

the
palestinian
museum

GREEN EDUCATION CREDIT

Innovation Category

Prepared by PalGBC
September 2016

التعاون
Taawon



Table of Contents

- Owner Commitment Letter 4**

- PART 1: LEED GREEN EDUCATION DOCUMENTATION..... 5**

- 1. Sustainable Site (Ss)..... 7**
 - 1.1. Ssp1 - Construction Activity Pollution Prevention 7
 - 1.2. Ssc1 - Site Selection..... 8
 - 1.3. Ssc4.1 - Alternative Transportation – Public Transport..... 8
 - 1.4. Ssc4.3 - Alternative Transportation – Low-emitting & Fuel-efficient Vehicles 8
 - 1.5. Ssc4.4 - Alternative Transportation – Parking Capacity 9
 - 1.6. Ssc5.2 - Maximizing Open Space 9
 - 1.7. Ssc6.1 - Storm Water Design, Quantity Control.....10
 - 1.8. Ssc6.2 - Storm Water Design, Quality Control10
 - 1.9. Ssc7.2 - Heat Island Effect – Roof.....10

- 2. Water Efficiency (We) 11**
 - 2.1 Wep1 - Water Use Reduction, 20% Reduction.....11
 - 2.2 Wec1 - Water-efficient Landscaping.....11
 - 2.3 Wec2 - Innovative Wastewater Technology.....12
 - 2.4 Wec3 - Water Use Reduction.....12

- 3. Energy And Atmosphere (Ea)..... 13**
 - 3.1. Eap1 - Commissioning of the Building Energy Systems13
 - 3.2. Eap2 - Minimum Energy Performance.....13
 - 3.3. Eap3 - Fundamental Refrigerant Management.....14
 - 3.4. Eac1 - Optimizing Energy Performance.....14
 - 3.5. Eac2 - On-Site Renewable Energy.....14
 - 3.6. Eac3 - Enhanced Commissioning14
 - 3.7. Eac4 - Enhanced Refrigerant Management.....15
 - 3.8. Eac5 - Measurement & Verification.....15

- 4. Materials & Resources (Mr) 16**
 - 4.1. Mrp1 - Storage & Collection Of Recyclables.....16
 - 4.2. Mrc2 - Construction Waste Management.....17
 - 4.3. Mrc4 - Recycled Content.....17
 - 4.4. Mrc5 - Regional Materials18

5.	Indoor Environmental Quality (Iq)	19
5.1.	leqp1 - Minimum Laq Performance.....	19
5.2.	leqp2 - Environmental Tobacco Smoke (Ets) Control.....	19
5.3.	leqc1 - Outdoor Air Delivery Monitoring.....	19
5.4.	leqc2 - Increased Ventilation.....	20
5.5.	leqc3.1 - Construction Laq Management Plan, During Construction.....	20
5.6.	leqc3.2 - Construction Laq Management Plan, Before Occupancy.....	20
5.7.	leqc4.1 - Low-emitting Materials, Adhesives, and Sealants.....	20
5.8.	leqc4.2 - Low-emitting Materials, Paints, and Coatings.....	21
5.9.	leqc4.3 - Low-emitting Materials, Flooring Systems.....	21
5.10.	leqc4.4 - Low-emitting Materials, Composite Wood, and Agrifiber Products.....	21
5.11.	leqc6.1 - Controllability of Systems, Lighting.....	21
5.12.	leqc6.2 - Controllability of Systems, Thermal Comfort.....	21
5.13.	leqc7.1 - Thermal Comfort, Design.....	22
5.14.	leqc7.2 - Thermal Comfort, Verification.....	22
6.	Innovation And Design Process (Id)	23
6.1.	Idc1.4 - Onsite Education Center.....	23
6.2.	Idc1.5 - Green Cleaning Policy.....	23
6.3.	Idc2 - LEED Accredited Professional.....	23
7.	Regional Priority (Rp)	24
	Wec1 - Water-efficient Landscaping (Achieved).....	24
	Wec2 - Innovative Wastewater Technologies (Achieved).....	24
	Wec3 - Water Use Reduction (Achieved).....	24
	Eac1 - Optimizing Energy Performance (Achieved).....	24
	Eac3 - Enhanced Commissioning (Achieved).....	24
	Eac5 - Measurement And Verification (Achieved).....	24
PART 2: PROJECT SPECIFIC GREEN EDUCATION PRESENTATION		25

Owner Commitment Letter

The owner confirmed his commitment to provide public with green building education as clarified in the following letter:



Date: September 19th, 2016

To: United States Green Building Council
Project: Palestinian Museum Project – Birzeit
LEED Project ID Number: 1000038721
Subject: Innovation Credit / On-Site Green Building Education

This is to confirm the Palestinian museum's commitment to provide public education focusing on green building strategies and solutions especially those have been implemented in the Palestinian museum to obtain the LEED certificate.

The Palestinian museum will provide interested visitors with a copy of the educational manual that was developed by the LEED team. The manual clarifies the green practices followed in the design, construction, and those will be implemented during the operation of the Palestinian museum building.

The Manual will also be designed and printed as appropriate. Moreover, the Palestinian museum will organize periodic guided tours for its visitors in addition to a presentation that explains how the Palestinian museum achieved LEED building certification. The guided tours will be announced on the Museum's website.

Best regards,



Bashar Ammar
Facilities Manager
bammar@palmuseum.org
Welfare Association – The Palestinian Museum



palmuseum.org
شماره المتحف: ص.ب. 48 بيرزيت فلسطين. ت: +970 (2) 294 1948 ف: +970 (2) 294 1948
info@palmuseum.org

**PART I:
LEED Green Education Documentation**





Intent

The purpose of this credit is to educate Museum staff and visitors regarding the building's achievement of LEED building certification. It is also designed to explain the benefits of LEED-certified building practices, as well as showing how staff and the public can help further improve green performance.



Innovation Educational Credit

The LEED team has prepared a manual to explain the strategies and solutions employed to achieve LEED certification for the Palestinian Museum. It describes current green features, and the building's total environmental impact. The manual has also been made into a presentation, and may be converted into a short film for public education purposes.



The Palestinian Museum LEED Certification

LEED (Leadership in Energy and Environmental Design) is an internationally recognized rating system developed by the USGBC (United State Green Building Council). The Palestinian Museum is the first green building in Palestine to meet its criteria.

The LEED rating system provides a set of tools and performance standards for the evaluation and measuring of the design, construction, and operation of green buildings that take environmental effects into consideration. These include, but are not limited to: efficient energy and water use, careful selection of green materials and resources, and the attention to quality level of indoor environments. Green buildings are certified based on the sum of points achieved in various categories, including prerequisites and credits: certifications range from basic to silver, gold or platinum. The Palestinian museum is seeking the silver certificate, which requires the achievement of 59 50 points.. This document outlines the categories under consideration at the Palestinian Museum and its facilities.



Photos by Ivan Baan

1. Sustainable Site (SS)

The purpose of this category is to adapt practical site design strategies sensitive to plant-life, wildlife, water and air quality onsite.

1.1. SSp1 Construction Activity Pollution Prevention

This prerequisite requires reduction of the pollution resulting from construction activities, as a means of limiting their effect on the surrounding environment. This was achieved at the Palestinian Museum through:

- Prevention of soil loss during construction by storm water runoff or wind erosion
- Prevention of waterway sedimentation
- Prevention of pollution of the air with dust and other particles

To achieve this purpose, an Erosion and Sedimentation Control (ESC) plan was developed and implemented by the contractor. The plan entailed using protective bunds, road watering, establishing a wheel wash area (washing station) at the exits, silt control fence, and gravel bag berms. Periodic inspections were made to ensure best management practice in the site. Date-stamped photos were taken to verify measures and corrective actions and therefore implement the ESC plan effectively (see figure 1, figure 2, figure 3 and figure 4).



Figure 1: Carwash station at project entrance



Figure 3: Silt fence



Figure 2: Sandbag barrier at the site



Figure 4: Prevention of leakage of soil to the sewerage system

1.2. SSc1 Site Selection

The project location was selected based on criteria designed to ensure minimum environmental impact:

- The project location was not a farmland
- The site elevation is more than five feet above the elevation of the -100year flood
- The site is not identified as a habitat for any threatened or endangered species
- The site is far from wetlands
- The site is far from any body of water that could support aquatic life (seas, lakes, rivers and tributaries)
- Prior to acquisition, the site was not public parkland

1.3. SSc4.1 Alternative Transportation - Public Transport

This credit stipulates reduction of pollution and protection from automobile impact by facilitating access to public transportation. The Palestinian Museum is located within 256 metres (0.16 miles) from a public bus stop, well within the 0.25 mile or 400 m LEED requirement. A site plan to scale, showing the path from the Museum's main entrance to the bus stop, is provided below. (see figure 5)

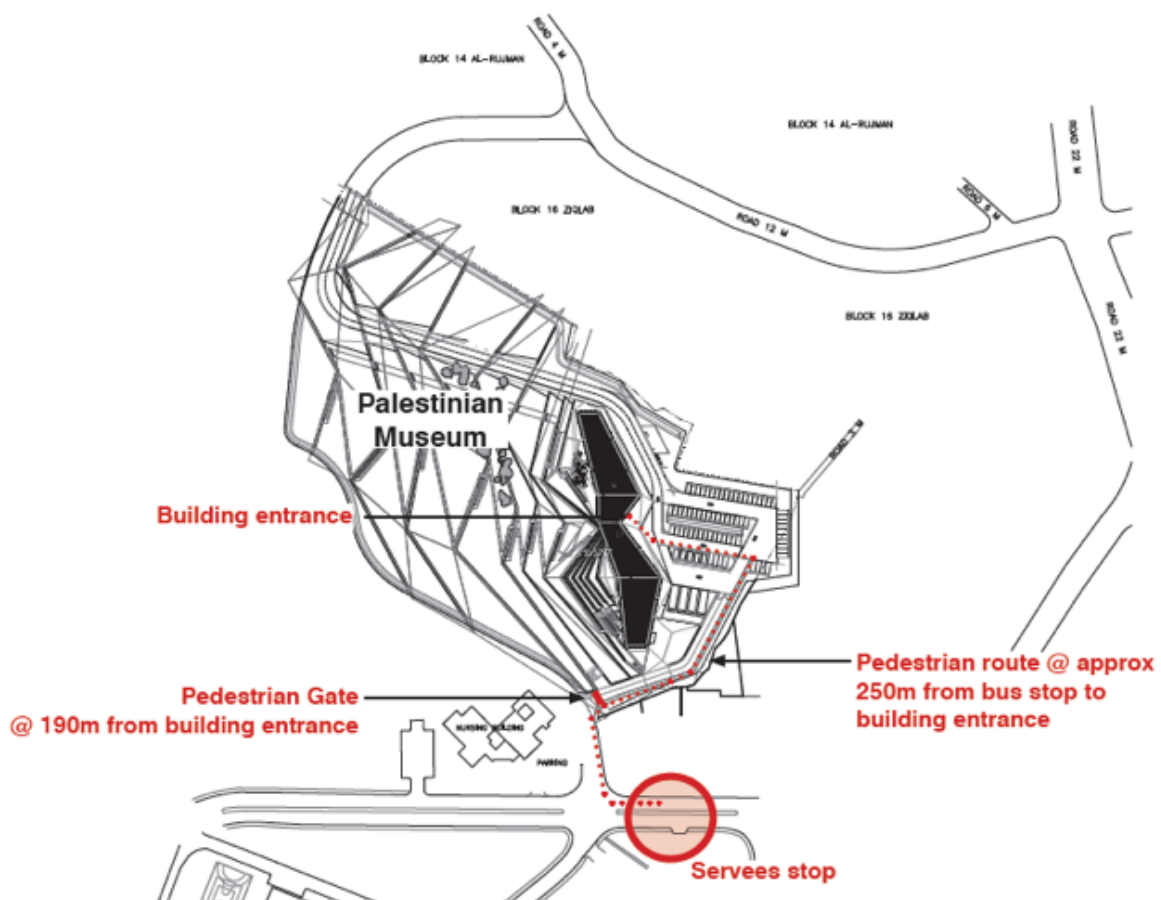


Figure 5: Site plan shows the pedestrian route from the bus stop to the building entrance

1.4. SSc4.3 Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles

This credit encourages the use of low-emitting and fuel-efficient (LE-FE) vehicles, reducing pollution impact from automobile use. Four preferred parking spaces are provided for low-emitting and fuel-efficient vehicles, equating to 5.41% of the total parking spaces (the LEED requirements are 5%). A site plan showing all parking areas and highlighting any preferred parking including detailed signs is provided onsite (see figure 6).

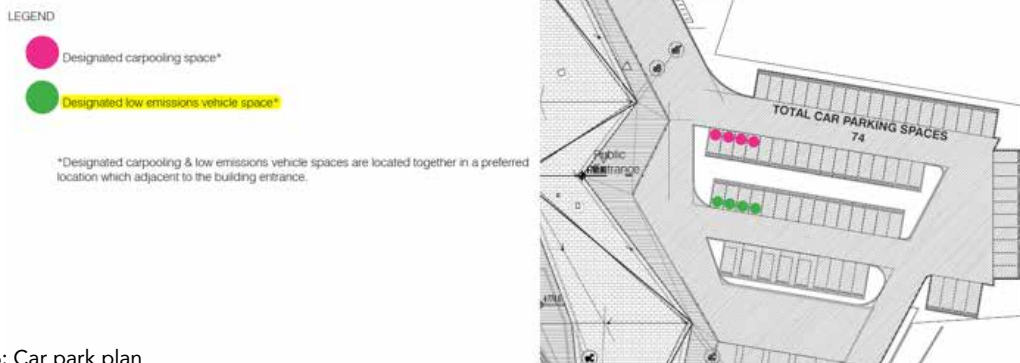


Figure 6: Car park plan

1.5. SSc4.4 Alternative Transportation - Parking Capacity

In order to reduce automobile pollution impact, the Palestinian Museum provided 74 parking spaces, less than the minimum parking spaces required by local zoning (96 spaces). Four preferred parking spaces for carpools or vanpools are also provided as a means of encouraging car-sharing cars, which helps reduce both carbon emissions and traffic congestion.

A site plan showing all parking areas and highlighting preferred parking, including detailed signs, is provided as verification (see figure 6).

1.6. SSc5.2 Maximizing Open Space

This credit encourages a high ratio of open spaces to development footprint in order to conserve natural areas and promote biodiversity. The project site contributes to 249,722 square feet of vegetated open space compared to a 24,164 square feet building footprint (built up area). This means that the open spaces form around 59.49% of the whole project site. As this percentage exceeded 50%, the Palestinian Museum was qualified to achieve one additional point for exemplary performance within the Innovation in Designs category (see figure 7).

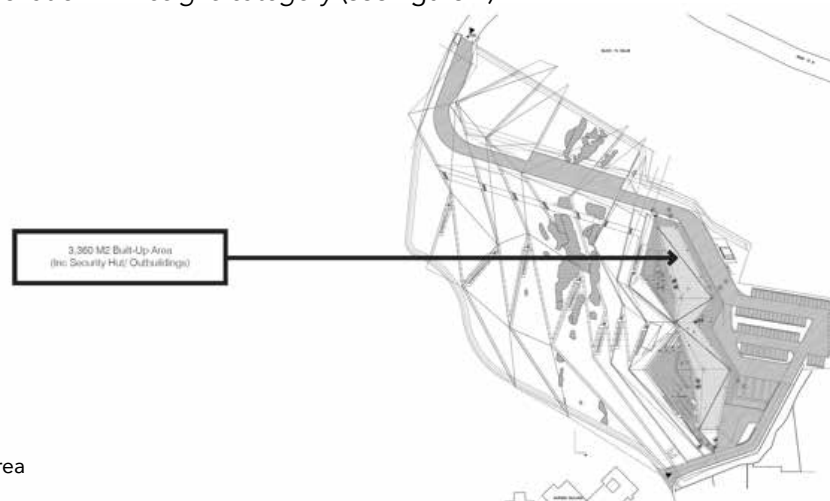


Figure 7: Plan showing built up area

1.7. SSc6.1 Storm Water Design, Quantity Control

This credit aims to limit disruption of natural hydrology by managing storm water so as to reduce impervious cover and therefore increase on-site infiltration, decreasing the pollution and contaminants of storm water runoff.

The imperviousness of the existing site is less than %50, but the completed project entailed a large amount of landscaping (approximately %60 of the site). This helps reduce runoff quantity and thus prevents excessive erosion. To protect the stream channel, a storm-water management plan was developed and implemented including onsite rainwater harvesting (see figure 8 and figure 9).



Figure 8: Impervious area plan

1.8. SSc6.2 Storm Water Design, Quality Control

This credit stipulates limitation of pollution of natural water flows, achieved by managing storm water runoff. At the Palestinian Museum, storm water is collected from the roof area, cafe terrace, and education courtyard. It is stored in tanks, treated using sand filtration, and reused for flushing and irrigation. This treatment method contributes to treating %9.56 of the storm water and meets the condition of %80 total suspended solids removal efficiency. The rest of the site runoff (%90.44 of storm water) will be captured through a planting bed from which it will be discharged to a natural valley offsite. The water will be treated by natural filtration underground.



Figure 9: The swale - storm water management

1.9. SSc7.2 Heat Island Effect - Roof

This credit aims to reduce the heat island effect of the development and thus its impact on microclimates, humans, and wildlife habitats. This credit was achieved through using materials with high solar reflectance that reduce heat absorption. The material used for roof surfaces is an untreated white stone with a solar reflectance index (SRI) of 84.71 (see figure 10).



Figure 10: Untreated white stone used for the roof area

2. Water Efficiency (WE)

As Palestine suffers from water scarcity, it is essential to find innovative solutions and techniques for water saving. The purpose of this category is to promote the efficient use of water for irrigation, sewage conveyance, and sanitary fixtures.

2.1 WEp1 Water Use Reduction, 20% reduction

This prerequisite stipulates a 20% saving in water use within the building, lightening the burden on municipal water supply and wastewater systems. Calculations were made to estimate water-use quantities, including the number of building users and flow or flush rates, in order to manage water saving.. High-efficiency water saving fixtures (lavatory faucets, kitchen sinks, urinals, water closets and showerheads) were installed, and the resultant reduction of water use in all the fixtures was found to be 48.73%.

2.2 WEc1 Water-Efficient Landscaping

The purpose of this credit is to reduce use of potable water for landscaping activities. For the Palestinian Museum project, the water requirement for each addition to the garden was calculated; water quantity required using firstly, a sprinkler irrigation system, and secondly, a drip irrigation system was then tested. Following the confirmation of a significant reduction in water consumption through drip irrigation, drip irrigation was installed throughout the site. Moreover, stored rainwater and onsite-treated wastewater were used in partial replacement of potable water. This resulted in a 65.37% reduction in potable water consumption for landscaping, and a 33.42% reduction in total water consumption for landscaping. By achieving a reduction percentage higher than 50% in potable water consumption in a context of Palestinian water scarcity, the project was qualified to achieving one additional point for regional priority credit (see figure 11).



Figure 11: Drip irrigation system for landscaping



2.3 WEc2 Innovative Wastewater Technology

This credit promotes limitation of wastewater generated and potable water discharged onsite, whilst increasing aquifer recharge. The Palestinian Museum building uses non-potable water for sewage conveyance, including stored rainwater, and 100% on-site wastewater treatment. Moreover, high-efficiency flush fixtures are used in the building, the latter producing approximately 49.23% reduction of water use in fixtures and entitling the Museum to an extra point within the Innovation in Design category. The project is further qualified to achieve another extra point for regional priority due to Palestinian water scarcity.

2.4 WEc3 Water-Use Reduction

This credit entails maximization of efficiency of water use through low-flow equipment. The following low-flow fixtures and fittings were used in the building: water closets, urinals, lavatory faucets, showers head and kitchen sink faucets. The resultant percentage of reduction of water-use was 48.73%. By achieving a reduction percentage higher than 30% and due to suffering from water scarcity in Palestine, the project is qualified to achieve one additional point in the regional priority category.

3. Energy and Atmosphere (EA)

The purpose of this category is to reduce the amount of energy required for building operations. This can be achieved by use of benign forms of energy and high-efficiency equipment. This category is particularly important in the context of Palestine as Palestinians import most of their energy from Israel and thus pay high costs for energy.

3.1. EAp1 Fundamental Commissioning of the Building Energy Systems

The intent of this credit is to verify that the building's energy related systems are installed, calibrated, and performs according to project requirements, basis of design (BOD), and construction documents. Energy consumption is thereby reduced and system performance enhanced. To ensure appropriate commissioning process, the project requirements were prepared in the conceptual design phase with the help of the LEED consultant and the design team. Moreover, a commissioning plan was developed and then implemented by the contractor to cover commissioning requirements for HVAC&R, DHW, Lighting controls, and renewable energy systems.

3.2. EAp2 Minimum Energy Performance

This credit aims to achieve a minimum of 10% energy cost saving compared to the baseline of ASHRAE 2007 90.1. The requirements of ASHRAE standard relate to building envelope design, HVAC systems, water heating, power lighting and other equipment. To enhance the building's energy performance, energy analysis was performed using an energy model. The primary benefit of energy modeling is the facilitation of comparison of alternative design options to determine their relative potential for energy-savings. Energy performance for the museum building was thus improved using several methods:

- 1) high levels of insulation were ensured for the building using low U-value materials indicating low thermal transmittance through the structure
 - 2) low energy systems were specified in appropriate areas
 - 3) heat recovery was included in ventilation systems wherever possible to minimize energy loss, and
 - 4) solar renewable energy source was used to partially generate the building's water heating needs.
- The resultant energy saving was 23.7% (see figure 12).



Figure 12: Installing insulation material

3.3. EAp3 Basic Refrigerant Management

This prerequisite entails avoiding the use of products and materials that cause ozone depletion and thus contribute to global warming. Instead of using CFC-based refrigerants containing carbone, chlorine and fluorine (chlorofluorocarbon) in the HVAC and firefighting system, the Palestinian Museum chose to employ Zero CFC-based refrigerants R410-A and R407-C (in limited quantities). These have a lower overall impact on global warming due to reduced greenhouse gas' emissions from power plants.

3.4. EAc1 Optimizing Energy Performance

This credit requires achievement of 22% energy saving. The energy saving in the project was calculated using the energy modeling software "eQUEST", according to which Palestine Museum project achieved about 23.7% savings in energy costs. This was achieved through use of low energy HVAC systems, high performance façade and shading techniques, renewable energy source for heating the domestic water and energy control devices. The project was qualified to achieve another extra point for regional priority since Palestine is a zone where energy is marked as environmental priority by the USGBC. Palestine imports almost all its electricity needs from Israel, which affects the cost of its energy units.

3.5. EAc2 On-Site Renewable Energy

This credit encourages and recognizes increasing levels of on-site renewable energy self-supply as a means of reducing environmental and economic impacts associated with fossil fuel energy use.

In the Palestinian Museum project, a modest solar thermal array (5 Solar Collectors- flat plate type), total area approximately 10.75 m², is designed to provide a renewable energy source for hot water services, with a backup electrical water heater used to cover any shortfall.

In the baseline case, an electric water heater was used as a source of hot water throughout the year. Using the solar system will save the energy that would be used by the electrical heater on sunny days, and the system is backed up with an immersion heater for the cloudy days in the winter season.

Use of the solar system lead to save about 62% of energy used for the hot water system compared to the baseline - equal to 5.5% of the total project energy consumption - qualified the project to earn 3 LEED points.

3.6. EAc3 Enhanced Commissioning

To enhance the commissioning process, it must be considered early in the design phase. In the Palestinian Museum project, project requirements and basis of design were reviewed early to ensure the construction documents' compliance. A system manual was also developed for future operating staff, including training requirements for staff and the building users. The building operation will be reviewed within 10 months of completion, taking into account staff and occupants' feedback. By achieving this credit, the project was qualified for a further extra point for regional priority credit.

3.7. EAc4 Enhanced Refrigerant Management

This credit aims to reduce the use of ozone depleting products whilst minimizing direct contributions to global warming. The design team at the Palestinian Museum project specified refrigerants with low ozone depleting and global warming potential, in addition to using efficient refrigeration equipment. The refrigeration index which indicates the refrigerants' global warming impact was calculated based on the characteristics of the refrigerant used and the characteristics of the equipment used. The combined contributions to ozone depletion and global warming potential were found to equal 100, an accepted value.

3.8. EAc5 Measurement & Verification

The purpose of this credit is to ensure energy conservation in the building over time, therefore ensuring the economic and environmental sustainability of the project. To ensure controlling and monitoring of the building energy consumption over time, a compliant measurement and verification plan (M&V) was developed. The plan includes a list of the project's energy end uses, and the method used to model the energy consumption baseline and calibrate the energy model. In addition, the plan assigns responsibilities and corrective action strategies regarding measuring and verification of energy use. Metering equipment is installed in the project to evaluate energy performance during the operation stage and compare it against predicted performance in the energy model. By achieving this credit, the project is qualified for another extra point for regional priority category.

4. Materials & Resources (MR)

This category encompasses responsible construction and materials selection. It gives priority to select sustainable materials that are recyclable and environment-friendly. This category also encourages waste reduction, namely reducing waste at source and reusing and recycling materials.

4.1. MRp1 Storage & Collection of Recyclables

In order to facilitate recycling process, this prerequisite stipulates specifying accessible and segregated areas for storage onsite. The Palestinian Museum is equipped with individual bins and a building waste collection area. Bins are provided at public arrival and congregation areas visible to visitors. Segregated bins for different types of waste are also provided at administration offices, and centralized bins are available for open plan / multi-occupant spaces to encourage waste reduction (see figure 13).

Waste is segregated in types; plastic, metal, paper, cardboard, and glass and stored at two accessible storage areas in the site. As the Palestinian Museum is a mixed-use building, the waste is being collected three times per week.

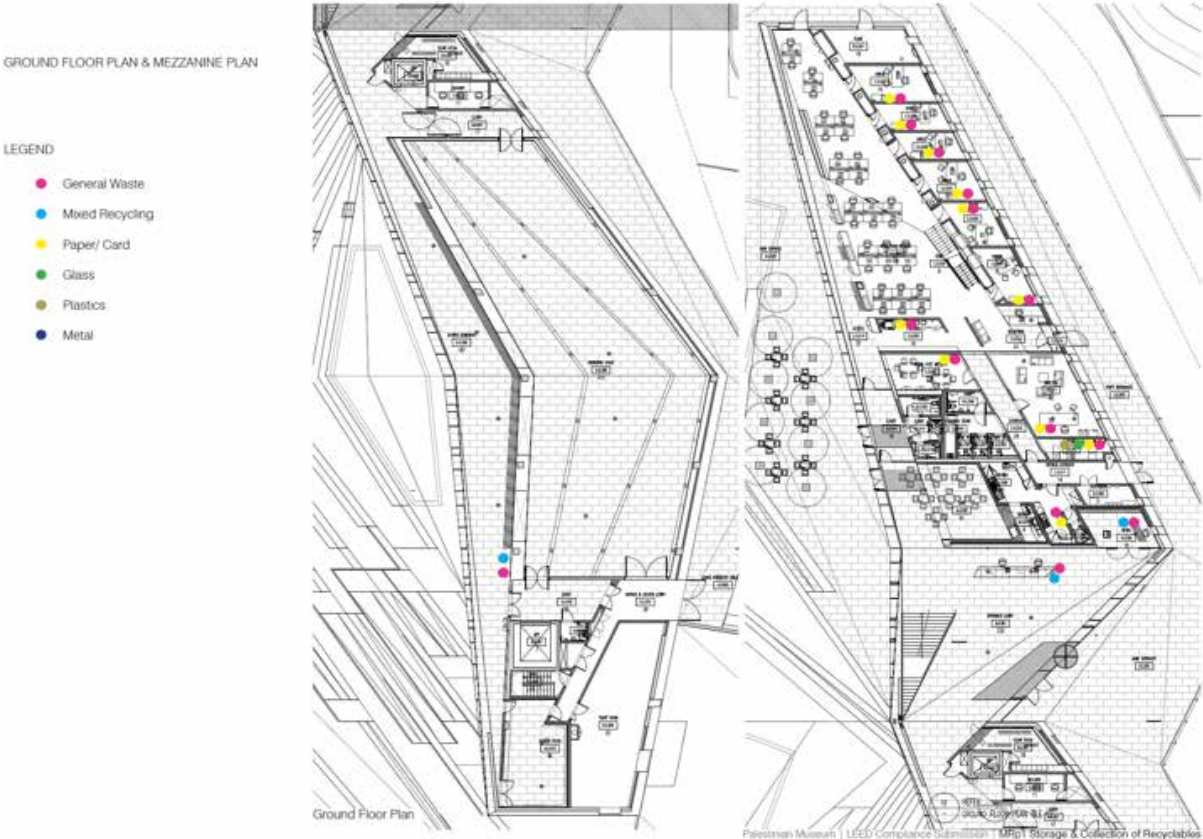


Figure 13: Ground Floor Plan and Mezzanine Plan – Waste Bins distribution

4.2. MRc2 Construction Waste Management

The purpose of this credit is to divert construction waste from disposal in landfills in order to facilitate reuse in the manufacturing and building process.

To achieve this credit, a construction waste management plan was developed by the main contractor. The plan included templates to facilitate monitoring and documentation of waste diversion. The waste resulting from construction process was segregated as follows:

- Scrap steel
- Plastic waste
- Carton and cardboard
- Wood waste
- Concrete waste
- Stone cladding waste
- Gypsum board waste

A storage area for each waste type was specified at the project site. After collection, segregation and storage processes, different waste types were assigned to different agents to be diverted, recycled, and reused in other manufacturing and building processes. The surplus waste was transferred to Al-Ram approved landfill. The percentage of construction waste diverted from disposal in landfill reached 95.82% of total construction waste. This high percentage qualified the Palestinian Museum to achieve one additional point for exemplary performance within the Innovation in Designs (ID) category (see figure 14, figure 15, figure 16, figure 17, figure 18, figure 19, figure 20, & figure 21).

4.3. MRc4 Recycled Content

The aim of this credit is to encourage use of construction materials with recycled contents and so increase demand for such materials, reducing the resultant impact of extracting and processing raw materials. For the Palestinian Museum project, the contractor secured materials with recycled content for outdoor and indoor usage. The proportions of pre-consumer and post-consumer recycled materials used in the project were documented, and found to account for 31.52% of the total cost of materials.



Figure 14: Construction waste management area - wood waste



Figure 15: Construction waste management area - paper & cardboard waste



Figure 16: Construction waste management facility - LEED Laborers collecting the construction waste



Figure 17: Collection of recyclable scrap steel & transferring it to construction waste management area



Figure 18: Steel and wood recyclable materials collection



Figure 19: Concrete waste management



Figure 20: Cleaning the construction site



Figure 21: Concrete spacers made from reused concrete

4.4. MRc5 Regional Materials

This credit encourages increased demand for building materials and products extracted and manufactured within the region (-500mile radius of the project site). This has resulted in a significant cost reduction due to the elimination of international transportation costs, which reduces fuel usage. It also encourages contractors and building stakeholders to support local and regional markets.

For the Palestinian Museum project, material types and resources were discussed during the design development phase and then drafted to the specifications book. The contractor supplied materials and products from regional sources. These sources included:

- Reuse of stone and crushed concrete
- Plants
- Cast-in-place concrete
- Precast Concrete
- Glazing
- Glazed Partitions/ internal doors
- Plaster/gypsum board
- Granite and marble
- Textiles

Regional materials constituted 40.76% of the total materials budget; 40% (by cost) of materials with regional content were provided with cut-sheets for proper installation and usage. As regional materials used exceeded 30%, the Palestinian museum was qualified for one additional point for exemplary performance within the Innovation in Design category.

5. Indoor Environmental Quality (IQ)

The category is designed to address environmental concerns related to the quality of indoor environments. Priorities in this category are as follows: improving ventilation, managing air contaminants, specifying less harmful materials, allowing occupants to control their immediate thermal and lighting environment, and providing daylight and external views.

5.1. IEQp1 Minimum IAQ Performance

This prerequisite stipulates establishment of minimum indoor air quality (IAQ) performance according to ASHRAE standard. This enhances indoor air quality in the building, thus contributing to the comfort and well-being of its users.

The Palestinian Museum project uses mechanical ventilation and conditioning systems. For each ventilation and heat system, the required outdoor air intake flow was calculated, and the outdoor air intake flow was designed to exceed the required (calculated) values.

5.2. IEQp2 Environmental Tobacco Smoke (ETS) Control

This prerequisite stipulates reduction of the exposure of building occupants, indoor surfaces and ventilation systems to environmental tobacco smoke. This is in order to protect the health of building users and enhance their comfort.

To achieve this prerequisite in the Palestinian Museum, a no-smoking policy was developed, prohibiting smoking within the building. Instead, a smoking area was specified outside the building, where it has no effect on the inside environment. The smoking area is provided with appropriate litter receptacles and signs (see figure 22 & figure 23).



Figure 22: No Smoking signage



Figure 23: Designated Smoking Area during the construction phase

5.3. IEQc1 Outdoor Air Delivery Monitoring

This credit requires that the minimum performance of ventilation system is ensured through the provision of ventilation system monitoring. This further promotes building user comfort.

Permanent monitoring systems were installed at the Palestinian Museum, including CO₂ sensors and outdoor airflow rate sensors. The CO₂ sensors have been installed in occupied spaces with a design density greater than or equal to 25 people per 1000ft², while outdoor airflow rate sensors are used to monitor airflow rate in the flow and return air streams of all of the central air handling units serving the building. Sensors are connected to the building management system (BMS) and programmed to activate an alarm if the conditions vary by 10% or more from the design value.

5.4. IEQc2 Increased Ventilation

This credit requires providing additional outdoor air ventilation to improve indoor air quality and promote occupant comfort, wellbeing, and productivity. At the Palestinian Museum, air ventilation rates in occupied spaces were designed to exceed 30% of the minimum rates required by ASHRAE standard 2007-62.1.

5.5. IEQc3.1 Construction IAQ Management Plan (During Construction)

This credit promotes maintenance of a high-quality internal environment during the construction phase, protecting the health of construction workers and promoting their productivity and comfort.

A Construction Indoor Air quality (IAQ) management plan was developed and implemented specifically for the Palestinian Museum project. The following actions were also taken in order to limit the absorption of other pollutants by absorbent materials:

- Materials were handled and stored as recommended by the manufacturer and the safety data sheets; high absorbent materials like duct liner, carpeting, and rock wool insulation, in addition to porous materials like gypsum, were stored indoors in an appropriate packaging
- Dense materials like glass, metal framing and ductwork were covered and kept dry
- Materials were cleaned before insulation
- Large cover sheet was used to protect the installed materials from rain and moisture
- No standing water was present at the site and the work area were kept dry all the time

5.6. IEQc3.2 Construction IAQ Management Plan (Before Occupancy)

This credit aims to reduce indoor air quality problems resulting from the construction process. This is necessary for sustaining the comfort and well-being of all Palestinian Museum building users. Following construction, and prior to occupancy, and with all interior finishes installed, the contractor will install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60°F (15.5°C) and relative humidity no higher than 60%. Using this method, the air will be cleaned of all contaminants and pollutants and occupants' health will be protected.

5.7. IEQc4.1 Low-Emitting Materials, Adhesives, and Sealants

The purpose of this credit is to encourage specification of low-VOC (Volatile Organic Compound) materials in construction documents. Long-term exposure to VOC materials contributes to health deterioration and sick building syndrome. New buildings tend to produce high levels of VOC in indoor environments due to new materials generating VOC particles. VOC can be produced by furnishings, wall coverings, office equipment, and adhesives and sealants. For the Palestinian Museum project, materials with no- or low-VOC were required in specifications and tender documents. All adhesives and sealants inside the weather-proofing system were supplied to meet the permissible VOC content standards. The materials covered in this credit include:

- Carpet and flooring adhesives
- Drywall and panel adhesives
- Structural glazing adhesives
- Metal, wood, and plastic adhesives
- Architectural and specialist sealants

5.8. IEQc4.2 Low-Emitting Materials, Paints, and Coatings

In order to limit or eliminate sources of indoor air contaminants, materials with no- or low-VOC content were specified and supplied for the Palestinian Museum project. The products covered for this credit include:

- Architectural paints, coatings and primers
- Anti-corrosion and anti-rust paints
- Clear wood finishes, floor coatings, sealers, and stains

5.9. IEQc4.3 Low-Emitting Materials, Flooring Systems

In order to limit or eliminate sources of indoor air contaminants, materials with no- or low-VOC content were specified and supplied for the Palestinian Museum project. The products and materials covered for this credit include:

- Indoor carpet Adhesives
- Rubber flooring Adhesive
- Vinyl for flooring

5.10. IEQc4.4 Low-Emitting Materials, Composite Wood, and Agrifiber Products

In order to limit or eliminate sources of indoor air contaminants, materials with no- or low-VOC contents were specified and supplied for the Palestinian Museum project. Elements considered in this credit include composite wood and agrifiber products (particleboard, medium density fiberboard (MDF), plywood, wheat board, strawboard, panel substrates and door cores). No added formaldehyde resins were used in the building.

5.11. IEQc6.1 Controllability of Systems, Lighting

The purpose of this credit is to provide individual occupants or groups in multi-occupant spaces with a high level of control over lighting system.

Palestinian Museum staff are provided with adjustable and flexible lighting solutions to make their working environment more comfortable and functional, thereby improving their productivity. Around 90% of occupants have access to the control lighting system, including turning it on and off. Moreover, the building is provided with a digitally programmable dimming control system which maximizes controlling flexibility and provides multiple options for user preferences including: daylight coordination, intelligent occupancy sensors, and timers with override capabilities. Collectively, these maximize energy savings. Multiple occupants' spaces are provided with a combination of digital programmable dimming control and multi-zone dimming.

5.12. IEQc6.2 Controllability of Systems, Thermal Comfort

The purpose of this credit is to provide building users with a high-quality thermal comfort system and allow them to control it effectively. More than 50% of the Museum staff have access to control and adjustment of the thermal system. Operable windows are provided at the building and thermostats are available at all shared and multiple-occupant spaces in order to allow local temperature controlling.

5.13. IEQc7.1 Thermal Comfort, Design

To ensure a comfortable internal environment, the heating, ventilating, air conditioning (HVAC), and building envelope were designed to meet the requirements of ASHRAE Standard 2004-55 (Thermal Environmental Conditions for Human Occupancy).

The HVAC system was designed to meet requirements at both partial and full load conditions. Moreover, the personal factors, including operative temperature, air speed and humidity were considered in the design in order to mitigate the local discomfort effects and thus limit the percentage of dissatisfied people to less than 10%.

5.14. IEQc7.2 Thermal Comfort, Verification

The aim of this credit is to ensure the effectiveness of the thermal system within the building and to assess the building thermal comfort overtime. To achieve this credit in the museum, a permanent monitoring system will be installed to ensure that building performance meets the desired comfort criteria. In addition to that, following six to eighteen months of occupancy a survey will be conducted to collect responses and assess satisfaction about thermal comfort. Using this feedback, a corrective action plan will be carried out if the survey results indicate that more than 20% of building occupants are dissatisfied with the thermal comfort in the building. The plan will include measurement of relevant environmental variables in problem areas, including but not limited to:

- Air temperature
- Radiant temperature
- Air speed
- Humidity



6. Innovation & Design Process (ID)

This category gives the project the opportunity to achieve additional points for exceptional performance above the requirement of the standard LEED credits, and for any innovative environmental features that are not specified in other LEED categories.

The Palestinian Museum project will potentially achieve extra points for exemplary performances in the following credits:

- IDc1.1 for exemplary performance in MRc5 (Regional Material)
- IDc1.2 for exemplary performance in WEc2 (Innovative Wastewater Technology)
- IDc1.3 for exemplary performance in SSc5.2 (Site Development-Maximizing Open Space)
- IDc1.4 On-site Education Center (detailed below)
- IDc1.5 Green Operation and maintenance Policy (detailed below)
- IDc2 Presence of LEED-Accredited Professionals (detailed below)

6.1. IDc1.4 On-Site Education Center

The purpose of this credit is to educate building staff and visitors regarding the building's achievement of LEED certification. To achieve this credit, the LEED team prepared a manual that explains the strategies and solutions employed to achieve every LEED credit, describing the green features employed and their environmental impact. The prepared manual was converted to a visitor-friendly presentation, and periodical accompanying site tours are to be announced and conducted by the FM.

6.2. IDc1.5 Green Cleaning Policy

In order to meet the requirements of LEED for Operation and Maintenance, a Green Cleaning Purchase policy was developed by the LEED team. It includes strategies for purchasing sustainable cleaning products & equipment to minimize the building's operational impact on the environment, visitors, and staff. The policy's management strategies take into account all environmental-sensitive issues, including:

- Energy conservation: use of energy efficient equipment
- Water conservation/reduction: control of water quantities used in cleaning and using water-efficient cleaning equipment
- Solid waste management & Hazardous waste management: explanation of the waste separation, storing, and disposing procedures used in the building
- Green purchasing: demonstration of available/affordable green products in the region attached with appropriate description (where applicable) in addition to information related to the items to be cleaned in the museum and reference to their locations and use
- Sustainable cleaning procedures: the policy clarifies procedures to be followed by the janitors and the facility manager to clean the different sections of the buildings; restrooms, food areas etc.

6.3. IDc2 LEED-Accredited Professional

The Palestinian Museum project achieved one additional point for having a LEED-Accredited Professional (AP) as a part of its supervision team. Several LEED APs were involved in the project throughout, from the master planning phase to the commissioning and operation phases.

7. Regional Priority (RP)

This category addresses geographically specific environmental priorities. Palestine is located in a zone that suffers from water scarcity: the actual household water use in Palestine is estimated to an average of 50 litre/capita/day because of the limited access to water resources. Further, Palestinians are prevented by political and economic circumstances from generating their own electrical power. As a result, the Palestinian Museum project was qualified to achieve extra points due its location.

WEc1 Water-Efficient Landscaping (Achieved)

WEc2 Innovative Wastewater Technologies (Achieved)

WEc3 Water Use Reduction (Achieved)

EAc1 Optimizing Energy Performance(Achieved)

EAc3 Enhanced Commissioning (Achieved)

EAc5 Measurement and Verification (Achieved)

Note: Although the Museum project was qualified to achieve all the above-mentioned credits, only four credits will be counted due to USGBC regulations (up to four credits only).

PART 2: PROJECT SPECIFIC GREEN EDUCATION PRESENTATION

