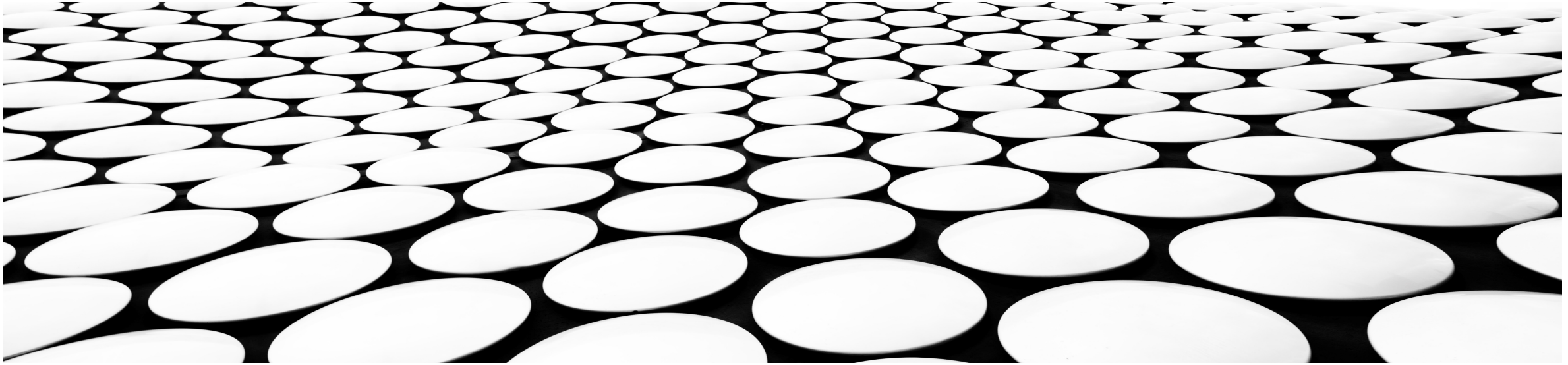
BEIRUT CITY CENTRE

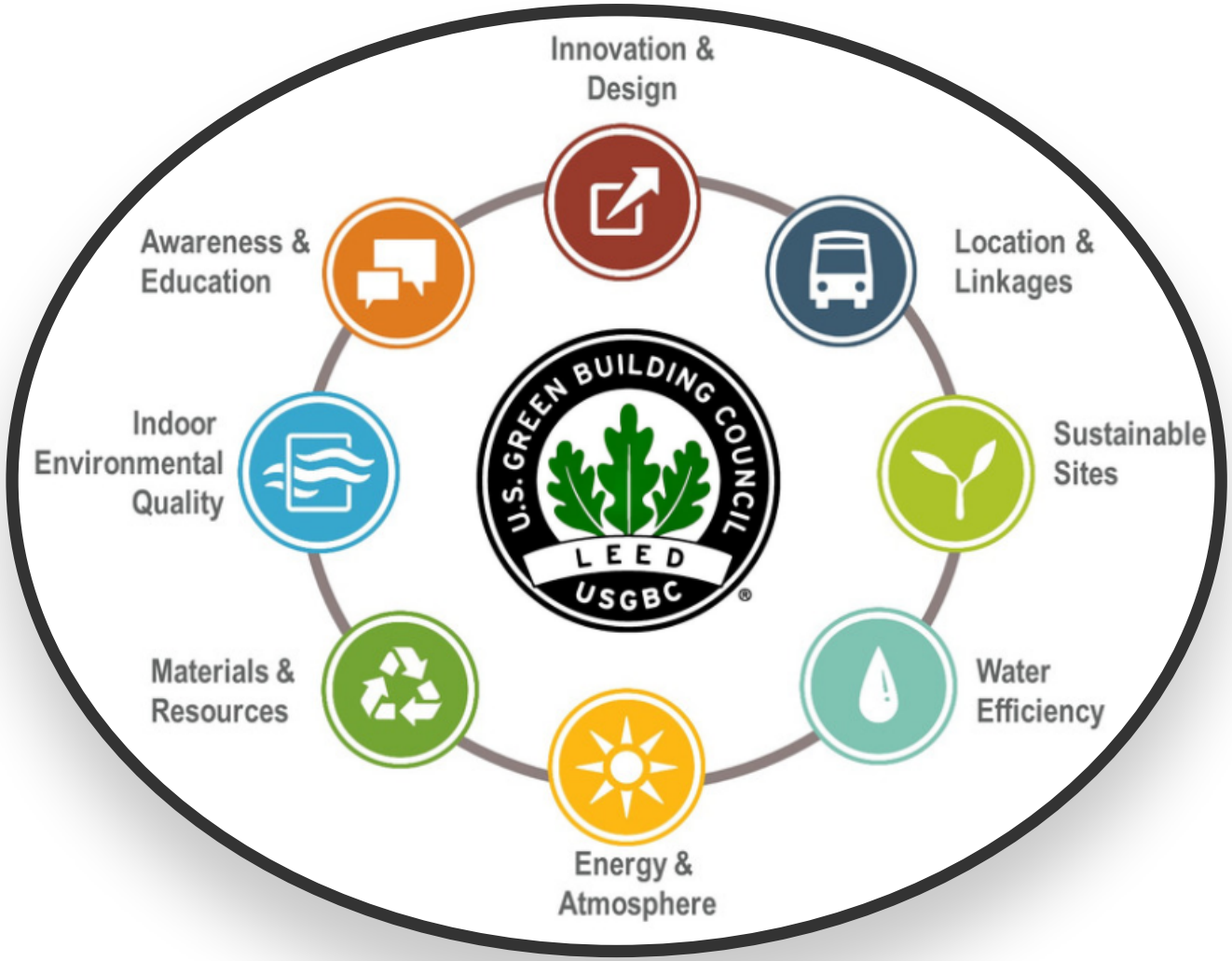
ARAB ACADEMY FOR SCIENCE, TECHNOLOGY, AND MARITIME TRANSPORT
COLLEGE OF ENGINEERING AND TECHNOLOGY
ARCHITECTURAL ENGINEERING AND ENVIRONMENTAL DESIGN DEPARTMENT
ENVIRONMENTAL STUDIES I (AR362)
PRESENTED TO: DR NADER GHARIB
ENG ENAS EL ASSAL
ENG ENAS ZAIN
PRESENTED BY: HANA RAGAB 19108302



WHAT IS LEED?

Leadership in Energy and Environmental Design
LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world. Available for virtually all building types, LEED provides a framework for healthy, highly efficient, and cost-saving green buildings.


LEED Certification Levels
Earn points for each sustainable design element achieved in a building.
Certified
40–49 Points
Silver
50–59 Points
Gold
60–79 Points
Platinum
80+ Points


Innovation & Design
Location & Linkages
Sustainable Sites
Water Efficiency
Energy & Atmosphere
Materials & Resources
Indoor Environmental Quality
Awareness & Education
U.S. GREEN BUILDING COUNCIL
LEED
USGBC

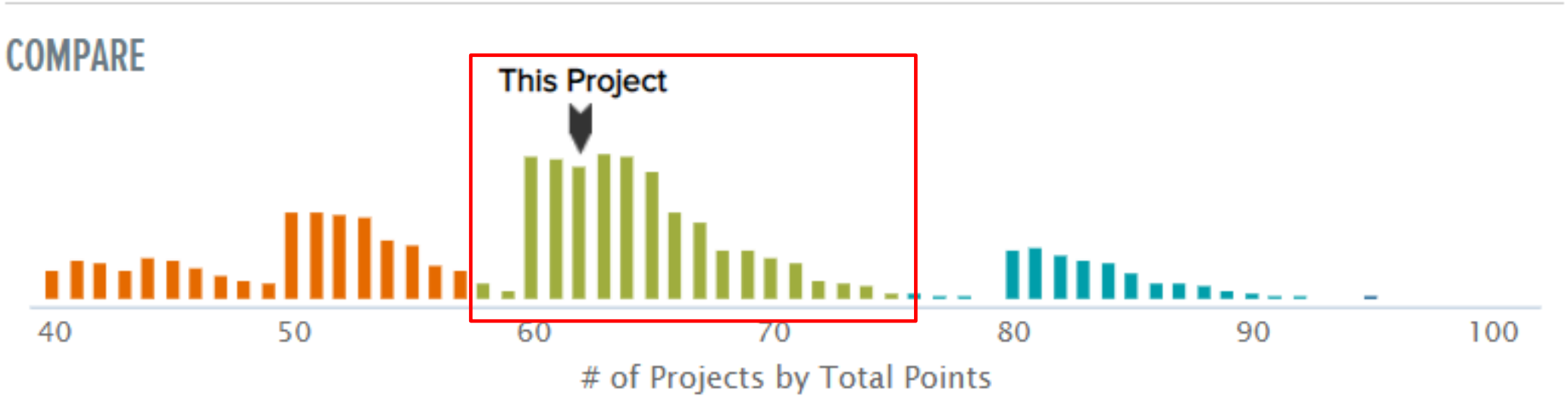
BEIRUT CITY CENTRE CERTIFICATION

Project Info

Size 1,037,723 sq ft

Certification type	Level	Points	Certification date
LEED 2009 Core and Shell	Gold	62	December 09, 2013

IN THE TOP 53% OF PROJECTS IN THIS RATING SYSTEM VERSION



1000003044, Beirut

Beirut City Centre

LEED BD+C: Core and Shell (v2009)

GOLD, AWARDED DEC 2013

SUSTAINABLE SITES — AWARDED: 17 / 28

SSp1	Construction activity pollution prevention	REQUIRED
SSc1	Site selection	1 / 1
SSc2	Development density and community connectivity	0 / 5
SSc3	Brownfield redevelopment	0 / 1
SSc4.1	Alternative transportation - public transportation access	6 / 6
SSc4.2	Alternative transportation - bicycle storage and changing rooms	2 / 2
SSc4.3	Alternative transportation - low-emitting and fuel-efficient vehicles	3 / 3
SSc4.4	Alternative transportation - parking capacity	2 / 2
SSc5.1	Site development - protect or restore habitat	0 / 1
SSc5.2	Site development - maximize open space	0 / 1
SSc6.1	Stormwater design - quantity control	0 / 1
SSc6.2	Stormwater design - quality control	0 / 1
SSc7.1	Heat island effect - nonroof	1 / 1
SSc7.2	Heat island effect - roof	1 / 1
SSc8	Light pollution reduction	0 / 1
SSc9	Tenant design and construction guidelines	1 / 1

WATER EFFICIENCY — AWARDED: 8 / 10

WEp1	Water use reduction	REQUIRED
WEc1	Water efficient landscaping	2 / 4
WEc2	Innovative wastewater technologies	2 / 2
WEc3	Water use reduction	4 / 4

ENERGY & ATMOSPHERE — AWARDED: 17 / 37

EAp1	Fundamental commissioning of building energy systems	REQUIRED
EAp2	Minimum energy performance	REQUIRED
EAp3	Fundamental refrigerant Mgmt	REQUIRED
EAc1	Optimize energy performance	5 / 21
EAc2	On-site renewable energy	0 / 4
EAc3	Enhanced commissioning	2 / 2
EAc4	Enhanced refrigerant Mgmt	2 / 2
EAc5.1	Measurement and verification - base building	3 / 3
EAc5.2	Measurement and verification - tenant submetering	3 / 3
EAc6	Green power	2 / 2

MATERIAL & RESOURCES — AWARDED: 5 / 13

MRp1	Storage and collection of recyclables	REQUIRED
MRc1	Building reuse - maintain existing walls, floors and roof	0 / 5
MRc2	Construction waste Mgmt	1 / 2

MATERIAL & RESOURCES — CONTINUED

MRc3	Materials reuse	0 / 1
MRc4	Recycled content	2 / 2
MRc5	Regional materials	2 / 2
MRc6	Certified wood	0 / 1

INDOOR ENVIRONMENTAL QUALITY — AWARDED: 7 / 12

EQp1	Minimum IAQ performance	REQUIRED
EQp2	Environmental Tobacco Smoke (ETS) control	REQUIRED
EQc1	Outdoor air delivery monitoring	0 / 1
EQc2	Increased ventilation	1 / 1
EQc3	Construction IAQ Mgmt plan - during construction	0 / 1
EQc4.1	Low-emitting materials - adhesives and sealants	1 / 1
EQc4.2	Low-emitting materials - paints and coatings	1 / 1
EQc4.3	Low-emitting materials - flooring systems	1 / 1
EQc4.4	Low-emitting materials - composite wood and agrifiber products	1 / 1
EQc5	Indoor chemical and pollutant source control	1 / 1
EQc6	Controllability of systems - thermal comfort	0 / 1
EQc7	Thermal comfort - design	1 / 1
EQc8.1	Daylight and views - daylight	0 / 1
EQc8.2	Daylight and views - views	0 / 1

INNOVATION — AWARDED: 4 / 6

IDc1	Innovation in design	0 / 1
IDc2	LEED Accredited Professional	0 / 1

REGIONAL PRIORITY CREDITS — AWARDED: 4 / 4

EAc1	Optimize energy performance	1 / 1
EAc3	Enhanced commissioning	1 / 1
EAc5.2	Measurement and verification - tenant submetering	1 / 1
WEc1	Water efficient landscaping	1 / 1
WEc2	Innovative wastewater technologies	0 / 1
WEc3	Water use reduction	0 / 1

TOTAL 62 / 110

40-49 Points	50-59 Points	60-79 Points	80+ Points
CERTIFIED	SILVER	GOLD	PLATINUM

LEED Scorecard

Gold 62/110

SUSTAINABLE SITES	17 / 28
WATER EFFICIENCY	8 / 10
ENERGY & ATMOSPHERE	17 / 37
MATERIAL & RESOURCES	5 / 13
INDOOR ENVIRONMENTAL QUALITY	7 / 12
INNOVATION	4 / 6
REGIONAL PRIORITY CREDITS	4 / 4

LEED DASHBOARD

Energy and Atmosphere

20/37

Possible Points

Materials and Resources

5/13

Possible Points

Indoor Environmental Quality

7/12

Possible Points

Sustainable Sites

17/28

Possible Points

Water Efficiency

9/10

Possible Points

Innovation in Design

4/6

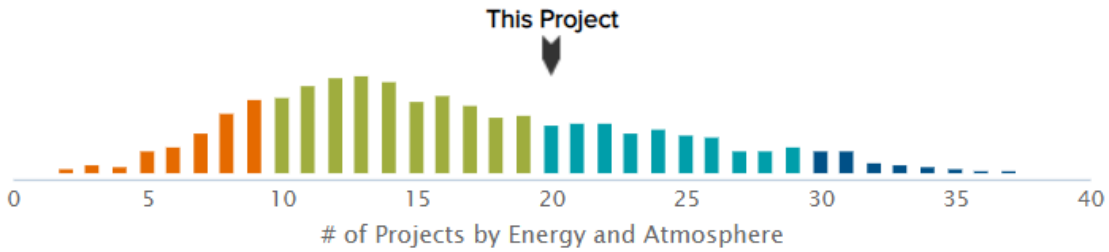
Possible Points

ENERGY AND ATMOSPHERE

16/37
Total EA Points

Very Good
Top **38%** of all LEED CS 2009 activities

Benchmark



Credit Achievement

EAc1: Optimize Energy Performance	EAc2: On-Site Renewable Energy	EAc3: Enhanced Commissioning	EAc4: Enhanced Refrigerant Management
6/21	0/4	3/2	2/2
Possible Points	Possible Points	Possible Points	Possible Points

EAc5.1: Measurement and Verification	EAc6: Green Power	EAp1: Fundamental Commissioning	EAp2: Minimum Energy Performance
3/6	2/2	YES	YES
Possible Points	Possible Points		

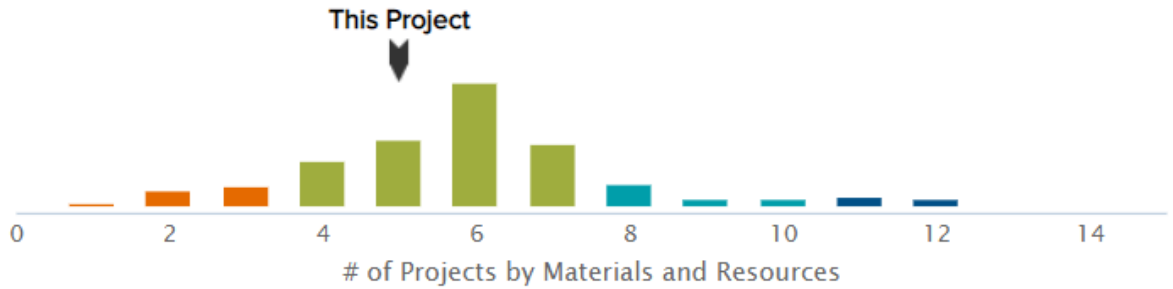
- The centre complies with the necessary qualifications to help reduce pollution, increase the effectiveness of energy sources such as electricity and water and encourage recycling processes.
- 18% improvement on baseline building performance rating
- 35% green power purchase

MATERIALS AND RESOURCES

5/13
Total MR Points

Very Good
Top **61%** of all LEED CS 2009 activities

Benchmark



Credit Achievement

MRc1: Building Reuse - Walls/Floor/Roof
0/5
Possible Points

MRc2: Construction Waste Management
1/2
Possible Points

MRc3: Buidling Materials Reuse
NO

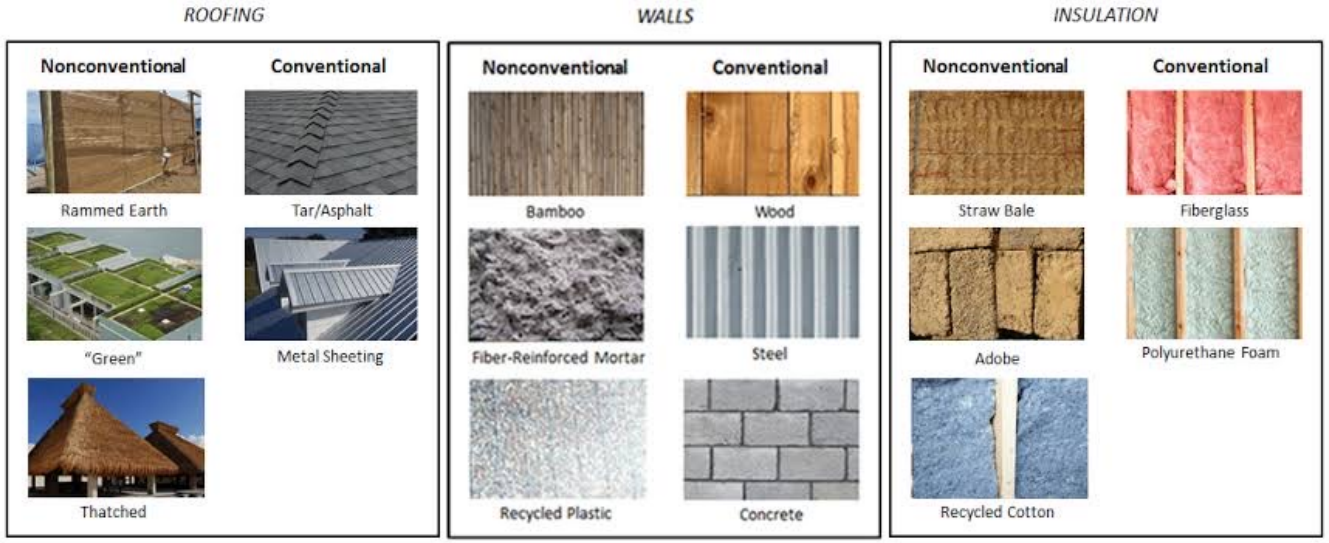
MRc4: Recycled Content
2/2
Possible Points

MRc5: Regional Materials
2/2
Possible Points

MRc6: Certified Wood
NO

MRp1: Recycling Collection / Storage
YES

- 50% diversion of construction and demolition debris
- 20% recycled content building materials
- 20% regionally extracted, harvested, recovered, or manufactured materials

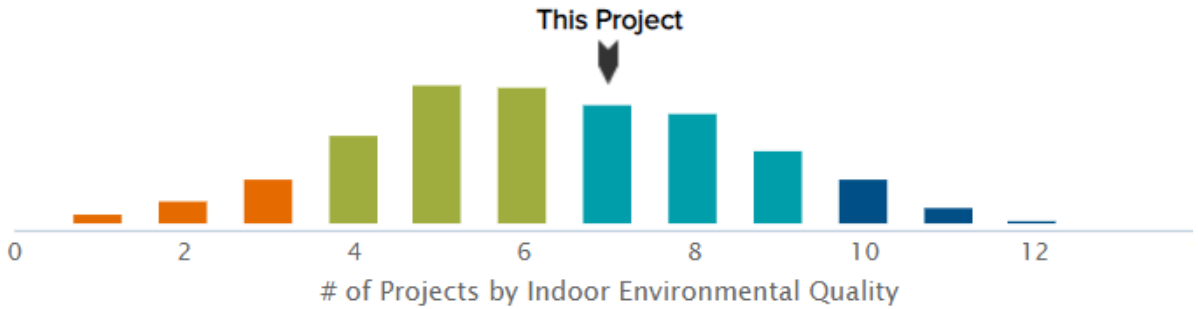


INDOOR ENVIRONMENT QUALITY

7/12
Total IEQ Points

Excellent
Top **35%** of all LEED CS 2009 activities

Benchmark

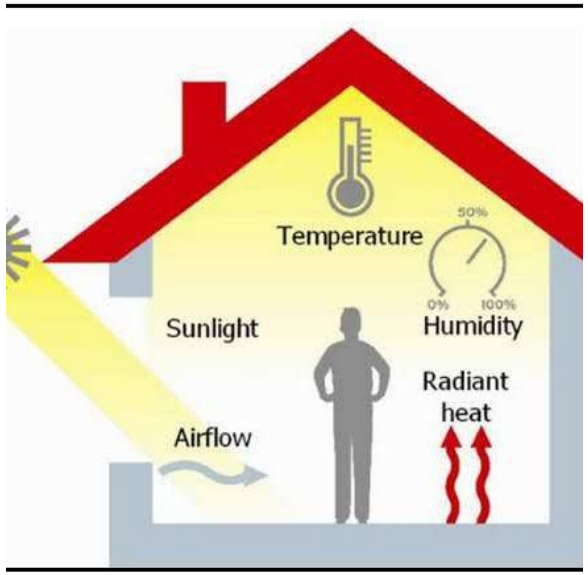


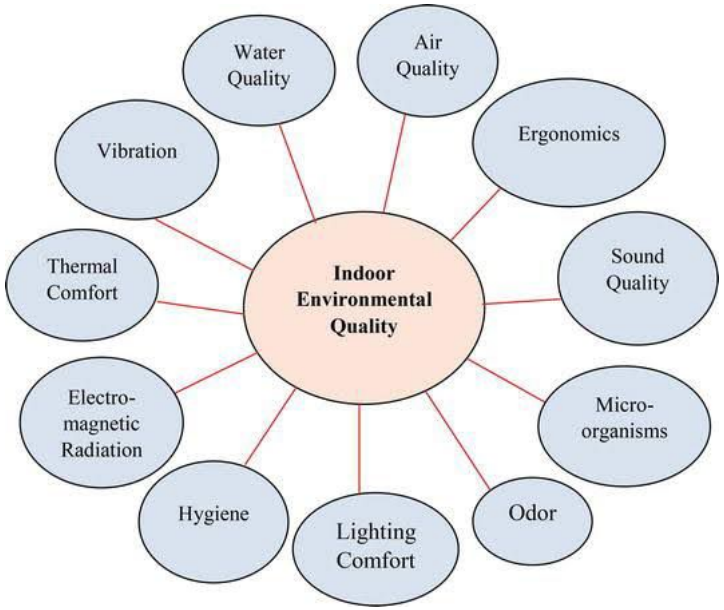
Credit Achievement

EQc1: Outdoor Air Delivery Monitoring	EQc2: Increased Ventilation	EQc3: Construction IAQ Management Plan	EQc4.1: Low-Emitting Adhesives / Sealants
NO	YES	NO	YES
EQc4.2: Low-Emitting Paints / Coatings	EQc4.3: Low-Emitting Flooring Systems	EQc4.4: Low-Emitting Composites	EQc5: Indoor Pollutant Source Control
YES	YES	YES	YES
EQc6: Controllability - Temp / Vent	EQc7: Thermal Comfort - Design	EQc8.1: Daylight / Views - Spaces	EQc8.2: Daylight / Views - Daylight Access
NO	YES	NO	NO
EQp1: Minimum IAQ Performance	EQp2: Eliminate Tobacco Smoke		
YES	YES		

- Thermal comfort describes the human satisfactory perception of the thermal environment. It refers to a number of conditions in which the majority of people feel comfortable.

- Thermal comfort is rated amongst the most important conditions for improving comfort and satisfaction of occupants with their indoor environment





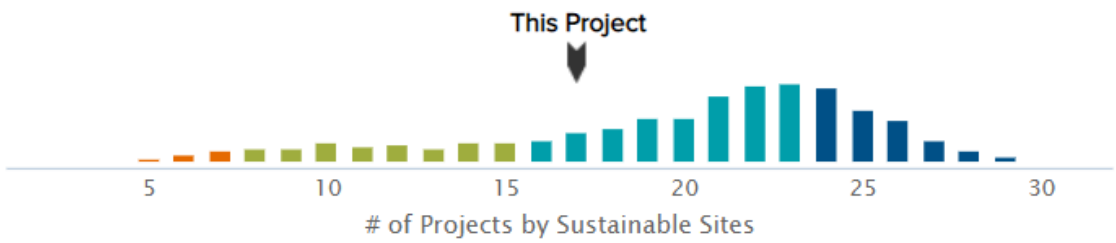
SUSTAINABLE SITES

17/28
Total SS Points

Excellent

Top **59%** of all LEED CS 2009 activities

Benchmark



Credit Achievement

SSc1: Site Selection	SSc2: Density / Connectivity	SSc3: Brownfield Redevelopment	SSc4.1: Public Transport Access
YES	NO	NO	6/6 Possible Points

SSc4.2: Bicycle Storage / Locker Room	SSc4.3: Fuel Efficient Vehicles	SSc4.4: Parking Capacity	SSc5.1: Protect / Restore Habitat
2/2 Possible Points	3/3 Possible Points	2/2 Possible Points	NO

SSc5.2: Maximize Open Space	SSc6.1: Stormwater Quantity Control	SSc6.2: Stormwater Quality Control	SSc7.1: Heat Island - Non-Roof
NO	NO	NO	YES

SSc7.2: Heat Island - Roof	SSc8: Light Pollution Reduction	SSc9: Tenant Buildout Guidelines	SSp1: Construction Pollution Prevention
YES	NO	YES	YES

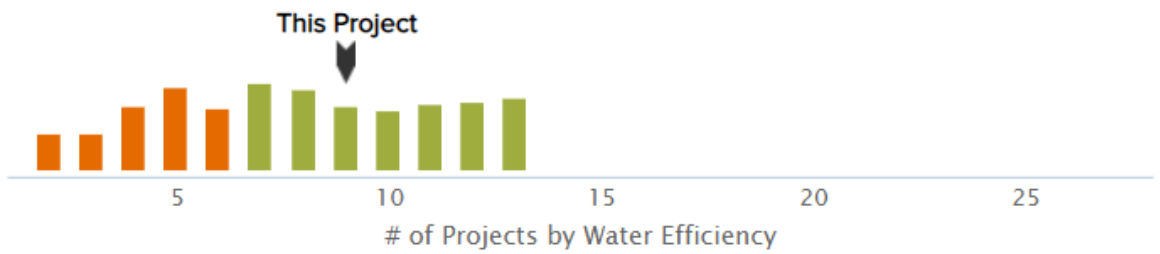
- The Centre is ideally located in the Hazmieh district next to the Damascus Highway. City Centre Beirut will become is the destination for both residents and tourists alike and serves the central and eastern areas of Beirut as it is easily accessed by way of a dedicated bridge and over 1,800 car park spaces. This exciting destination is over 650,000 square feet and stretches across 3 levels and an open-air rooftop restaurant precinct.

WATER EFFICIENCY

9/10
Total WE Points

Very Good
Top **33%** of all LEED CS 2009 activities

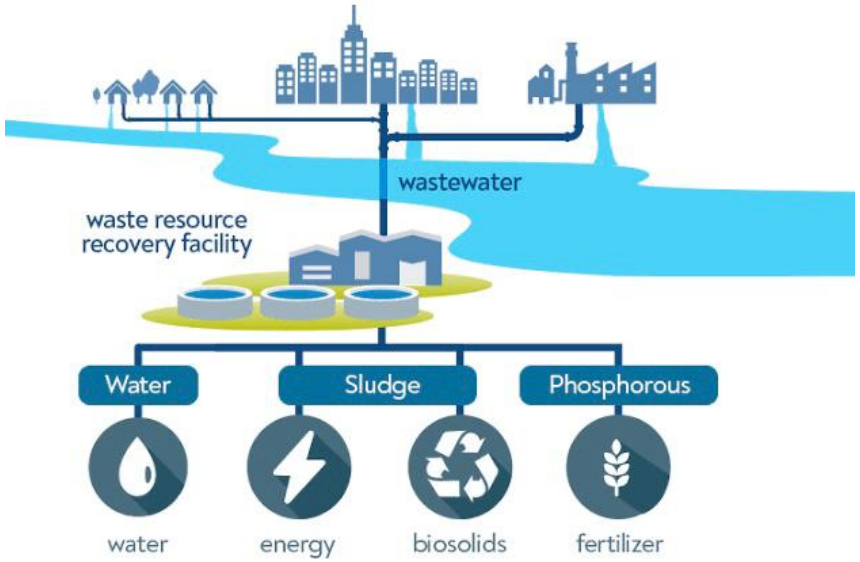
Benchmark

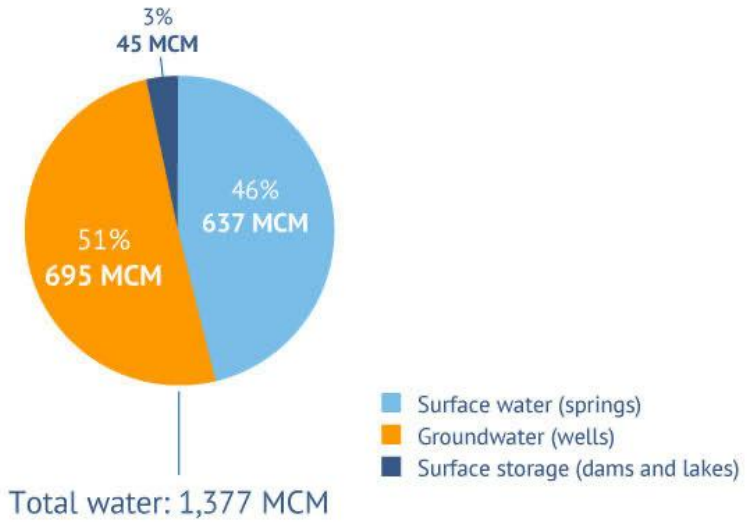


Credit Achievement

WEc1: Water Efficient Landscaping	WEc2: Wastewater Technologies	WEc3: Water Use Reduction	WEp1: Water Use Reduction
3/4	2/2	4/4	YES
Possible Points	Possible Points	Possible Points	
●●●○	●●	●●●●	

- 40% reduction in baseline indoor water use
- 50% reduction in wastewater generation
- 50% reduction in potable landscape water use





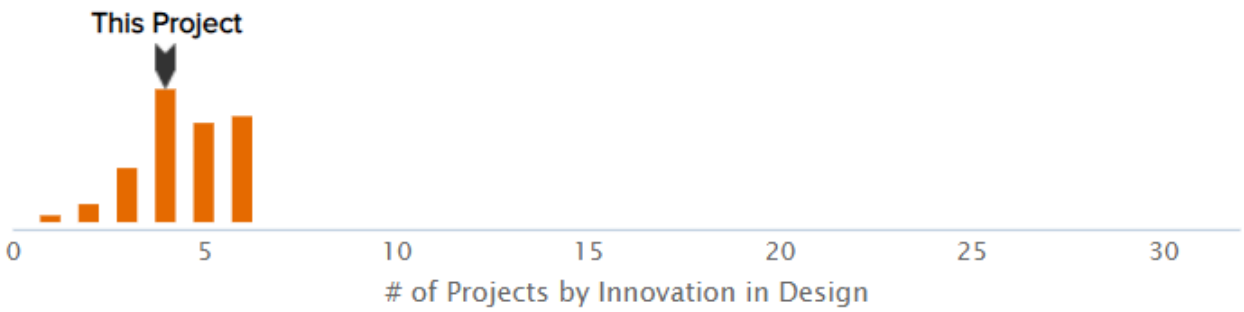
ID

INNOVATION IN DESIGN

4/6
Total ID Points

Good
Top **63%** of all LEED CS 2009 activities

Benchmark



Credit Achievement

IDc1: Innovation in Design

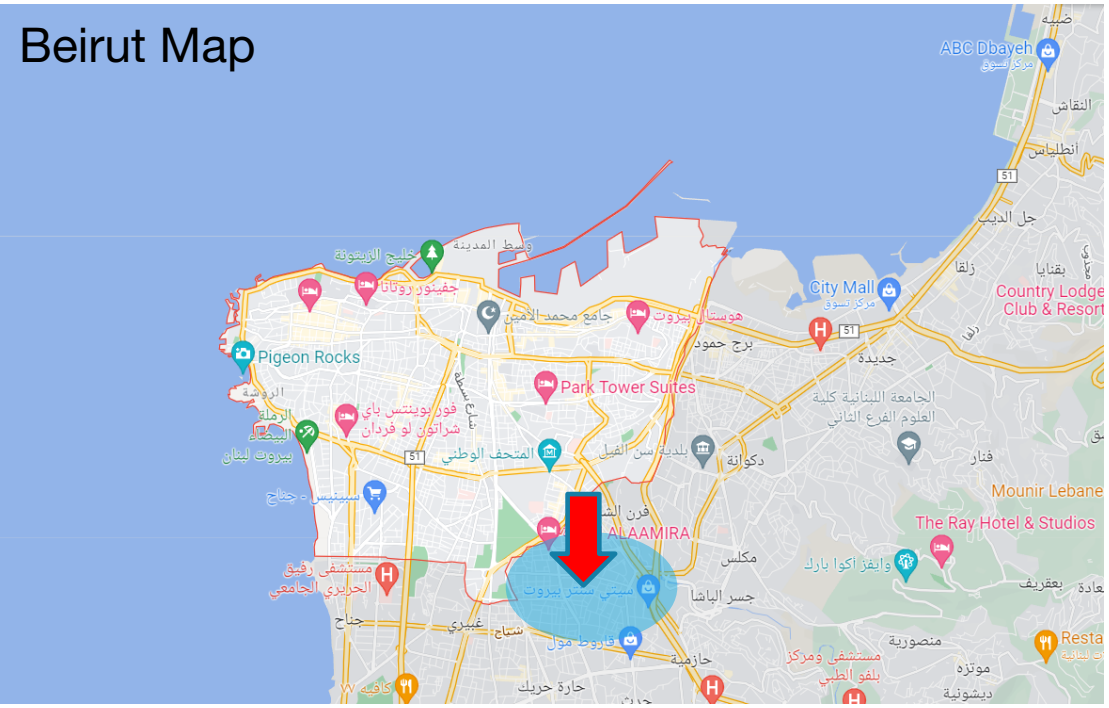
1/5
Possible Points

IDc2: LEED Accredited Professional

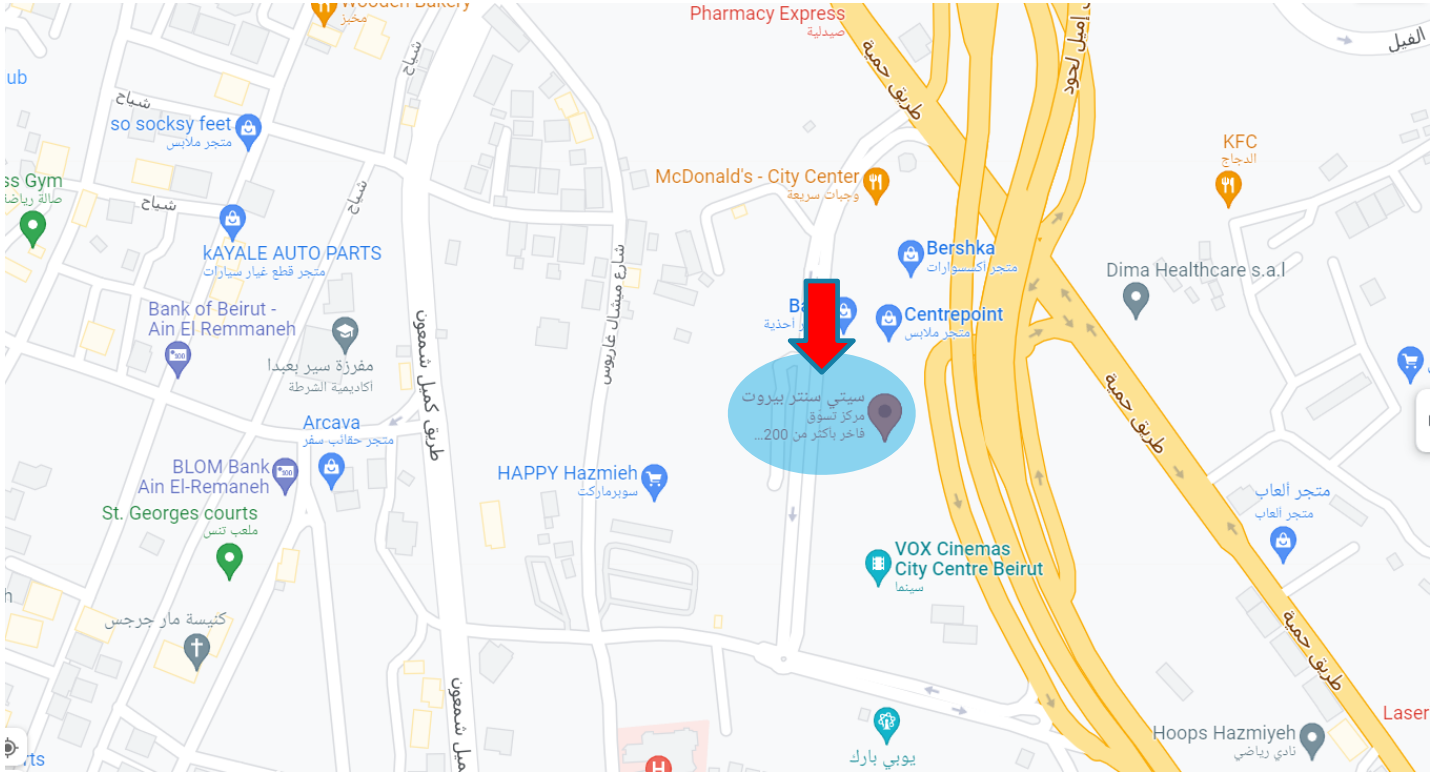
YES

- The interior design of the mall creates a single unifying identity through the use of varying stone finishes, stepped slab edges, alternating bridges and escalators to allow visitors to perceive the entire length of the atrium space. An undulating steel rooflight constructed from structural fins provides daylight to all four retail levels and allows for views of the sky while providing shading and diffusion to prevent excessive solar gain.

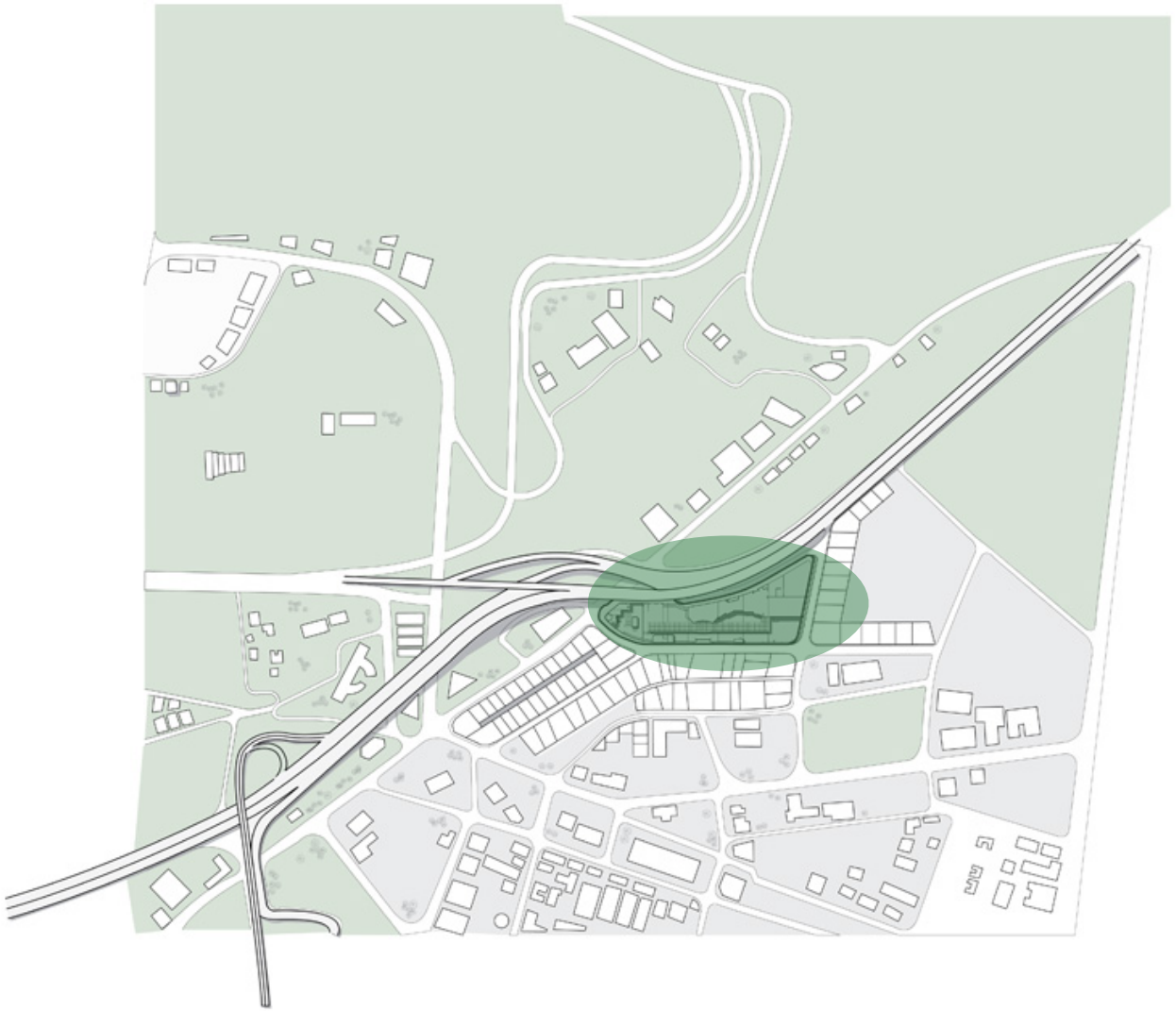
LOCATION



City Centre Beirut, located in Hazmieh district, is the first mall opened in Beirut by Majid Al Futtaim

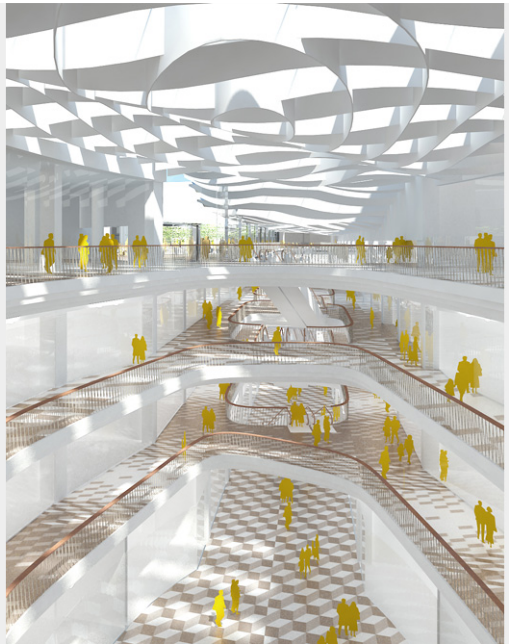


SITE



DESCRIPTION

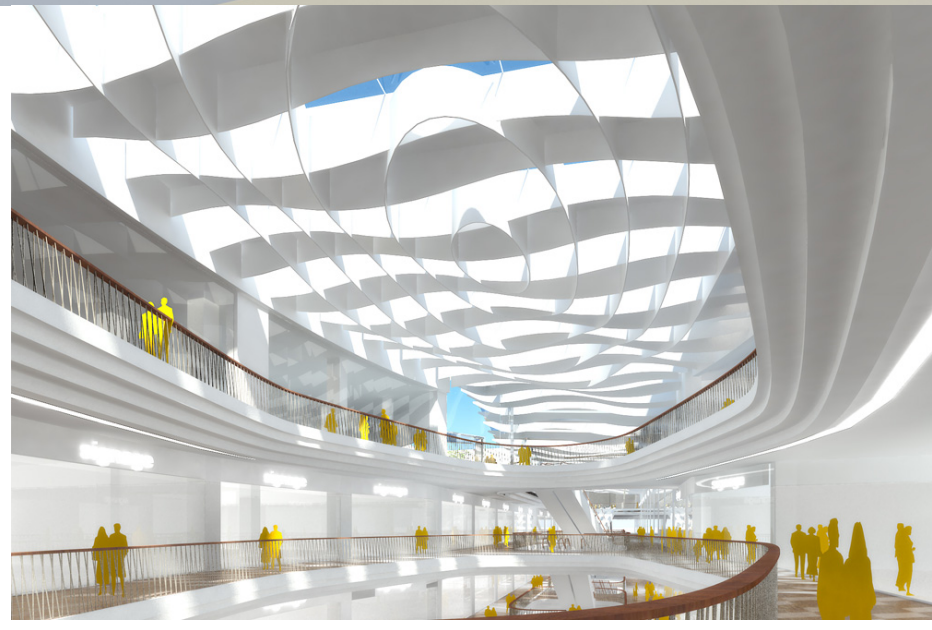
Beirut City Centre is a regional shopping mall located on Damascus Road in Hazmieh Quarter. Enclosed on all four sides by the adjacent highways, the project tries to maximize site usage with multiple levels of underground parking and a hypermarket, shops, restaurants and cinemas arranged over four floors above.



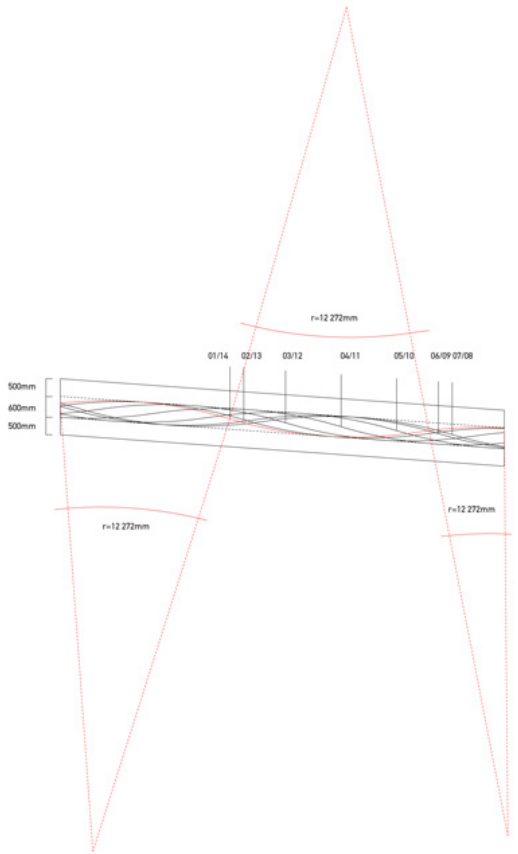
DESIGN

All retail units are oriented towards a central 218m long atrium void that runs the entire lengths of the scheme, leaving the external elevations as mostly blank walls with little opportunity for windows and activation. A concrete fin facade was developed that plays with the perception of the building from the adjacent highway flyover and creates an animated, ever-changing curtain of colour, light and shadow during day and night.

The interior design of the mall creates a single unifying identity through the use of varying stone finishes, stepped slab edges, alternating bridges and escalators to allow visitors to perceive the entire length of the atrium space. An undulating steel rooflight constructed from structural fins provides daylight to all four retail levels and allows for views of the sky while providing shading and diffusion to prevent excessive solar gain.

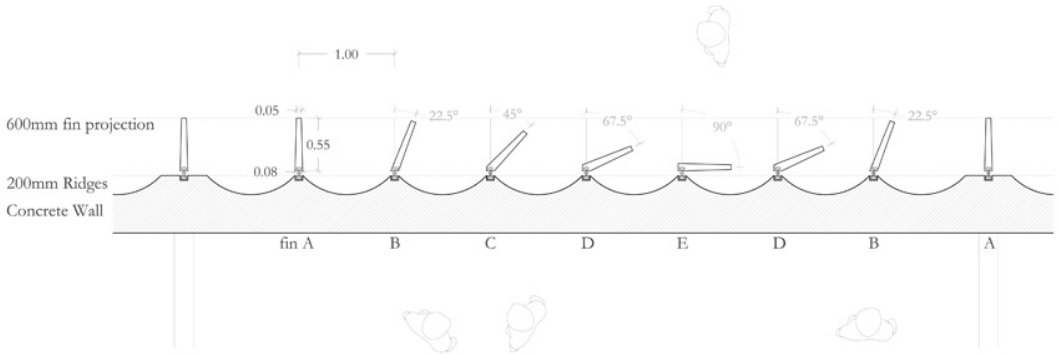


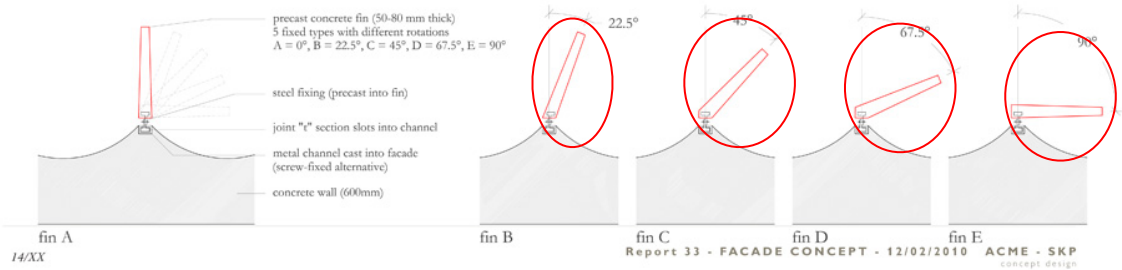
STRUCTURE



Beirut City Centre

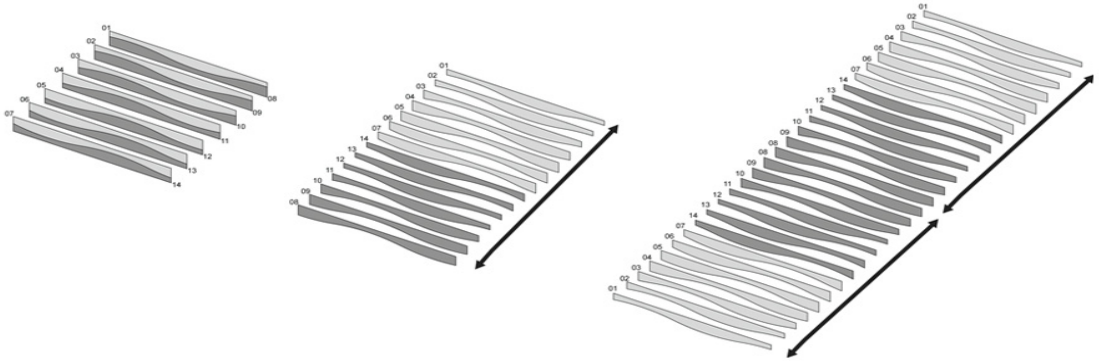
Fin Joint Options
Option 2: Five Different Fin Types with Fixed, Standard Joint





14/XX

Report 33 - FACADE CONCEPT - 12/02/2010 ACME - SKP
concept design



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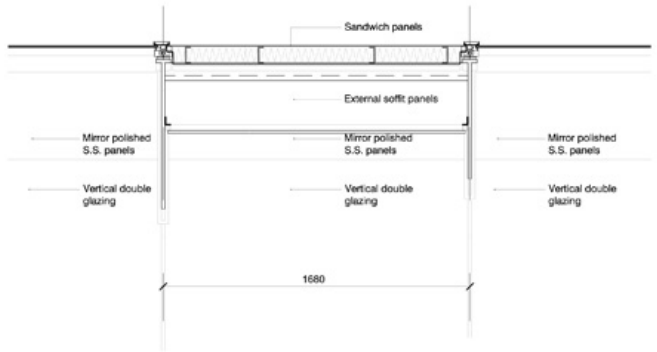

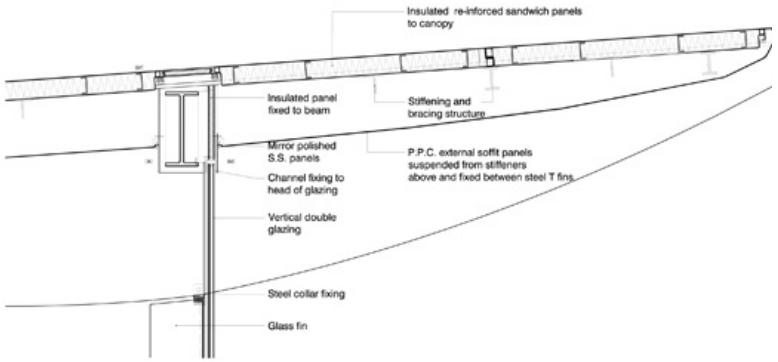

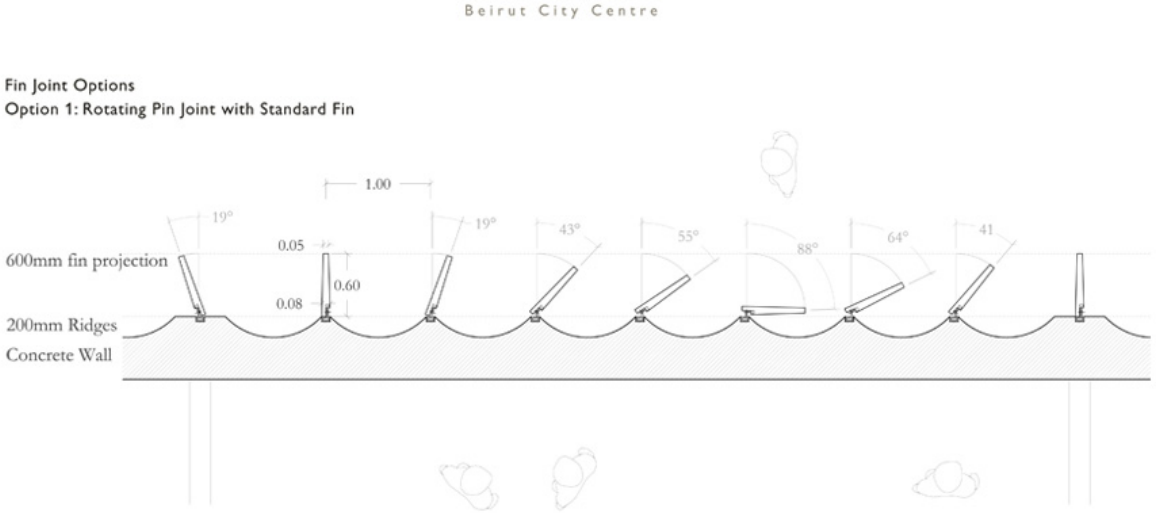

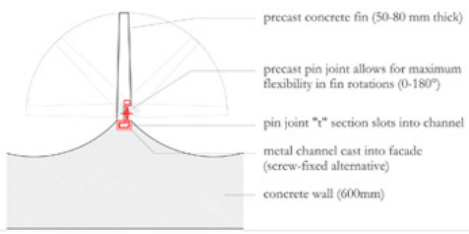

Three different options were explored for fixing the fins to the facade ridges. Option 1 provides the most flexibility and complexity in form by using a pin joint that allows the fins to be rotated to virtually any angle between 0-180 degrees before being fixed/locked in position. There is only one type each of the straight and twisted fins for this option.

Option 2 explores a much simpler, economical and repetitive joint while instead creating a fixed number (5) of precast fins with more complex geometries that allow for fixed, predetermined angles to be created.

Option 3 explores using simpler joints that are pre-fabricated at 5 specific angles, as well as using one type of repetitive fin. The angular joints are screwed into the concrete wall and the fins, and although this option would be more economical than option 1 and 2 to manufacture it is more labour intensive.

REFERENCES

- https://wzarchitects.com/architecture/city-center-beirut
- https://www.sinarlb.com/portfolios/4-beirut-city-center-lebanon/
- https://www.citycentremallbeirut.com/media-centre/city-centre-beirut-defining-sustainability
- http://www.gbig.org/activities/leed-1000003044

THANK YOU!