

Baku Olympic Stadium

Project & Cost Management





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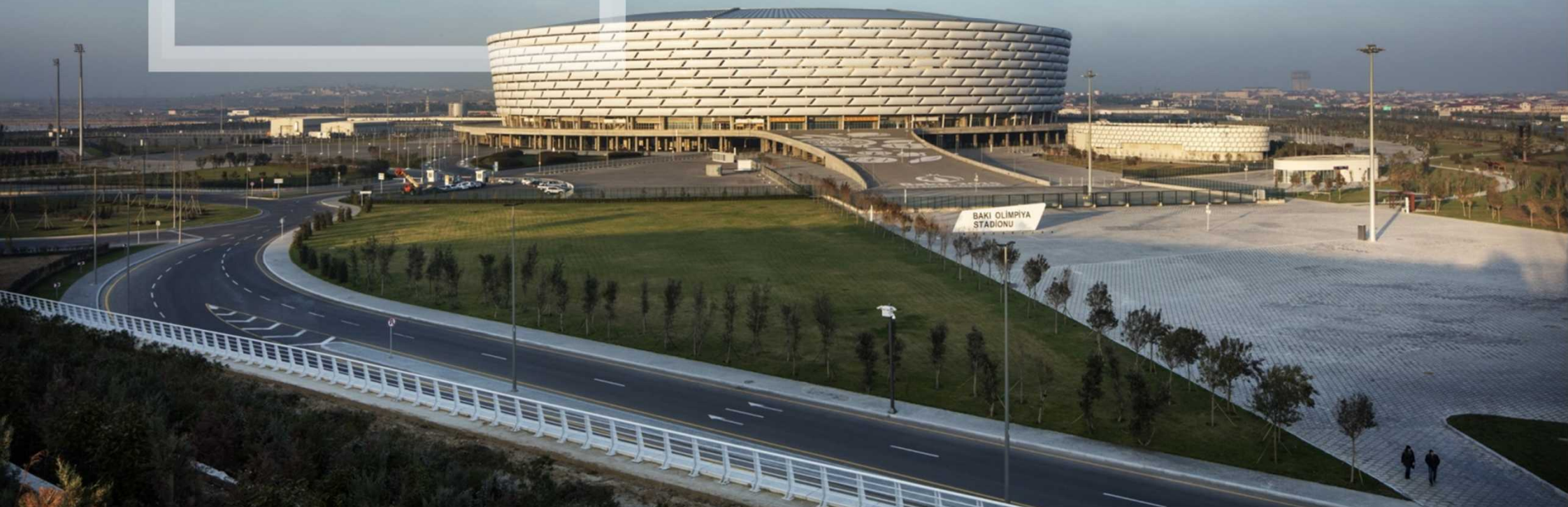
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01

Project Summary

1-1. Location

1-2. Scale & Characteristics



BAKU OLYMPIC STADIUM



1. Project Summary

Location & Scale / Characteristics



Classification	Description
LOCATION	HEYDAR ALIYEV AVENUE, BAKU, AZERBAIJAN REPUBLIC
CLIENT	THE STATE OIL COMPANY OF THE AZERBAIJAN REPUBLIC(SOCAR)
PARTICIPANTS	- DESIGN : Heerim Architect & Planners - CONSTRUCTION : TEKFEN Construction - CM : Heerim Architect & Planners
SCALE	6 STORIES (ABOVE GROUND)/ 68,000 SPECTATORS - GROSS FLOOR AREA : 207,000 m²
DURATION	- CONSTRUCTION : Nov. 2012 ~ Feb. 2015 (26 MONTHS) - CM : June 4th, 2012 ~ May 30th, 2016 (48 MONTHS)
COST OF CONSTRUCTION	\$ 700 Million USD
CM SERVICE COST	\$ 23.15 Million USD
REMUNERATION & PAYMENT	PAYMENT BY WORKS DONE
CM TENDERING	DESIGNATED BIDDING
SELECTION METHOD	TECHNICAL · COMMERCIAL SEPARATION
CHARACTERISTICS	COST PLUS FEE, FAST TRACK & DESIGN BUILD

02

Project Purposes & Schedule

2-1. Project Purposes

2-2. Project Schedule



BAKİ OLİMPİYA
STADİONU

“Successful Hosting International Athletic Events”

View of the Site Location

Caspian Sea



Boyuk Shor lake

Purposes

01. Building a Main Stadium

- Opening & Closing Ceremony Events for the 1st European Games
- Athletic Sports

02. Creating a Landmark

- Construction a symbolic building to introduce Azerbaijan to the world

03. Urban Regeneration

- Land developing the contaminated oil storage site
- Creation an eco-friendly park for the citizens

2. Project Purposes & Schedule

Project Schedule



Polluted Oil Storage Site



Completed Stadium Site



Building the sustainable international stadium site by regenerating the contaminated oil storage site

03

Main Tasks of the PCM

- 3-1. General Project Management
- 3-2. Cost Management
- 3-3. Construction & Schedule Management
- 3-4. Quality Management
- 3-5. Safety Management



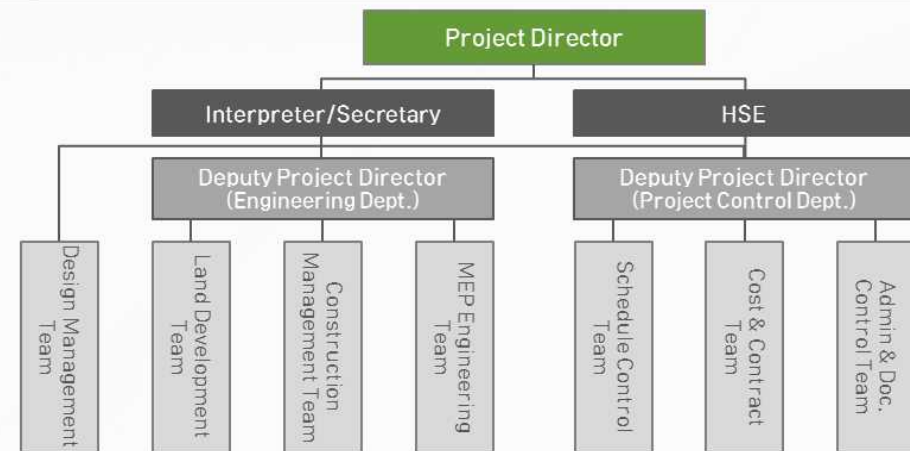
3. Main Tasks of the PCM

General Project Management - Work Scope & Manpower Management

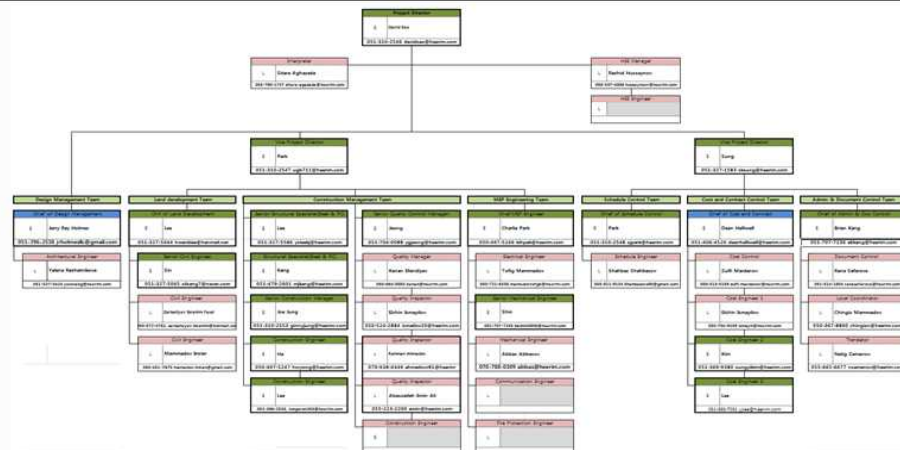
The Organization Chart in accordance with the Work Scope of the PCM

Work Scope of the CM

- ✓ Phase A. Pre Construction and Mobilization
 - Environmental
 - Earthwork
 - Main Construction (Stadium Building)
- ✓ Phase B. Construction
- ✓ Phase C. Post Construction
- ✓ Additional Services



The Actual Manpower in comparison to Generally Expected Manpower



Staffing Plan (Phase B. Construction)

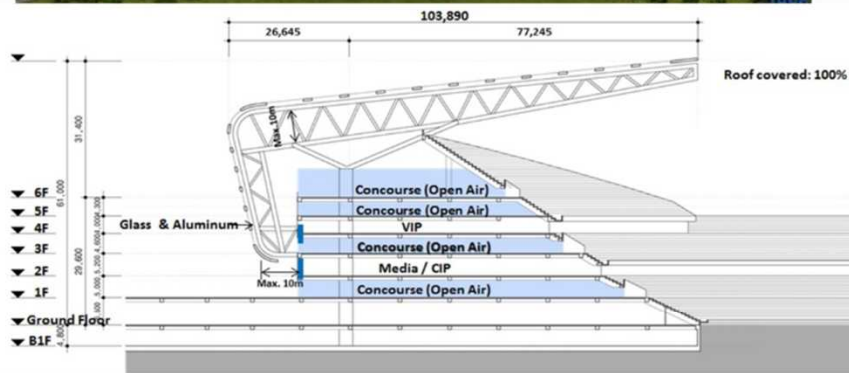
T/O	General	Actual	Variation
Expatriate	15	19	+4
Local	30	17	-13
Sum	45	36	-9

- Reduced actual manpower in comparison to generally expected manpower in similar projects scale by efficient work scope & manpower management according to site conditions

3. Main Tasks of the PCM

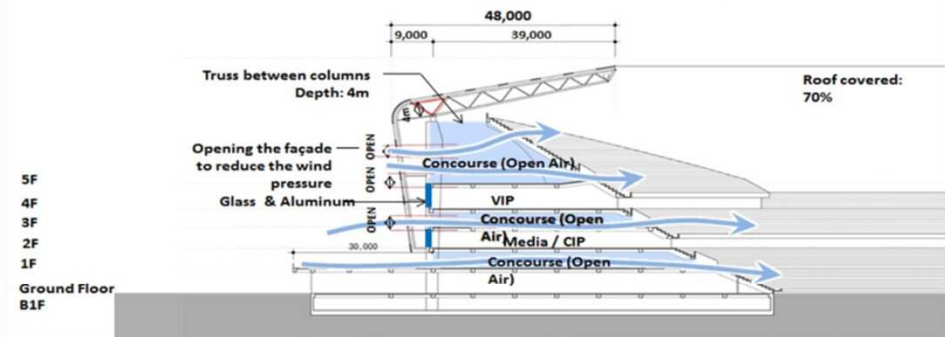
Cost Management - Value Engineering Proposals

Existed Plan



- ✓ Unperformed Wind Tunnel Test
- ✓ Insufficiency of local design codes analysis & scheduling
- ✓ Excessive estimation of construction cost

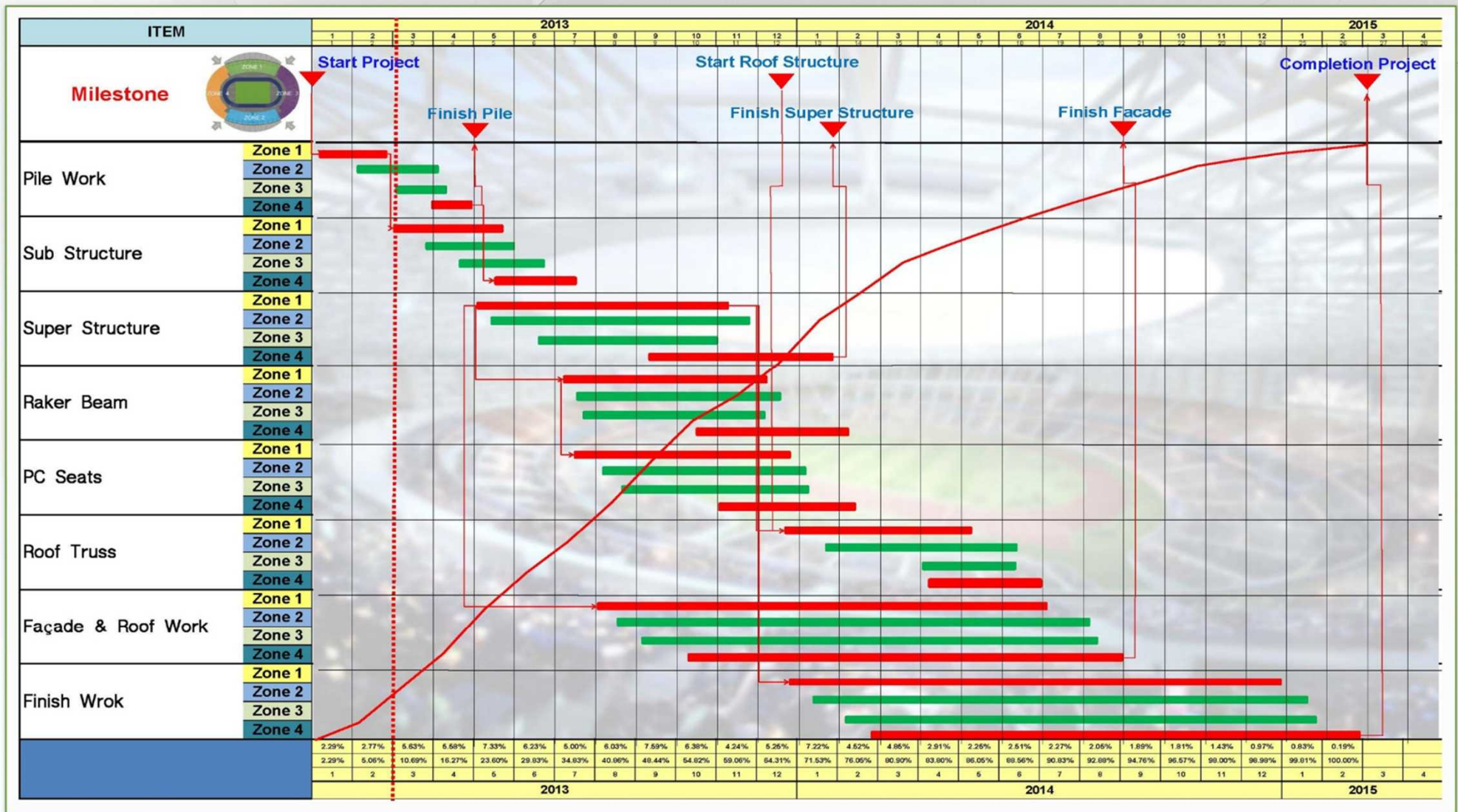
Changed Plan_Heerim Architect & Planners



- ✓ Found potential problems from existed schedule & construction cost based on case studies
- ✓ **Changed Design/Designer by VE Proposals**

3. Main Tasks of the PCM

Construction & Schedule Management - Master Schedule

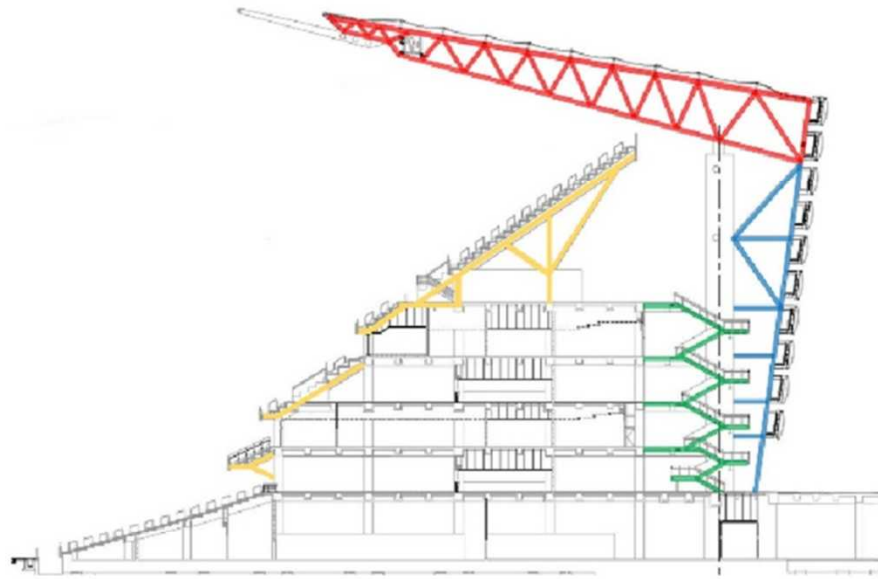


3. Main Tasks of the PCM

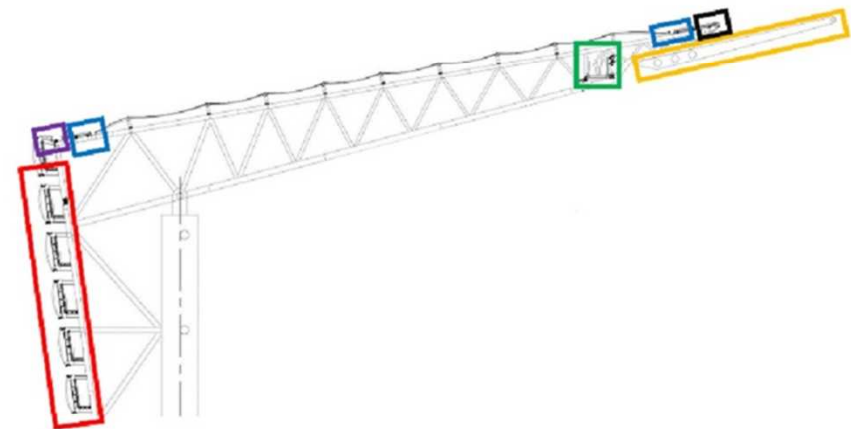
Construction & Schedule Management - Steel Structure Works (1/4)

Total Amount of Steel	Classification	Roof Structure	Back Structure	Raker Structure	ETFE Structure	Steel Stair	Embed	Total
	Weight(Ton)	6,970	5,257	3,391	3,003	1,503	692	20,816

Classification of Steel Structure



- Roof Truss
- Raker Structure
- Back Structure
- Steel Stair



- Façade
- Flat Roof
- Eyebrow
- Gutter
- Catwalk
- Bullnose

Shop Fabrication for Steel Structure

TEKFEN CEYHAN (Turkey)

- Total amount : 13,741 ton
- Land Transportation : Turkey-Georgia-Azerbaijan (approximately 2,230km)

AZERI STEEL (Azerbaijan)

STP-Sumgait Technologies Park (Azerbaijan)

- Total amount : 7,075 ton

Manpower Management for Erection of Steel Structure

24 hours works : 2 Shifts (Day, Night)

Working Days : included local holidays & weekends

Inspection of workers & progresses of Roof Truss works

- Inspection by the PCM : every 2 hours / 24 hours

Lifting & Erection Machines for Steel Structure Works

Name of machines	Ton	Number	Use
Tower Crane	15	8	• Truss Purlin, Catwalk, Gutter, Flat Roof, Bullnose, Raker Beam
Crawler Crane	1,250	1	• Dual/Single Roof Truss
Crawler Crane	500	2	• Back Structure, Eyebrow
Crawler Crane	300	2	• Back Structure, Roof Truss (fabrication on the ground)
Crawler Crane	90	1	• Roof Truss (fabrication on the ground)
Hydro Crane	160	2	• Roof Truss (fabrication on the ground)
Hydro Crane	75	3	• Roof Truss (fabrication on the ground)
Hydro Crane	50	3	• Roof Truss (fabrication on the ground)

Roof Truss

Fabrication of Roof Trusses

Poor Working Conditions due to gales

- Available Dates for lifting works : Max. 5 days/week

Minimization of lifting works & working in high places

Installation of fabrication shops on the ground

- Assembling Flat Roof, Gutter, Bullnose Sub Frame on the ground before lifting a roof truss
- Completing painting works

Maximization of fabrication completeness of a roof truss

Placement of shops in accordance with C/Crane routes

- Standing by fabricated Roof Trusses in lifting order

Compressed the lifting duration
(5days/pc → 4.1days/pc)

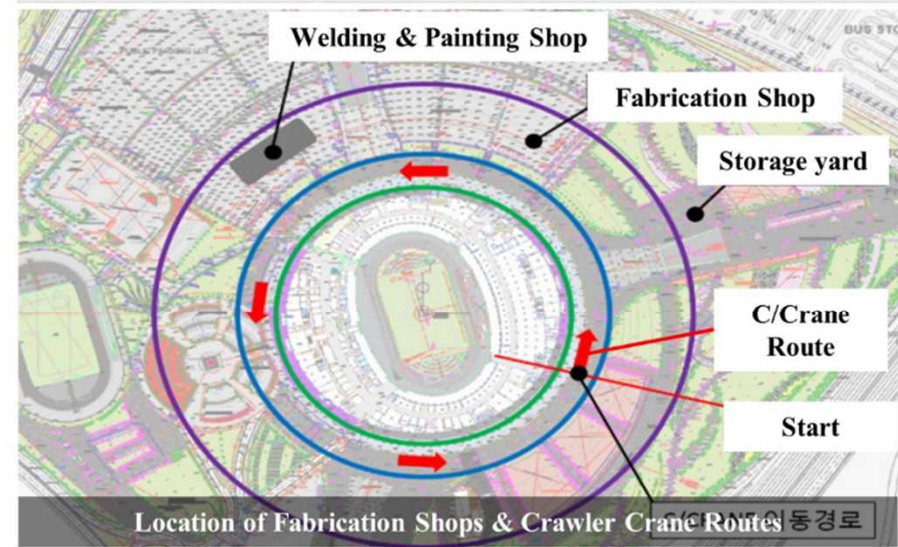
Erection of Roof Trusses

Operation of a 1,250ton Crawler Crane

- Fabricating a Dual Roof Truss
(250ton_Combined 2pcs of Single Roof Trusses)

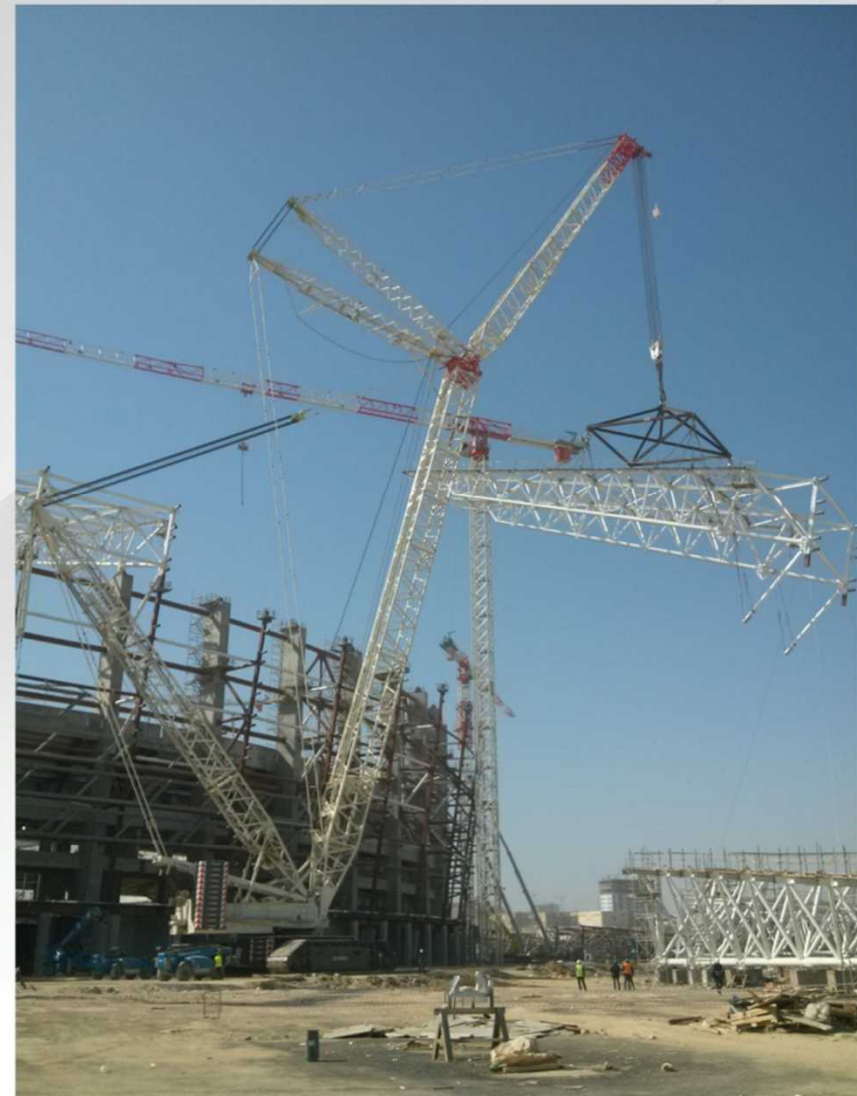
Reduced the number of lifting works (60 → 32times)

- Dual Roof Truss : 28pcs
- Single Roof Truss : 4pcs



3. Main Tasks of the PCM

Construction & Schedule Management - Steel Structure Works (4/4)



Mobile Construction Management System



• MCMS



Connected to Project Management Information System



• PMIS (MCMS Web Site)

Development Strategy of MCMS



Functions of MCMS

The screenshot displays the MCMS mobile application interface. On the left is a main menu for the 'Baku Olympic Stadium' project, listing various functions: Home, Site Information, Organization, Issue Tracker, Document Log, Task & Schedule, Punch List, Deficiency Notice, Field Instruction, Safety Issue, and Finish Schedule. The 'Site Information' and 'Issue Tracker' menu items are highlighted with dashed red and green boxes, respectively. The 'Site Information' screen (center) features a 'Bird's eye view' of the stadium and a 'Recent Pictures' section with three images of the construction site. The 'Issue Tracker' screen (right) shows a list of issues, with one issue highlighted: 'MEP waterproofing' with status 'OPEN', priority 'HIGH', and date '2014.SEP.23'. Below this, a 'Detail' view shows three records of the issue's progress, including dates and actions taken by BAKU ADMIN and SEO, BONG WH...

Main Menu:

- Baku Olympic Stadium
- Menu
- Home
- Site Information
- Organization
- Issue Tracker
- Document Log
- Task & Schedule
- Punch List
- Deficiency Notice
- Field Instruction
- Safety Issue
- Finish Schedule

Site Information Screen:

- Bird's eye view
- Recent Pictures

Issue Tracker Screen:

- OPEN HIGH 2014.SEP.23
- MEP waterproofing
- Issue Tracker Detail
- Status: OPEN Priority: HIGH
- Issue Description: MEP waterproofing
- Issue Date: 2014.SEP.23
- Detail 3 record
- 1 request contractor repair Date 2014.SEP.23 Action by BAKU ADMIN
- 2 under repairing Date 2014.SEP.28 Action by BAKU ADMIN
- 3 will check together Date 2014.SEP.30 Action by SEO, BONG WH...

Effective & systematic project management using mobile phones

The Process of Quality Management & Making a Punch List¹⁾ Utilizing MCMS

Works of CM
Works of DB Contractor
Joint Works

Baku Olympic Stadium

Menu

- Home
- Site Information
- Organization
- Issue Tracker
- Document Log
- Task & Schedule
- Punch List**
- Deficiency Notice
- Field Instruction
- Safety Issue
- Finish Schedule
- Settings
- Setting

Punch List Add

Activity: Interior Work

Location: Level 2

Location Detail: 2102 CIP SUITE-1

Photo: [Camera Icon] [Gallery Icon]

Punch Comment

- (C)GYPSUM BOARD + PAINT/ ACOUSTICAL
- OMIT / IMPROPER MATERIAL
- WATER LEAK
- CRACK

Punch List

Activity: Interior Work

Location: Main Stadium - Zone 1...

Status: OPEN

Date: 2014.OCT.02

Activity: Interior Work

Location: Main Stadium - Zone 1... 2102 CIP SUITE-1

Status: RESPONDED

Date: 2014.OCT.01

Activity: Interior Work

Location: Main Stadium - Zone 1... 2102 CIP SUITE-1

Status: OPEN

Date: 2014.OCT.01

Activity: Interior Work

Location: Main Stadium - Zone 4... T005 PM RM S-2

Status: RESPONDED

Date: 2014.OCT.01

Activity: Interior Work

Location: Main Stadium - Zone 1... T004 IT RM E-3

Status: RESPONDED

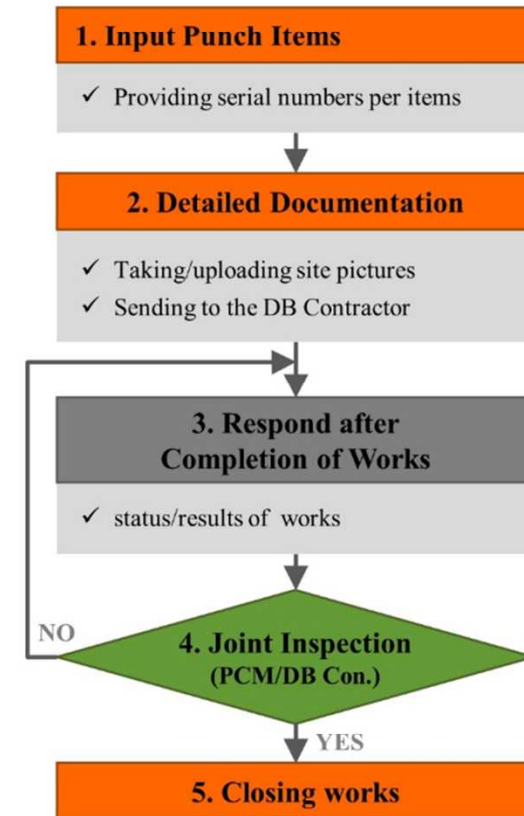
Date: 2014.SEP.30

Activity: Interior Work

Location: Main Stadium - Zone 1... T004 IT RM E-3

Status: RESPONDED

Date: 2014.SEP.30



1) A list made near the completion of the construction work indicating items of work that remain unfinished, do not meet quality or quantity requirements as specified or are yet to be performed which must be accomplished by the Contractor prior to completing the terms of the contract. - CMAA, 2002 Edition, Construction Management Standards of Practice (CMAA Document A-1 / CMAR) p.12

3. Main Tasks of the PCM

Quality Management - Mobile Construction Management System (MCMS) (4/5)

Punch List _ Samples of PMIS

The image displays two screenshots from the MCMS (Mobile Construction Management System) interface. The left screenshot shows the main dashboard with a navigation menu at the top. The 'Punch List' option is highlighted in the menu. Below the menu, there is a table titled 'Punch List I' showing a list of punch list items. The right screenshot is a detailed view of a specific punch list item (ID: 5737) with the status 'OPEN'. It contains fields for Activity, Location, Part, Charge in PCM, Charge in Contractor, punch comment, Others, Action By, Date, Photo, response comment, expected closing date, Reject Comment, and Close out. An orange arrow points from the 'Punch List' menu item in the left screenshot to the detailed view on the right.

Punch List I

NO	Status	Activity	Location	Room	Part
5739	OPEN	handover	Main Stadium-Zone 1-Grou	KITCHEN	BEGOC
5738	OPEN	handover	Main Stadium-Zone 1-Grou	KITCHEN	BEGOC
5737	OPEN	handover	Main Stadium-Zone 1-Level	IT ROOM	PCM
5736	OPEN	handover	Main Stadium-Zone 1-Level	CATERING E-2	PCM
5735	OPEN	handover	Main Stadium-Zone 1-Level	CATERING E-1	PCM
5734	OPEN	handover	Main Stadium-Zone 1-Level	4102 CIP SUITE-20	PCM
5733	OPEN	handover	Main Stadium-Zone 1-Level	4102 CIP SUITE-15	PCM
5732	OPEN	handover	Main Stadium-Zone 1-Level	part 7 (Axis 28-33,	PCM
5731	OPEN	handover	Main Stadium-Zone 1-Level	Part 1 (Axis 12-17,	PCM

Punch -- Webpage Dialog

Punch List : 5737 (STATUS : OPEN)

Activity: handover Location (Cl.v): Level 2 IT ROOM

Location: Main Stadium-Zone 1-Level 2-IT ROOM

Part: PCM

Charge in PCM: Jeong Yeon Gil Charge in Contractor: Toiga Ergin

punch comment: DEFECT NEED CLEANING

Others:

Action By: PCM Lee, Jong Date: 2015-04-20

Photo: [Attach File / Download -]

response comment: [Attach File / Download -]

expected closing date: [Attach File / Download -]

Action By: PCM Lee, Jong Date: [Attach File / Download -]

Photo: [Attach File / Download -]

RESPONSE REGIST

Reject Comment: [Attach File / Download -]

REJECT REGIST

Action By: PCM Lee, Jong Date: [Attach File / Download -]

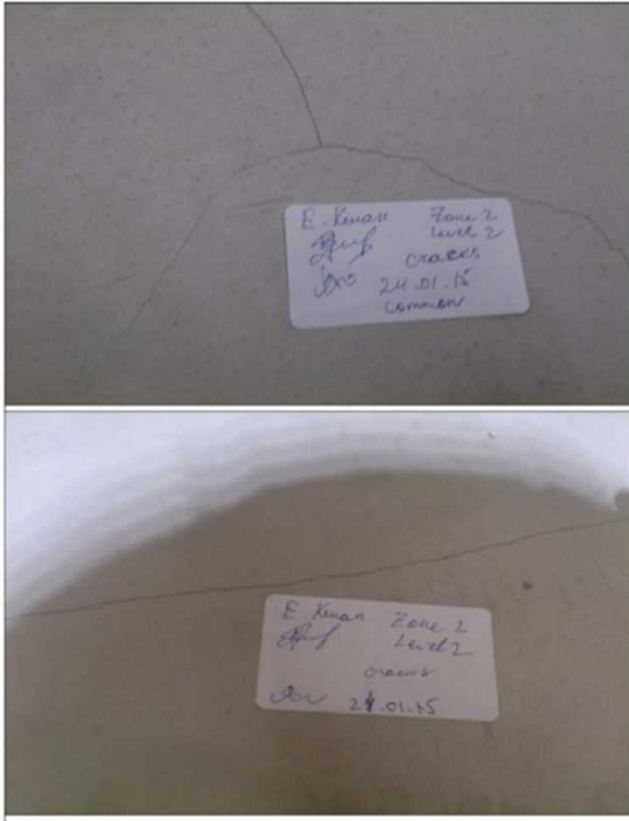
Close out: [Attach File / Download -] Closed By: PCM Lee, Jong Date: [Attach File / Download -]

Punch lists made by MCMS are connected to PMIS

3. Main Tasks of the PCM

Quality Management - Mobile Construction Management System (MCMS) (5/5)

Punch List _ Samples of PMIS

SOCAL		heerim CM		PUNCH LIST (Gordocak (gpr system))	
Project:	Baku Olympic	Issued Photo			
Issued to (+a verisi)					
Issued by (parafidan)					
Subject (Mowu)					
Discipline (nizam)	☐ Civil (hazir) ☐ Electric (Ele)				
Type (shv)	DWG (Dok)				
Location (Makam)	Main Stadium-Z				
Issued Date (verima tarixi)	Date (tarix)				
	2015-01-24 15:				
Punch Comments & Others CRACKING					
Respond Comments (Cavab ps)					
Checked by (Tastad)					
Received by (Qabul etdi)					
Distribution (Tasvifat)					

Main Stadium-Zone 2-Level 2-COMMON PARTS / FLOOR / CRACKING &

► Results of Application

• Usability

- ✓ Real time site Monitoring & application of information
- ✓ Efficient on site paper works & systematic management

• Schedule & Quality Management

- ✓ Prevention of time delay by documentation works procedure such as inspection, defects repair/completion of incomplete works, re-inspection, approval, etc.
- ✓ Information sharing among project participants by continuous feedback functions

Contribution to
time compression

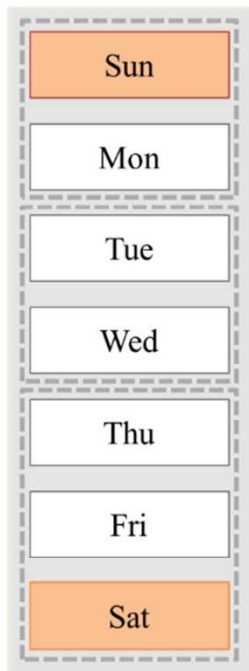
Concentration on
Quality improvement

“Safety is the first priority”

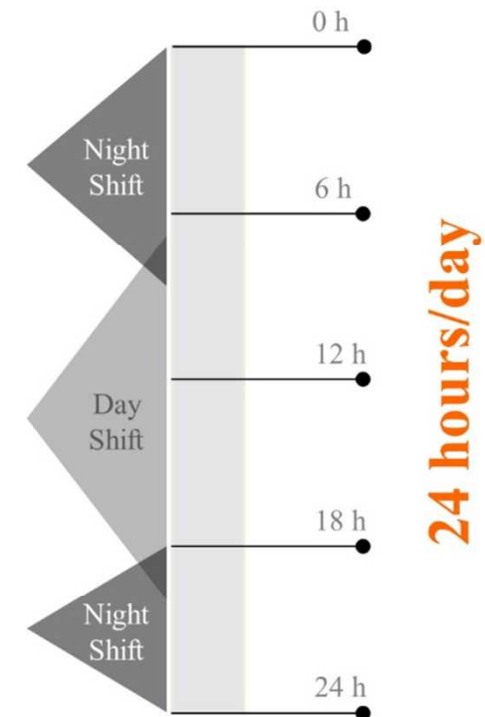
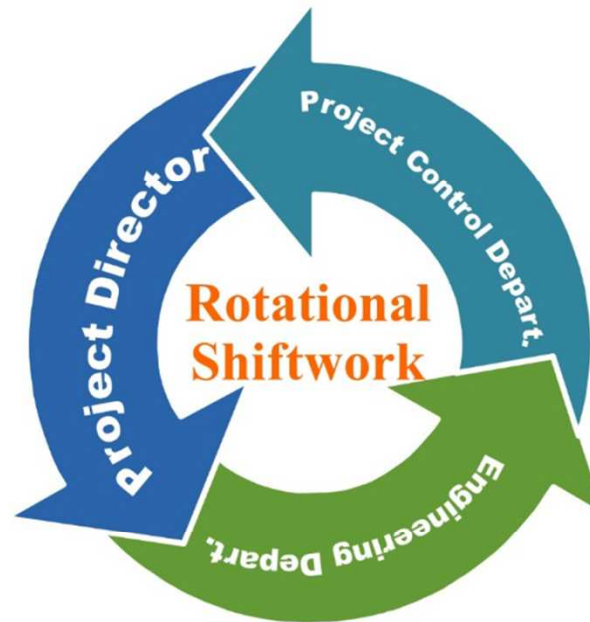
Rotational Shiftwork of the PCM in compliance with Tight Construction Schedule

Hourly Site Patrol

7 days/week



Duty on holidays & weekends



2 shifts rotational duty

Main Contents of Safety Management



SOCAR		heerim		TEKFEN	
		Architects & Planners		CONSTRUCTION	
BAKU OLYMPIC STADIUM PROJECT					
PROJE BİTİMİNE KALAN GÜN SAYISI		LAYİHİNİN BASA CATMASINA QALAN GÜN SAYI		0	
DAYS LEFT TO END OF THE PROJECT					
PROJEDE ÇALIŞILAN TOPLAM GÜN SAYISI		LAYİHƏDƏ GÖRÜLƏN İŞLƏR ÜZRƏ CƏMI GÜN SAYI		747	
TOTAL MAN-HOURS WORKED IN THE PROJECT					
PROJEDE ÇALIŞILAN TOPLAM ADAM-SAAAT		LAYİHƏDƏ GÖRÜLƏN İŞLƏR ÜZRƏ CƏMI ADAM-SAAAT		20517870	
TOTAL MAN-HOURS WORKED IN THE PROJECT					
İŞ GÜNÜ KAYIPSAZ ÇALIŞILAN TOPLAM GÜN SAYISI		İŞ GÜNÜ İTİRİLMƏDƏN GÖRÜLMÜŞ CƏMI GÜN SAYI		747	
TOTAL DAYS WORKED WITHOUT LTI					
İŞ GÜNÜ KAYIPSAZ ÇALIŞILAN TOPLAM ADAM-SAAAT		İŞ GÜNÜ İTİRİLMƏDƏN GÖRÜLMÜŞ CƏMI ADAM-SAAAT		20517870	
TOTAL MAN-HOURS WORKED WITHOUT LTI					
SEC ÖNCELİGİMİZDİR! / İLK NÖVBƏDƏ TƏHLÜKƏSİZLİK! / HSE IS OUR PRIORITY!					

- ✓ Daily Tool Box Meeting
- ✓ Daily housekeeping at the end of each work
- ✓ Brain storming regarding safety management before works
- ✓ Installation of proper lighting & cleaning up at all openings, stairs and paths
- ✓ Installation of Safety guard around openings, working platforms of Scaffoldings
- ✓ Obligation to wear Personal Protection Equipment
- ✓ Installation of designated smoking areas & drinking fountains
- ✓ Assignment of safety managers/inspectors at work places
- ✓ Safety training for new/exiting employees

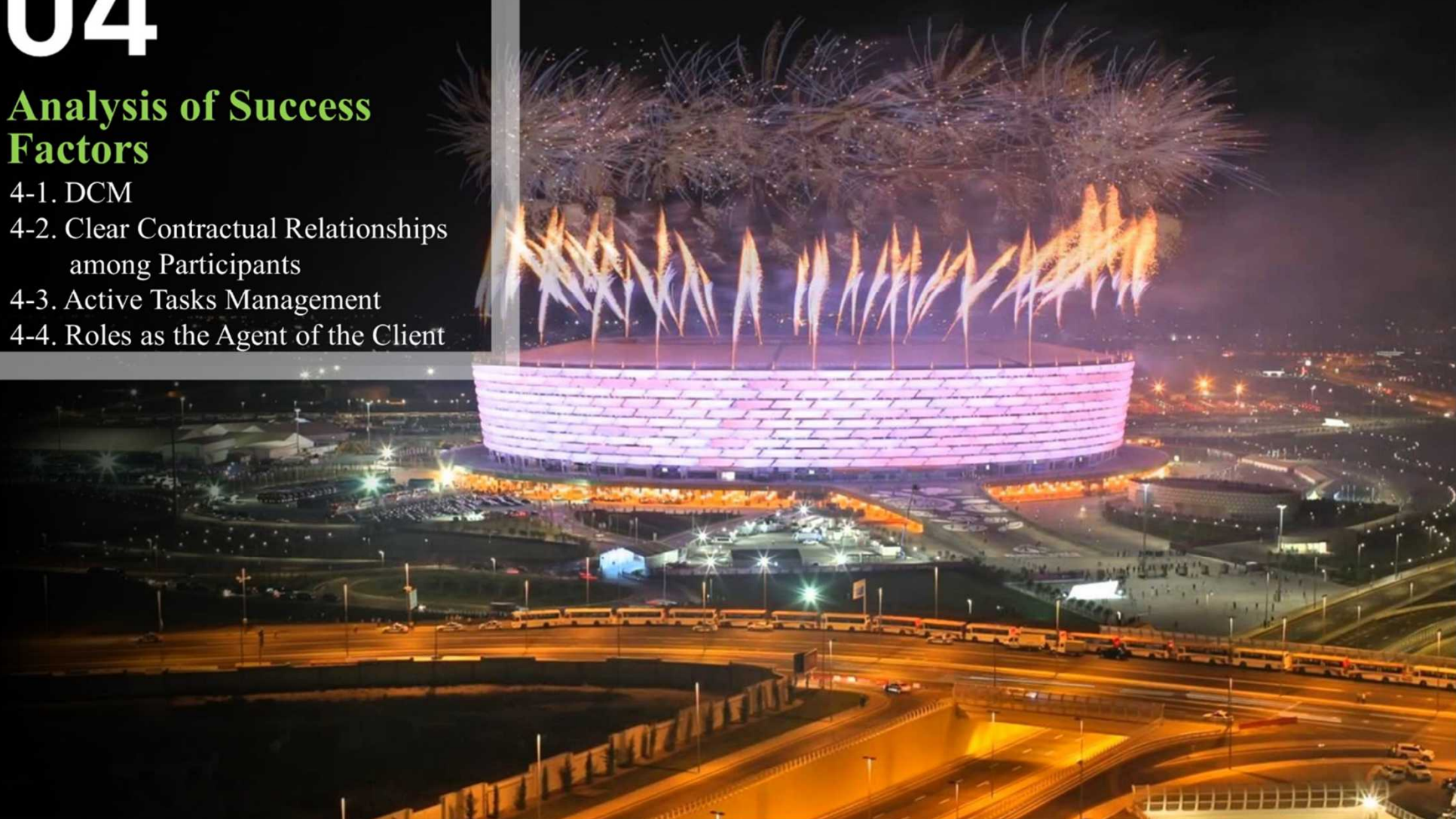
Construction of Baku Olympic Stadium



04

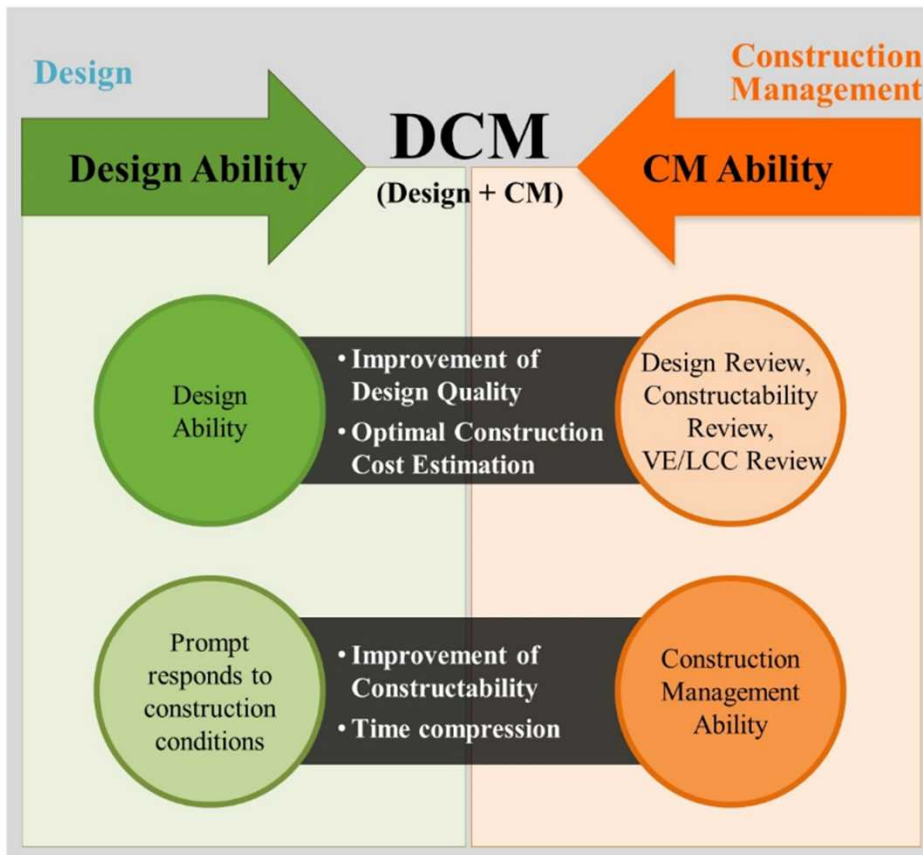
Analysis of Success Factors

- 4-1. DCM
- 4-2. Clear Contractual Relationships among Participants
- 4-3. Active Tasks Management
- 4-4. Roles as the Agent of the Client



“Design + Construction Management”

Definition & Effectiveness of DCM



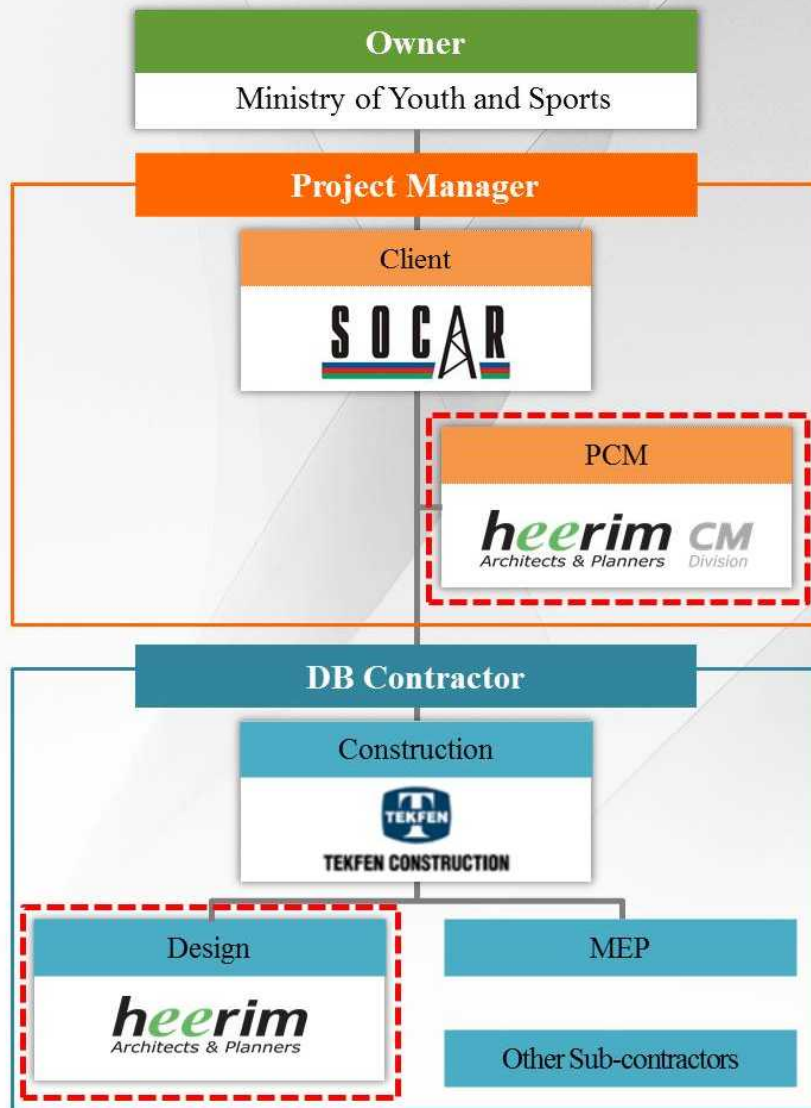
Based on closer cooperation between Designer & CM

- ✓ Provision of one-stop total service of Design & CM
- ✓ Specific comprehension of a project by performing Design & CM at the same time
- ✓ Integrated review of Design & Engineering
- ✓ Securement of Design improvement & constructability at the same time
- ✓ Prompt & reasonable decisions making through continuous feedback
- ✓ Reflected maximized design intentions in Construction
- ✓ Flexible actions to issues such as change orders, etc. in the construction phase

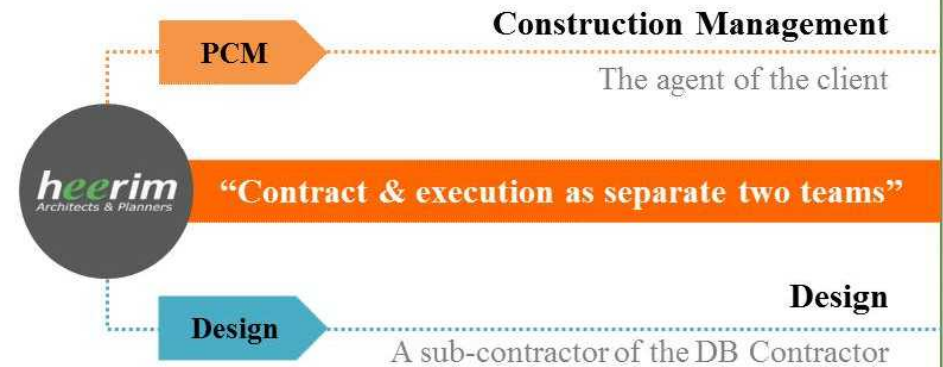
Concurrent satisfaction with completeness of architecture & efficiency of projects

4. Analysis of Success Factors

Clear Contractual Relationships among Participants



Contract Relation of Heerim



Project performing methods as per Contract Relations

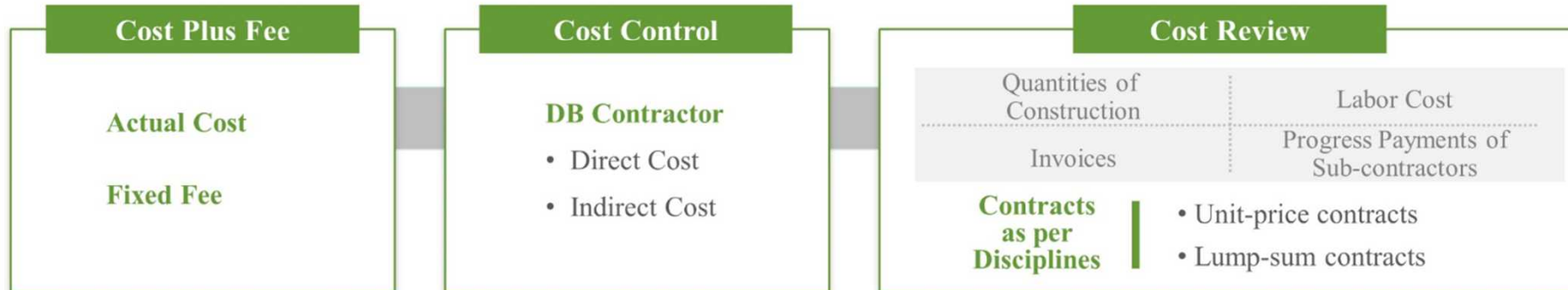
✓ Positive Responds to Fast Track

- Easy to acquire information & understand intentions of design
- Prompt performing of change orders reflected requirements of the client
- Establishment of firm cooperative relationship between the PCM & DB Contractor

✓ Clarification the relation of responsibility according to contracts

- Design shall be conducted & managed by the DB Contractor

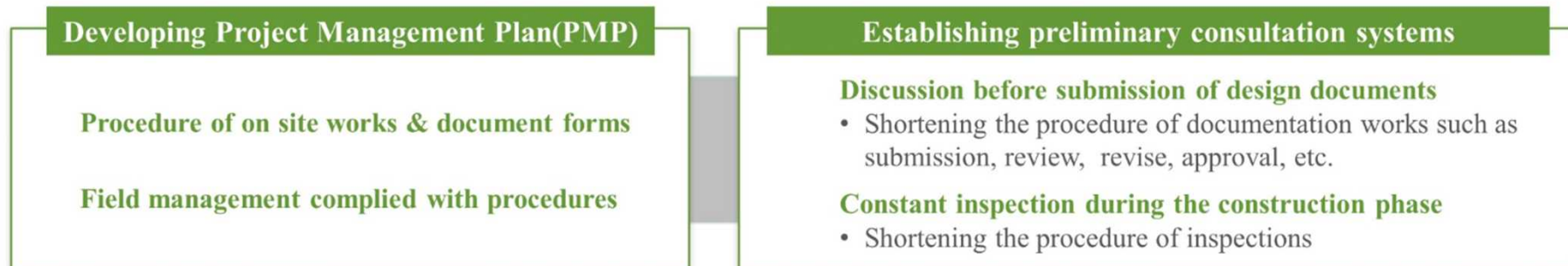
Cost Management



On site inspection of labors manpower, equipment, material, etc. for 24 hours

Handling additional works of the PCM for cost verification

Design & Construction Management



Prevention of time delay by documentation works and the site inspection procedure

Roles of the PCM for the European Games

Commencement of Preparation for “the European Games”



Occurrence of conflicts among project stakeholders

Issue of selection the main agent for decisions making/managing

Issue of Schedule & cost management

Responsibility issue of incomplete works, defects, rectification works during the preparation phase

“ The overlay phase is out of the of the PCM’s work scope ”

Performing roles of a coordinator as the agent of the Client

Resolution of conflicts & hosting the successful international event

05

Corporate Social Responsibility

5-1. Support a social welfare facility

5-2. OJT Program



Local Disable Children Center (THE CHILD PSYCHO-NEUROLOGICAL CENTER)

Visit the Center Once a Month

- Lack of financial support & child care teachers
- Maintenance the center, housekeeping, etc.



Going out with Children & Invitation to the Accommodation for Employee

- Visit parks, zoos, swimming pools, etc.
- Participation in events (magic show, handicraft, etc.)



Mitigation of resistance to a foreign company & harmony with local society
Improvement positive images toward Korean companies

Participation in the On the Job Training Program of the Oversea Construction Business

“Selection of applicants for the OJT Program”

“Training & performing of on site tasks”

“Contribution to fosterage Construction Manager for Oversea Projects”

“Public relation for the OJT Program”



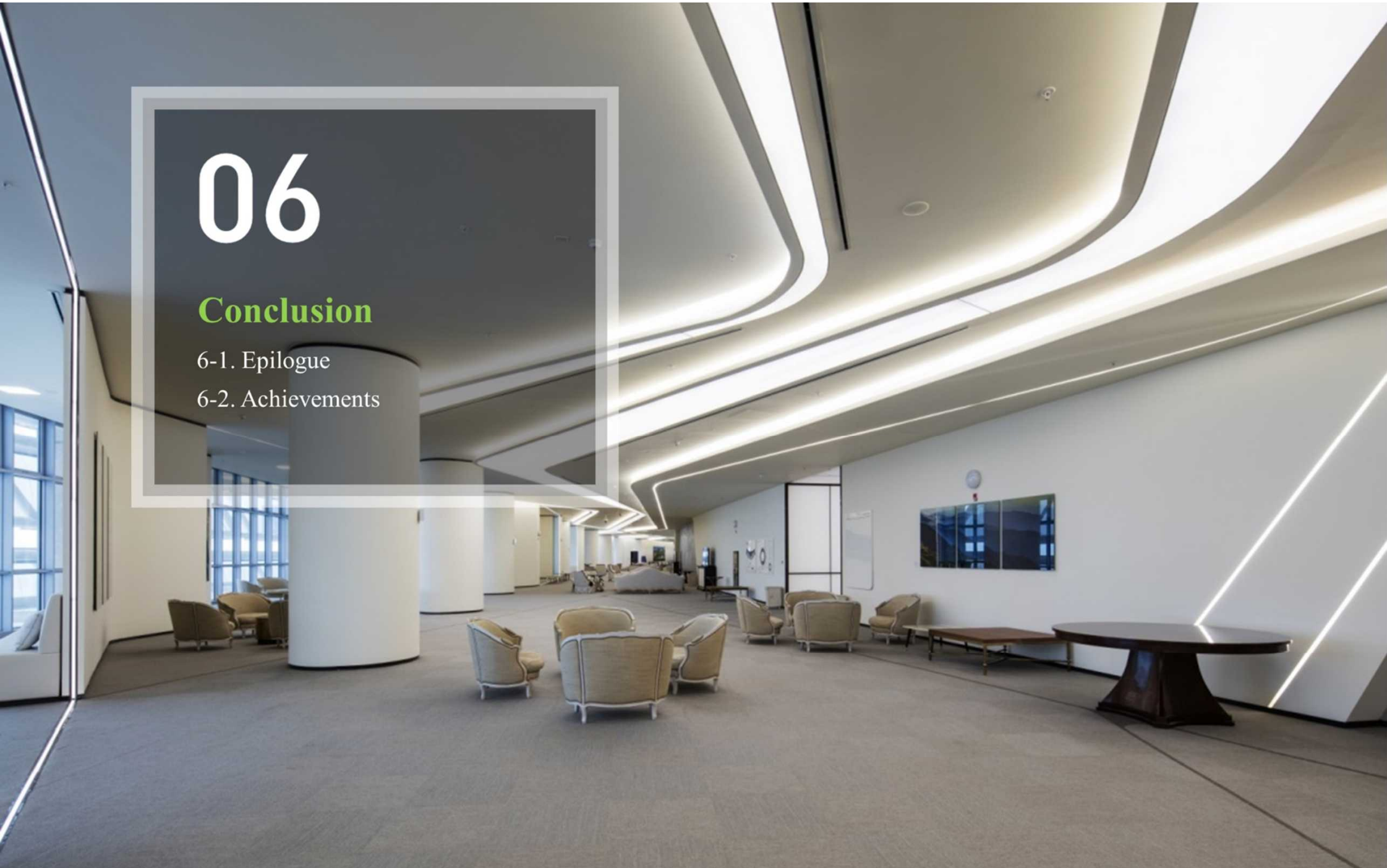
Executing roles to encourage & give opportunity to applicants for overseas projects

06

Conclusion

6-1. Epilogue

6-2. Achievements



Recognition of “Same Team”

Win-Win strategies through inspiring Korean/Local Staffs with senses of belonging & duty

for Korean Staffs

to understand cultural & language diversities



- Learning local language



- Slogan Contest & award



- Birthday parties



- Sports events

for Local Staffs

to improve working conditions & welfare

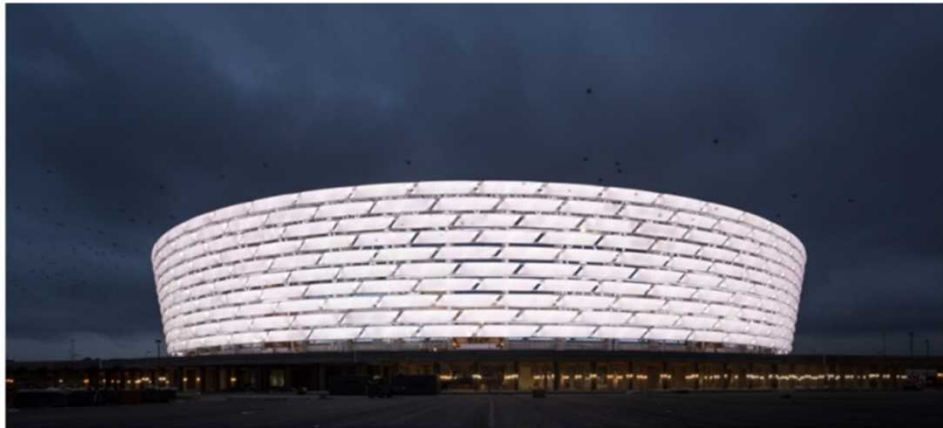
- Operation commuting shuttle buses
- Proper compensation
- Leisure activities
- Family events

Performing tasks as the agent of the client

+

Sharing an awareness that the PCM is the “same team” to try to agonize & solve in advance of project stakeholders’ difficulties.

Awards & Press Releases



1. Awards

- ✓ 2015 ENR Global Best Project – Sports/Entertainment
- ✓ Diamond Award : Structural Systems, 2016 ACEC New York Engineering Excellence Award
- ✓ 2016 World Stadium Congress Award
- ✓ FIDIC Award of Merit 2016
- ✓ Grand Prize : Minister of Land, Infrastructure and Transport Award, 2016 The Day of Construction Engineering & Management in Korea

2. Press Releases

- ✓ Web Magazine, STADIA (September, 2014)
- ✓ Southeast Building Magazine (May, 2015), etc.

Significances of the Project



1. 1st European Games

- ✓ Period : June 12th, 2016. ~ June 28th, 2016
- ✓ Participating Nations : 50

2. Results of the Project

- ✓ The biggest international sports event in Azerbaijan
- ✓ By successful hosting the 1st European Games, contributing Azerbaijan's national prestige soared

Questions?

