices (summer 2017). We have then included a location factor of 1,44 (initial estimate) to accommodate market prices in Iceland. Our goal is to come up with a realistic budget (instead of an estimate). A more detailed technical brief and this budget will then become an essential part of the d&b brief (see above).
2. The price of 400 €/per person is based on an evaluation of various projects (incl. Spardabank Hessen/Offenbach/Germany, Gamla Ullevi/Göteborg/Sweden; Groupama Arena/Budapest/Hungary). The initial price is for an average quality and quantity. This should be taken as a realistic target for design to budget, not an estimate based on a reference design. The position “miscellaneous” allows for modifications to increase the quality (if desired by the owner/operator) and will be discussed in the next phase.
3. There is no façade included in the budget of scenario A (and yes, discussions in late summer 2017 underline the requirement of a façade to protect the spectators from rain and wind). In scenario B we have considered a façade (position “retractable roof”): approx. 6.000 sqm x 200 € = 1.240.000 €. It includes a simple weather/wind protection, a mix of metal and glass and open for smoke exhaust. The position “miscellaneous” allows for modifications (if desired by the owner/operator) and will be discussed in the next phase.
4. We have included a budget for the retractable roof (scenario B). Our initial discussions involved a leading specialist engineering company Schlaich Bergermann (www.sbp.de). Our budget is based on these discussions and benchmarks from existing stadia (incl. Gelredome/Arnheim/Netherlands, Veltins Arena/Gelsenkirchen/Germany, Esprit Arena/Düsseldorf/Germany). Since only very few football stadia with retractable roof exist, we recommend initiating a more detailed engineering study during the next phase.
8. The estimate of 100 €/sqm for sky boxes is too low and needs to be verified in the next phase. Discussions in the past months also suggest including this topic in a value engineering exercise, since there might be an opportunity to include all hospitality areas in the West (increase of the existing building, demolition of the old stands, consolidation of all MEP areas, elimination of unnecessary access areas and roads). This might allow for optimum synergies (design/construction and operation/commercialization).

9. The costs for building a new roof above the existing West stand is not included. There is an opportunity to keep the existing roof however our recommendation is to develop a complete new roof for the entire stadium. The position "miscellaneous" allows for modifications (if desired by the owner/operator) and will be discussed in the next phase. Please note that we have included 10% for "miscellaneous" in scenario A (compared to 5% in scenario B) to make sure the owner is a bit more flexible in regards to qualities.

12. We consider 5-10% for "miscellaneous", 5% for "planning costs", 10% for "owner costs", and 10% for "contingency" as adequate. Since our approach is different from the traditional approach (see previous comments) we have a much higher cost accuracy. In addition, the 10% owner costs normally include the project management fees (see "employer's costs") and planning costs (below the subtotal). This means we have an additional 10% reserve (to make sure we accommodate for whatever is necessary).

Hope the above clarifies the points of discussions. We would like to point out that hopefully more good discussions will come up in the next phase. The feasibility phase (work in the past years) aims to paint a full picture of the project, suggest an efficient organization and initial budget (not estimate). We are confident that these findings will allow for moving into the next phase (development phase) which will bring clarity to remaining issues (and I am sure some new topics will also come up, but everyone is prepared to solve these).

Please let us know if you have any more queries.

Best regards

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Appendix 3 2018-02-28 MoM LS cost estimate review_IFS Comments

Comments IFS to MoM VERKIS-LS

Reference in MoM

Comment IFS VERKIS

1

The location factor (1,44) cannot be checked by IFS. Anyway it must be considered that construction costs in Germany developed roughly as follows:

2010 =	100 %
1/2017 =	115,5 %
1/2018 =	119 %

This might influence the factor, we recommend an update.

2 Construction

Cost of 400 €/PAX can be confirmed by IFS as a serious assumption for a design to budget for a stand with „normal“ soil conditions, comfort and amenity value standard 2. Bundesliga, simple and functional roof construction (=> protects from weather, no specific design requirements, simple metal roofing etc.) Cost index is 2017.

We would recommend to adjust to 2018 (+3 % up to date) and an additional allowance for future cost in 2018. assuming construction will start in 2019 we recommend 420 - 440 €.

If further design requirement (textile roofing, special steel construction etc.) are under discussion, we recommend to define an additional budget as cost benchmark for the design and build process.

3 façade

Overall quantity and quality cannot be checked as only the total amount for the retractable roof is listed (15.000.000 €). For sure this façade can only be a quite simple weather protection. If required by regulation or for a higher level of comfort additional cost for M+E (ventilation, heating, smoke exhaust) must be considered. If the façade should fulfill design requirement we would define an additional budget for the design and build process.

4 Retractable roof

The estimated costs of 15.000.000 can be confirmed by a (not realised) design and estimate for another project, index 2016. Benchmarking is difficult, as there are very few retractable roofs and conditions vary considerably. We agree that a specific design and engineering study is required.

8 Skyboxes

Budget for Skyboxes excluding interior fittings should be 300€ to 350€ /sqm

10

The estimate includes:

Scenario A:

Design Costs:	12,5% (Sheet Cost Calculation) + 5% (Sheet Chart) =	17,5%
Employers Cost:	5% (Sheet Cost Calculation) + 10% (Sheet Chart) =	15%
Miscellaneous:	10% (Sheet Cost Calculation) + 0% (Sheet Chart) =	10%
Contingencies:	0% (Sheet Cost Calculation) + 10 % (Sheet Chart) =	10%

Scenario B:

Design Costs:	8 % (Sheet Cost Calculation) + 5% (Sheet Chart) =	13 %
Employers Cost:	4% (Sheet Cost Calculation) + 10% (Sheet Chart) =	14%
Miscellaneous:	5% (Sheet Cost Calculation) + 0% (Sheet Chart) =	5%
Contingencies:	0% (Sheet Cost Calculation) + 10 % (Sheet Chart) =	10%

This looks comfortable for scenario A but inadequate for scenario B as B implies similar or even higher risks. We recommend to adjust B.

09.03.18

Dr.Ing. Heiner Peschers



