LEED Gap Analysis
Respecting Diversity through the Localization of the LEED Rating System in the Region - Jordan as a Case Study
ACKNOWLEDGEMENTS

The Jordan Green Building Council JordanGBC would like to acknowledge the dedication of the professionals who volunteered their effort and contributions to author and compile this document:

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Preface

The initial enthusiasm within the Jordan Green Building Council (JordanGBC) Technical Development Committee members spearheaded a discussion of where to begin. Discussions began by talking about local standards and codes viewed from the perspective of sustainability. Two broad components were identified: one relates to documented current local standards and their newly to be released versions, the second relates to the actual implementation and practical possibility of local regulatory authorities enforcing those documented codes given limited staff and resources. The legislative arm would not be able to follow-up on a legislative sustainability framework if not supported by a regulatory body that would be able to follow-up on all current, new and planned projects in the Kingdom (The stick being the legislation). Their hands are already tied up with more basic design and project concerns and to even be freed up to evaluate and check for sustainability elements.

What became very clear is the need for a ‘carrot’ mechanism to ignite the interest of the investors, developers, contractors, owners, and occupants as an effective way to promote sustainable development and the adoption of green practices and processes. Identifying the carrots and how best to use them was the task. When project teams choose to make a project ‘green,’ how does one measure adherence to green practices? Which practices should be chosen and why? How are these choices affected and dictated by local requirements and contingencies both in terms of environmental, social norms, and economic feasibility? These are among the questions our team considered and in doing so we began to realize the size of the task at hand.

A diverse professional group began meeting regularly under the umbrella of JordanGBC. This group included professional architects, engineers, consultants, and contractors from the Council membership base. This group put together a plan that spelled out the following path:

We are not in a position to re-invent the wheel. The resources available as a volunteer based organization are limited and the need to utilize appropriate green practices and processes in Jordan is paramount. With thousands of projects being planned and implemented, we do not want to miss this opportunity. Do we accept this environmental loss, an irreversible loss, while there are systems out there developed and implemented all around the world? As such we decided not to create a green building rating system from scratch, instead we felt it better to take an existing system and assess its appropriateness for the region based on a devised and documented criteria/methodology. By utilizing an existing green building rating system we could build upon and fine tune the tremendous work others have already undertaken.

Again the team began asking itself a series of questions: which of the rating systems do we choose? How do we entice the engagement of the contractors in the chosen rating system? Which system is most widely used and recognized? Which system, if adopted by developers and owners, would create value through brand recognition? Which rating system adopts baseline references that are similarly integrated in local codes?

From a global perspective, it was clear that the LEED rating system, created by the USGBC, was the most widely recognized and implemented rating system and possessed strongest brand impact. Using a recognized brand like LEED would help to provide the carrot to pursue green buildings, in addition to the flexibility to accommodate local codes and baselines.

Once the LEED rating system was selected, the task was to analyze it in comparison to local codes and standards. Next the Technical Committee would document the gaps between the LEED rating system and what is available, appropriate, and feasible in Jordan. On a credit by credit basis within the five main components of energy, water, sustainable sites, materials & resources, and indoor environmental quality, these gaps were outlined under consistent criteria and recommendations of feasible solutions to the implementation of credits or modifications to the credit requirements/intent.

This task is now complete and documented for others in the region, namely, the Middle East and North Africa (MENA) and Gulf Cooperation Council (GCC) regions, as well as the world at large. After all, in order to build green, local contingencies and requirements must be considered and therefore a similar exercise is beneficial regardless of the region. We hope we have created something beneficial from some of the lessons we learned or through the mistakes you might be able to avoid. In this way we hope this publication helps make building green, wherever you may be, a little easier while respecting local diversity.

We dedicate this publication to our environment, hence to the generations to come. Design environmental sustainability into your future projects. Sustainability by design, not by virtue.
One of the main objectives of the JordanGBC Technical Development Committee is to ensure adherence and compatibility of international green building practices with local requirements. This requires developing an understanding and knowledge of different Green Building rating systems and applying lessons learned to the context of Jordan. As such, the Committee set out to develop a comprehensive and holistic approach to realize the effort of localizing the Leadership in Energy and Environmental Design (LEED) international rating system to Jordan and ultimately the region. The LEED v3 for Building Design and Construction (LEED BD+C) was the main reference for the exercise, as it encompasses a much broader scope in regional markets than other rating systems like LEED Core and Shell (LEED CS), LEED for Existing Buildings, Operations and Maintenance (LEED EB O&M), or LEED for Commercial Interiors (LEED CI).

Through a collaborative approach involving a number of stakeholders, such as Architects, Engineers, Developers, Contractors, Associations, Government Representatives, and local and international experts, each of the Committee’s specialized subcommittees focused its efforts on one of LEED’s credit categories: Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials and Resources (MR), and Indoor Environmental Quality (IEQ), in order to ensure that all aspects of the rating system are examined in light of Jordan’s context. This was carried out through the following process:

1. **Gap Analysis: Codes Versus Credits**

In order to analyze the conditions that affect the applicability of the rating system in Jordan, the Technical Committee carried out a gap analysis of various existing conditions related to the local market and examined important factors including existing building codes and regulations, market conditions, technical expertise in the field of construction, and the roles of key stakeholders including the Government and JordanGBC. Based on this analysis, all prerequisites and credits were categorized either as Applicable (A), Applicable with Difficulty (AWD), or Not Applicable (NA).

Applicable prerequisites and credits meet the credit intent outlined in LEED and are widely adopted or practiced in the Jordanian market with little to no extra effort. Credits categorized as applicable with difficulty can be implemented with extra effort from various stakeholders including designers and legislators but are beyond current common practice in the construction market. Furthermore, some of these credits can be implemented but without meeting the credit intent, hence the difficulty is to ensure that the original environmental and economic benefits are achieved from implementation. Credits that are not applicable, which are few, have been identified as such due to the extreme difficulty in meeting their intent and/or implementation given the current situation. The reasons behind the assessment of each credit’s applicability have been identified by each subcommittee to identify areas for future development.

In addition to categorizing the applicability of credits, the gap analysis identifies the role of key stakeholders in facilitating credit implementation, outlining the role that the market, Government, Jordan Green Building Council (JordanGBC), and even the rating system itself can play to further advance green building practices in Jordan. Additionally, each credit outlines the responsible party or parties, linking the roles of various team members with the intent and implementation of the credit.

2. **Credit Prioritization**

The gap analysis provided strong indicators as to which credits are more important compared to those with a lower priority. The Technical Committee set a number of criteria to evaluate the priority of credits on a scale of 1 to 5, taking into account the economic aspects of the rating system in order to highlight the importance of adoption:

- **Current Practice**: Relates to the implementation of the credit as per current building practices in Jordan where 1 is not in practice and 5 is common practice.

- **Ease of Implementation**: Relates to the current practice where 1 denotes “hard” and 5 “easy”.

- **Cost**: Refers to additional initial costs pertaining to the incorporation and implementation of credit requirements, a score of 1 denotes high additional costs and 5 refers to low additional costs.

- **Feasibility**: Refers to the economic feasibility of implementing the credit, in conjunction with cost, the main issue is economic benefit in the long run, a score of 1 is not feasible while a 5 is feasible.
Based on the abovementioned criteria and scoring system, the priority score was calculated for each credit where an average of less than 2 is low priority, a score of 2.1 to 3.9 is medium priority, and anything within the 4 to 5 range is high priority. This process allowed members of the Technical Committee to identify areas where efforts need to be focused in a future rating system for Jordan and the region, highlighting both 'low-hanging fruit' and focusing on the most challenging environmental issues like water efficiency. Low priority credits can be considered in future versions of the rating system, to be given a higher priority once green building practices, market tools, and legislative frameworks are well in place.

3. International Consultant Review

After the prioritization process, an international consultant with extensive knowledge in green buildings and LEED reviewed the analysis in order to ensure alignment of efforts with overall objectives of the rating system, as well as to provide a fresh perspective on the methodology and results. The review took place over the course of a week and all credit categories were reviewed and in some cases modified to better reflect what can be achieved through the adoption of a localized rating system. One of the recommendations was to share the outcomes with a wider range of practitioners through designing a survey and asking the audience about the highest priority sectors to be covered in a localized rating system and which sectors are most important (ranking questions).

4. Survey Design, Dissemination, and Analysis

In order to maintain a transparent and collaborative approach, the Technical Development Committee set out to receive input and feedback from professionals in the field, outside the membership base of the Committee and Council, in an effort to outline the main components and issues that the rating system should focus on. An online technical survey was designed to guide the Committee, in addition to providing criteria and guidelines for the future development of the rating system. The survey was structured to find out the following information:

- The importance of having a local rating system for Green Buildings in Jordan.
- Identifying the most important design component to Jordan, (Water, Energy, Materials, Sustainable Sites or Indoor Environmental Quality) in addition to an idea about the ranking of credits in each component.
- Type(s) of buildings to be included (applicable) in the rating system.
- Ranking the criteria in the selection and implementation of various sustainable design strategies and building systems.
- Any additional items that could be added to the local rating system.

With a statistical sample of over 100 professionals and practitioners in field, the survey provided valuable insight for Committee members. The results were analyzed and 49.3% of the respondents found that having a local rating system for Green Buildings in Jordan is very important. According to the survey, 72.1% of respondents thought that water is the most important sustainable design category, followed by energy, and indoor environmental quality. The most important building type in the applicability of a localized rating system were educational buildings including schools and universities, followed by mid to high rise residential buildings with 42% and 33.8% respectively. In addition, results indicated that long term feasibility is the most important criterion in creating a localized rating system for Jordan, 44.8% of respondents ranked it first. Environmental impact and ease of implementation followed in second and third place respectively. Respondents indicated a number of other criteria they consider in the selection and implementation of various sustainable design strategies and building systems. These included long term impact on Jordan’s limited water supply, owner attitude and acceptance, appearance, life-cycle, and maintenance requirements.

5. Credit Weighting

Based on the results of the survey and Gap Analysis, the credit weighting was revised in order to give greater emphasis to issues that are of local significance, mainly Water and Energy Efficiency. The integrity of the rating was maintained, including the total number of points, and therefore the extra points for water and energy were shifted from other credit categories, specifically from credits with lower priority. The following demonstrates the credit points that were moved from each category to Water Efficiency for a total of 26 points (24+2 from Regional Priority):

- SS Credit 2 -3
- SS Credit 4.1 -3
- EA Credit 1 -4
- EA Credit 5 -1
- EA Credit 6 -2
- MR Credit 6 -1
The new proposed weighting per category:

<table>
<thead>
<tr>
<th>Category</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Sites (SS)</td>
<td>20</td>
</tr>
<tr>
<td>Water Efficiency (WE)</td>
<td>26</td>
</tr>
<tr>
<td>Energy and Atmosphere (EA)</td>
<td>30</td>
</tr>
<tr>
<td>Materials and Resources (MR)</td>
<td>13</td>
</tr>
<tr>
<td>Indoor Environmental Quality (IAQ)</td>
<td>15</td>
</tr>
<tr>
<td>Innovation in Design (ID)</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>110</strong></td>
</tr>
</tbody>
</table>

Proposed Weights Scheme
SUSTAINABLE SITES
Introduction

Site selection and development are important components of a building's sustainability as the building and its construction activities affect natural habitats. Construction activities can destroy existing wildlife, flora and fauna down to the level of the micro habitat and affect air quality which impacts plants, animals, and humans.

Therefore credits in this category discourage development of previously undeveloped land, and seek to minimize a building's impact on ecosystems. Promotion of construction on previously developed land, by re-using abandoned land, or land that has been contaminated are all measures which contribute to Sustainable Sites. Other aspects of Sustainable Sites relate to preservation of natural habitats, reduction of soil disturbance on the construction site and erosion control and prevention. A building's impact on watersheds is also considered and addressed through storm water design to capture rainwater.

Reducing micro climate change is another goal of Sustainable Sites and is addressed through reducing the heat island effect, encouraging regionally appropriate landscaping, and reducing light pollution.

The impact of buildings and construction activities on air quality is addressed by the requirement to manage and reduce construction-related dust pollution. Proximity to public services, which reduces the need for transportation by individual motorized vehicle, is also a priority. Site proximity to mass (public) transportation (bus, tram, train, etc.) is encouraged as a more sustainable transportation choice thereby reducing emissions compared to those of personal motor vehicles.

Executive Summary

This section assesses the applicability of the Sustainable Sites (SS) prerequisite and credits for Jordan. Challenges to meet the criteria are the following:

- Dust reduction from construction site is a prerequisite and an important aspect for air quality, even in a desert environment.
- Currently, sustainability is not an integrated part in urban planning for major urban areas in Jordan. There are certain exceptions, namely components of the Master Plan for Amman, and certain parts of development in Aqaba. In rural areas urban planning is not much more than a parcelation plan with functional zoning.
- Concepts like urban density which contribute to the economic feasibility of mass transportation must become integral in future urban master plans.
- Currently, land preservation of specific areas only occurs through the creation of Nature Reserves (National Parks), under the auspices of the Royal Society of the Conservation of Nature and the Ministry of Environment.
- At present public transportation is underutilized, due to the lack of information on public transportation systems and the negative image associated with public transit. In part this is the result of public transportation being viewed as unappealing and low quality and the fact that Jordanians generally have a strong preference to drive their own car.
- Some regulations and baseline references that are referred to in LEED credits originate from the United States of America and are not relevant to Jordan. Additionally, in some cases equivalent local regulations or guidelines do not exist (e.g. dust prevention in construction or flood plans). In these cases, recommendations are given for each credit, based on regional experience and best practices.

In Jordan credits related to water retention and consumption are considered most important: credits that apply to water within Sustainable Sites are SS Credit 6 - Storm Water Control and Design and SS Credit 5 - Site Development. Both of these high priority water related credits were determined to be achievable.

The Credits that can be achieved without difficulty are: Development Density & Community Connectivity (Credit 2), Alternative transport (Credit 4), Site Development (Credit 5), Storm water design (Credit 6), Heat Island (Credit 7), and Light Pollution (Credit 8).

Credits that are Not Achievable or can be achieved with difficulty are:

- Prerequisite 1: Controlling erosion and dust is difficult to achieve, since it is based on foreign regulations and equivalent local regulations are not in place. Furthermore there is a lack of knowledge/skills with contractors and related workers.
• **Credit 1**: Avoiding development of inappropriate sites is difficult to achieve due to lack of local regulations.

• **Credit 3**: In terms of brownfield redevelopment, lack of local regulation is an issue.

For these credits it is recommended that similar regulations be developed by the government or that credits are checked against local planning regulations.

**Credits that do not meet the credit intent or are less relevant for Jordan are the following:**

- **Credit 4**: Alternative transport:
- **Credit 4.2**: Bicycle Storage and Changing Rooms is difficult to achieve due to absence of bike-lane infrastructure and natural typography.
- **Credit 4.3**: Low Emitting and Fuel Efficient Vehicles are uncommon and natural typography makes electrical cars less efficient that in a flat topography.

**The role that the JordanGBC could play related to the Sustainable Site credits is the following:**

1. Raise awareness for Professionals (architects, engineers, landscape designers, contractors, suppliers) on subjects such as; Erosion and dust control in bidding documents, Parking Capacity, Site Development., Storm Water Design, Heat Island Effect, and Light Pollution Reduction.
2. Furthermore clients (or developers) could be made more aware of relevant issues related to site selection and assignment definition.
3. Lobbying the Government and Local Municipalities to define appropriate development sites, brownfields, and preferred construction sites. Additionally, JordanGBC should lobby for public transportation development and regulations and/or definitions of dust and erosion control, Light Pollution reduction.

**SS Prerequisite 1: Construction Activity Pollution Prevention**

**Intent**

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

**Requirements**

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local standards and codes, whichever is more stringent. The plan must describe the measures implemented to accomplish the following objectives:

- To prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- To prevent sedimentation of storm sewers or receiving streams.
- To prevent pollution of the air with dust and particulate matter.

The EPA’s construction general permit outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the permit only applies to construction sites greater than one acre (4,050 square meters), the requirements are applied to all projects for the purposes of this prerequisite.

**Baseline Reference**


**Implementation Time frame**

Implementation of this prerequisite starts when the project civil engineer or landscape architect prepares an erosion and sedimentation control plan for the project during the design stage and ensures that its requirements are incorporated into projects drawings and documents. During construction the contractor is responsible for implementing the plan and documenting all measures and strategies carried out by the report on site.
Team Responsibility

Civil Engineer, landscape architect, and contractor.

Applicability in Jordan

The difficulty in the application of this prerequisite in Jordan are the requirements of the referenced EPA standard, particularly requirements relating to project area where project teams are more likely to refer to the National Pollutant Discharge Elimination System (NPDES) program. Furthermore, there are local requirements as set forth by the Ministry of Public Works and Housing but to date it is difficult to determine which are more stringent due to the difference in the structure and details of both documents. It is most likely though the EPA standards are more stringent, however, for a country with very little precipitation and hence erosion and sedimentation, these standards may not be applicable. The dust control component needs to be revisited if it is to be applied, mainly due to the fact that dust is a predominant factor in the local climate, particularly during the warmer months and especially in May and June.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Easy</td>
<td>Low</td>
<td>Feasible</td>
</tr>
<tr>
<td>Partially Done</td>
<td>Med</td>
<td>Med</td>
<td>Med</td>
</tr>
<tr>
<td>Not Done</td>
<td>Hard</td>
<td>High</td>
<td>Not Feasible</td>
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</table>

- **Current Practices**: With the exception of large scale projects, current construction practices do not include erosion and sedimentation control measures or detailed erosion and sedimentation control plans within project documents as per prerequisite requirements.

- **Ease of Implementation**: Implementation of this prerequisite is difficult due to current building practices which in large part do not take prerequisite requirements into consideration, particularly when it comes to dust control measures.

- **Cost**: If considered early in the design process and followed through during construction, many of ESC measures can be inexpensive to implement but do require additional costs for contractors.

- **Feasibility**: Implementation of this prerequisite is medium.

Overall Prioritization

Based on the above mentioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Prerequisite Intent

In order to facilitate the implementation of this prerequisite and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   No market recommendations at this time as related to this prerequisite.

2. **Jordan Green Building Council**
   Awareness programs are needed for contractors mainly to change current mindsets and building practices on site.
3. **Government**  
Develop current codes and standards for erosion and sedimentation control accompanied by an enforcement program and mechanism.

4. **Local Rating System**  
Keep prerequisite requirements to encourage advancement of the sector and better construction practices.

**Conclusion**

Although not in practice present, it is important that this prerequisite is maintained in order improve current construction practices. This is particularly true for large scale projects with higher impact due to various construction activities and excavation practices. In addition, maintaining the prerequisite would allow for better maintenance of construction sites where sites and materials are covered and properly stored to minimize the impact of construction activity, not only on the site itself but also into neighboring sites.

**SS Credit 1: Site Selection**

**Intent**

To avoid the development of inappropriate sites and reduce the environmental impact from the location of a building on a site.

**Requirements**

Do not develop buildings, hardscape, roads or parking areas on portions of sites that meet any of the following criteria:

- Prime farmland as defined by the U.S. Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5).
- Previously undeveloped land whose elevation is lower than 5 feet above the elevation of the 100-year flood as defined by the Federal Emergency Management Agency (FEMA).
- Land specifically identified as habitat for any species on federal or state threatened or endangered lists.
- Land within 100 feet of any wetlands as defined by the U.S. Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, or within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent.
- Previously undeveloped land that is within 50 feet (15.25 meters) of a water body, defined as seas, lakes, rivers, streams and tributaries that support or could support fish, recreation or industrial use, consistent with the terminology of the Clean Water Act.
- Land that prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (park authority projects are exempt).

**Baseline Reference**

U.S. Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5), Definition of Prime Agricultural Land.  
Federal Emergency Management Agency (FEMA), Definition of 100-Year Flood.  

**Implementation Time frame**

Early during the design process and during site selection, the project team should include a number of professionals and specialists including landscape architects and ecologists if needed to aid the project owner as much as possible and work collaboratively to select the proper site and boundaries for a project. If needed, the design team should coordinate with government officials from relevant ministries, NGO's and local municipalities to ensure that the selection process is aligned with local regulations for the site.
Team Responsibility

Owner, architect, landscape architect and ecologist.

Applicability in Jordan

This credit is applicable in Jordan; however one has to include sites that are identified as inappropriate to build or develop projects and these must be defined by local standards and regulations in order to fully realize the credit intent, including sites with known environmental degradation or those that are habitats for local endangered species. In some cases, these sites are not clearly defined by various regulations which might be challenging for project teams.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
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</table>

• **Current Practices**: Particularly in the case of large scale projects where a detailed Environmental Impact Assessment (EIA) is usually required, this requirement is at least partially implemented in most cases. In others, regulations prohibit development in certain areas for natural and/or heritage values.

• **Ease of Implementation**: Implementation of this credit is easy, particularly if future regulations and codes are developed to properly identify areas which should not be developed as per Jordanian requirements.

• **Cost**: There are minimal or no extra costs for the implementation of this credit.

• **Feasibility**: Implementation of this credit is feasible.

Overall Prioritization

Based on the above mentioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   Not Applicable.

2. **Jordan Green Building Council**
   Collaborate with local organizations like the Royal Society for Conservation of Nature (RSCN) to raise awareness about appropriate and inappropriate site selection which target the public and government.

3. **Government**
   Develop clear definitions of inappropriate development sites in collaboration with local municipalities and other organizations responsible for master plan development in various areas.

4. **Local Rating System**
   Keep credit requirements to raise awareness regarding the environmental impact of buildings, particularly in areas that have been identified by local authorities as polluted or in need of pollution mitigation.
Conclusion

It is important to emphasize in any rating system that the process of sustainable design starts very early in a project's lifecycle, beginning with assembling the team and even selecting the site. Credits such as this one are important to have in order to highlight this issue in addition to emphasizing the importance of minimizing the negative impacts that buildings and projects might have on the natural environment. This is particularly true in areas such as those defined by local and international standards as protected and inappropriate for development.

SS Credit 2—Development Density and Community Connectivity

Intent

To channel development to urban areas with existing infrastructure, protect greenfields, and preserve habitat and natural resources.

Requirements

Option 1: Development Density

Construct or renovate a building on a previously developed site AND in a community with a minimum density of 60,000 square feet per acre net (1,486.5 square meters per 4.05 Dunams). The density calculation is based on a typical two-story downtown development and must include the area of the project being built.

OR

Option 2: Community Connectivity

Construct or renovate a building on a site that meets the following criteria:

- Is located on a previously developed site.
- Is within 1/2 mile (0.80 km) of a residential area or neighborhood with an average density of 10 units per acre (4.05 Dunams) net.
- Is within 1/2 mile (0.80 km) of at least 10 basic services.
- Has pedestrian access between the building and the services.

For mixed-use projects, no more than one service within the project boundary may be counted as one of the 10 basic services, provided it is open to the public. No more than two of the 10 services required may be anticipated (i.e., at least eight must be existing and operational). In addition, the anticipated services must demonstrate that they will be operational in the locations indicated within one year of occupation of the applicant project.

Examples of basic services include the following:

<table>
<thead>
<tr>
<th>Bank</th>
<th>Senior Care Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of Worship</td>
<td>Park</td>
</tr>
<tr>
<td>Convenience Grocery</td>
<td>Pharmacy</td>
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<tr>
<td>Day Care Center</td>
<td>Post Office</td>
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<tr>
<td>Cleaners</td>
<td>Restaurant</td>
</tr>
<tr>
<td>Fire Station</td>
<td>School</td>
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<tr>
<td>Beauty Salon</td>
<td>Supermarket</td>
</tr>
<tr>
<td>Hardware</td>
<td>Theater</td>
</tr>
<tr>
<td>Laundry</td>
<td>Community Center</td>
</tr>
<tr>
<td>Library</td>
<td>Fitness Center</td>
</tr>
<tr>
<td>Medical or Dental Office</td>
<td>Museum</td>
</tr>
</tbody>
</table>
Proximity is determined by drawing a 1/2-mile (0.80 km) radius around a main building entrance on a site map and counting the services within that radius.

Baseline Reference

There is no baseline reference for this credit.

Implementation Time frame

Various options for locating the building based on density and proximity to existing infrastructure as per credit requirements should be assessed by the project team and project owner or developer as early as possible during design.

Team Responsibility

Owner, developer, and architect.

Applicability in Jordan

This credit was found to be easily applicable in Jordan, particularly in urban areas.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
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- **Current Practices**: Credit requirements are widely practiced in urban areas where land prices are higher and investors benefit by developing areas with existing infrastructure.
- **Ease of Implementation**: Implementation of this credit is easy, but additional documentation is required for credit compliance.
- **Cost**: There are minimal or no extra costs for the implementation of this credit.
- **Feasibility**: Implementation of this credit is feasible, as evidenced by building owners taking advantage of existing infrastructure and services.

Overall Prioritization

Based on the above mentioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   Not Applicable.

2. **Jordan Green Building Council**
   Conduct courses and awareness sessions about the benefits of reusing existing buildings and areas that are in proximity to existing infrastructure and community services.
3. **Government**  
Provide incentives for developers to implement projects in developed urban areas in compliance with local master plan and zoning requirements.

4. **Local Rating System**  
Keep credit requirements to encourage use of existing infrastructure for future development and review lists of services to see if additional services that are relevant to the local context may be added like grocery stores, restaurants, and other services.

**Conclusion**  
It is important to emphasize in any rating system that the process of sustainable design starts very early in a project's lifecycle, beginning with assembling the team and even selecting the site. Credits such as this one are important to have in order to highlight this issue in addition to emphasizing the importance of making use of previously developed areas and sites that already serviced by infrastructure and other facilities, particularly in urban areas.

**SS Credit 3: Brownfield Redevelopment**

**Intent**
To rehabilitate damaged sites where development is complicated by environmental contamination and to reduce pressure on undeveloped land.

**Requirements**

**Option 1**
Develop on a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local voluntary cleanup program).

**OR**

**Option 2**
Develop on a site defined as a brownfield by a local, state, or federal government agency.

**Baseline References**
There are no baseline references.

**Implementation Time Frame**
If contamination is suspected then conduct an environmental phase II site assessment to determine whether remediation of the site is necessary. Phase II assessment requires that an environmental professional test the air, water and soil to identify what kinds of contaminants exist and at what level. Tests vary but normally low cost ones are selected first and involve taking samples, which are then analyzed in a laboratory. If sufficient contaminants are discovered, more sophisticated tests should be performed. Use remediation experts to develop a master plan for any site cleanup.

**Team Responsibility**
The client; During the site selection process, developers should contract with an environmental consultant to conduct site assessment, identify contaminants and determine a schedule for cleanup based on the remediation methods selected.
Applicability in Jordan

In order for this credit to be easily applicable to Jordan, further efforts are required in order to identify criteria for sites to be defined as brownfields or contaminated by local standards and regulations.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
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<tr>
<td>Already Done</td>
<td>Partially Done</td>
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- **Current Practices:** For most projects it is not a common construction practice to undertake pollution mitigation measures for sites with identified environmental problems.

- **Ease of Implementation:** In most cases, this credit would be difficult to implement.

- **Cost:** Due to the abovementioned factors, the cost to implement pollution mitigation measures would be medium to high, depending on the site and level of pollution.

- **Feasibility:** Implementation of this credit is not feasible.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a low priority.

Recommendation to Achieve Credit Intent

1. **Market**
   - No market recommendation could be identified at this stage.

2. **Jordan Green Building Council**
   - Work together with government and local authorities to raise awareness about the importance of this issue.

3. **Government**
   - Provide a clear definition of a brownfield site according to the local context in order to encourage mitigation measures and selection of these sites for development.

4. **Local rating systems**
   - Redefine the following terminology in relation to local context and requirements:
     - Clean site declaration.
     - Urban Wasteland indication.

Conclusion

The applicability of this credit may be revisited at a later stage in order to highlight the importance of considering various options for development when it comes to new projects. This may include redevelopment of areas with previously identified environmental challenges.
SS Credit 4.1: Alternative Transportation—Public Transportation Access

Intent
To reduce pollution and land development impacts from automobile use.

Requirements
Locate the project within 1/2-mile (0.80 km) walking distance (measured from a main building entrance) of an existing or planned and funded commuter rail, light rail or subway station. Another option is to locate the project within 1/4-mile (0.40 km) walking distance (measured from a main building entrance) of one or more stops for two or more public, campus, or private bus lines usable by building occupants.

Baseline Reference
Not developed yet, as the public transportation map is not available in Jordan at the time of issue of this publication.

Implementation Time Frame
At the site selection stage, the optimal sites for meeting the credit intent should be determined and considered.

Team Responsibility
The Architect, design team, and owner should determine which options for the project site location would best meet the public transportation access requirements for this credit.

Applicability in Jordan
This credit is applicable and feasible but with potential challenges. The public transportation network in Jordan is limited to buses, and does not efficiently cover most areas.

Credit Prioritization
This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<thead>
<tr>
<th>Current Practices</th>
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<th>Cost</th>
<th>Feasibility</th>
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<tbody>
<tr>
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<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
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<td>X</td>
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</table>

- **Current Practices:** Public transportation is available but limited to buses.
- **Ease of Implementation:** The public transportation network is limited. Furthermore there is a lack of accurate information about public transportation routes, stops, and schedules.
- **Cost:** Additional cost is minimal (e.g.: expanding the public transportation network, providing reliable information like timetables). However, in order to enhance the transportation system as a whole or to introduce rail commute for example, the added cost would be high.
- **Feasibility:** Access to public transportation is feasible if the site is chosen correctly. However, other factors in determining site selection may prove make building in proximity to public transportation challenging.
Overall Prioritization
Based on the above mentioned analysis, this credit was given a high priority.

Recommendations to Achieve Credit Intent

1. Market
   Not applicable.

2. Jordan Green Building Council
   Establish a joint collaboration with the Greater Amman Municipality to raise awareness on advantages of using the public transportation system. Receive feedback from the community to determine public needs and how to improve the existing system.

3. Government
   Raise awareness on advantages of using the public transportation system. Expand the network by reaching areas which are not accessible to the transportation system. Enhance the existing system with regular maintenance. This option may be preferable to purchasing new buses and building new stations which is extremely expensive. Introduce short-route high-frequency service passenger transportation systems to connect isolated areas with main routes and hubs of the main public transportation system.

4. Local Rating System
   Meeting this credit will depend on locating the project on a site which has accessibility to the public transportation system. Otherwise, a private bus line can be provided to satisfy the intent.

Conclusion

Many Jordanians do not use the bus due to cultural or social reasons, in addition to perceptions about its relative inconvenience. Owning a car is a priority which creates a large car to citizen ratio. This is why enhancing the quality of the public transportation system, in addition to educating and raising awareness on the advantages of using public transit is essential.

Creating alternative methods for transportation such as a "light" rail system or subway network is expensive and requires significant capital. This investment, however, would save future expenses, reduce fuel consumption, and reduce dependency on private vehicles. Lack of proper transportation planning in relation to urban planning is still a challenge.

Meeting this credit by facilitating accessibility to public transportation is feasible. It is recommended to introduce comprehensive, effective, and high quality mass transit systems in Jordan, which would help to enhance perceptions of public transport and thereby increase ridership.

SS Credit 4.2: Alternative Transportation—Bicycle Storage and Changing Rooms

Intent
To reduce pollution and land development impacts from automobile use.

Requirements

Option 1: Commercial or Institutional Projects
Provide secure bicycle racks and/or storage within 200 yards (183 meters) of a building entrance for 5% or more of all building users (measured at peak periods).

Provide shower and changing facilities in the building, or within 200 yards (183 meters) of a building entrance, for 0.5% of fulltime equivalent (FTE) occupants.
OR

Option 2: Residential Projects

Provide covered storage facilities for securing bicycles for 15% or more of building occupants.

Baseline Reference

Relevant local references currently do not exist.

Implementation Time Frame

Bicycle storage and shower facilities should be incorporated into design concepts during schematic design and design development. However, during the site selection phase, the project team can include proximity to any existing bicycle infrastructure as a criterion.

Team Responsibility

Coordination between the architect, plumbing engineer, civil engineer, and/or landscape architect is necessary for locating and designing bicycle storage and shower facilities.

Applicability in Jordan

This credit is attainable but does not meet the credit intent. Using bicycles as an alternative transportation method in Jordan is difficult for multiple reasons such as the topography of Jordan, social, and cultural aspects, and lack of suitable infrastructure. However, providing shower facilities and bike racks will hopefully encourage the use of bicycles as it could only become more common with time.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
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<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
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</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Easy</td>
<td>Low</td>
<td>Feasible</td>
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<tr>
<td>Partially Done</td>
<td>Med</td>
<td>Med</td>
<td>Not Feasible</td>
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<td>Not Done</td>
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- **Current Practices:** Bicycles are not widely used as an alternative transportation method.

- **Ease of Implementation:** This credit can be implemented to meet credit intent but faces multiple obstacles such as lack of infrastructure (no bicycle lanes, routes, or storage facilities), in addition to cultural and social aspects where a culture of cycling does not yet exist.

- **Cost:** Minimal added cost relative to a project budget.

- **Feasibility:** Feasible but does not meet credit intent as the obstacles for using bicycles as an alternative transportation method are challenging, at least for the time being.

Overall Prioritization

Based on the abovementioned analysis, this credit was given a low priority.
Recommendations to Achieve Credit Intent

1. **Market**
   Not applicable.

2. **Jordan Green Building Council**
   Raise the issue of using bicycles as an alternative transportation method. Get feedback through surveys on willingness to use one and what can be done to encourage cycling.

3. **Government**
   Provide infrastructure such as bicycle lanes and storage.

4. **Local Rating System**
   This credit would optional and met under specific criterion such as maximum slope in a defined parameter around the site.

**Conclusion**

This credit is attainable but does not meet credit intent at the moment in Jordan. The challenges restricting the use of bicycles as an alternative transportation method are large. Infrastructure should be implemented to allow safe use of bicycles in the busy streets which hardly fit cars with all the traffic. Amman’s topography creates a challenge of its own to climb steep slopes, although other cities with similar topography have appropriate biking infrastructure and offer good concepts when dealing with such slopes. Also, certain cultural and social barriers exist which may constrict the use of bicycles.

Overall, this credit is feasible and could encourage the use of bicycles but would require a lot of improvement in other aspects such as transportation, awareness for using less fuel, and willingness to use a bicycle instead of the comfort and safety of a private car.

**SS Credit 4.3: Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles**

**Intent**
To reduce pollution and land development impacts from automobile use.

**Requirements**

**Option 1**
Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site. Providing a discounted parking rate is an acceptable substitute for preferred parking for low-emitting/fuel-efficient vehicles. To establish a meaningful incentive in all potential markets, the parking rate must be discounted at least 20%. The discounted rate must be available to all customers (i.e., not limited to the number of customers equal to 5% of the vehicle parking capacity), publicly posted at the entrance of the parking area and available for a minimum of two years.

OR

**Option 2**
Install alternative-fuel fueling stations for 3% of the total vehicle parking capacity of the site. Liquid or gaseous fueling facilities must be separately ventilated or located outdoors.

OR
Option 3
Provide low-emitting and fuel-efficient vehicles for 3% of full-time equivalent (FTE) occupants. Provide preferred parking for these vehicles.

OR

Option 4
Provide building occupants access to a low-emitting or fuel-efficient vehicle-sharing program. The following requirements must be met:

- One low-emitting or fuel-efficient vehicle must be provided per 3% of FTE occupants, assuming that one shared vehicle can carry eight persons (i.e., 1 vehicle per 267 FTE occupants). For buildings with fewer than 267 FTE occupants, at least 1 low emitting or fuel-efficient vehicle must be provided.
- A vehicle-sharing contract must be provided that has an agreement of at least two years.
- The estimated number of customers served per vehicle must be supported by documentation.
- A narrative explaining the vehicle-sharing program and its administration must be submitted.
- Parking for low-emitting and fuel-efficient vehicles must be located in the nearest available spaces in the nearest available parking area. Provide a site plan or area map clearly highlighting the walking path from the parking area to the project site and noting the distance.

Baseline Reference
None.

Implementation Time Frame
Any fueling stations for alternative-fuel vehicles should be incorporated into design concepts during schematic design and design development. If such vehicles are purchased as part of the design strategy, project team should communicate requirements to procurement officials well in advance of the deadline for ordering the vehicles. Designating park spaces is generally not as time sensitive as other strategies, but a plan should be developed early.

Team Responsibility
The Architect and design team along with the project owner should choose the appropriate approach for future users of the building.

Applicability in Jordan
This credit is applicable and feasible but should be encouraged by offering incentives.

Credit Prioritization
This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<th>Current Practices</th>
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<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
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- **Current Practices:** The government offered tax deductions and exemptions on certain hybrid cars several years ago; this increased the number of cars which are not 100% dependent on petrol. However, the number of these vehicles is still disproportionately small compared to traditional vehicles.

- **Ease of Implementation:** The major obstacle is the high cost of fuel efficient vehicles. Providing preferred parking is not a problem.
• **Cost:** Preferred parking has no added cost, but this credit was assigned as high added cost as there are not many cars in Jordan that use alternative fuel at the moment and the cost will remain high unless tax exemptions are introduced.

• **Feasibility:** Feasible but as discussed earlier, but with challenges.

### Overall Prioritization

Based on the abovementioned analysis, this credit was given a medium priority.

### Recommendations to Achieve Credit Intent

1. **Market**  
   Offer more options and models as technology advances.

2. **Jordan Green Building Council**  
   Raise awareness and education on differences between traditional vehicles and alternative-fuel vehicles. Prove that using these alternatives can be less costly in the long run as they consume less fuel. This sort of awareness could increase consumer demand for fuel efficient vehicles.

3. **Government**  
   Introduce tax exemptions as well as regulations on alternative-fuel technologies which benefit the environment and the economy as the petrol prices continue to rise.

4. **Local Rating System**  
   The focus will be on preferred parking as it is the most cost effective and feasible option.

### Conclusion

Alternative-fuel vehicles will likely become more widespread as petrol prices continue rising, people become more aware of the environment, and demand increases. The key way to bring about widespread use of these types of vehicles in Jordan is through relevant tax exemptions. This way the costumer will have two options for buying a car, one that is petrol dependent against a cheaper and more environmentally friendly option.

### SS Credit 4.4: Alternative Transportation—Parking Capacity

#### Intent

To reduce pollution and land development impacts from automobile use.

#### Requirements

**Case 1: Non-Residential Projects**

**Option 1**

Size parking capacity to meet but not exceed minimum local zoning requirements. Provide preferred parking for carpools or vanpools for 5% of the total parking spaces.

OR

**Option 2**

For projects that provide parking for less than 5% of full-time equivalent (FTE) building occupants:
Provide preferred parking for carpools or vanpools, marked as such, for 5% of total parking spaces. Providing a discounted parking rate is an acceptable substitute for preferred parking for carpool or vanpool vehicles. To establish a meaningful incentive in all potential markets, the parking rate must be discounted at least 20%. The discounted rate must be available to all customers (i.e., not limited to the number of customers equal to 5% of the vehicle parking capacity), publicly posted at the entrance of the parking area, and available for a minimum of two years.

OR

Option 3
Provide no new parking.

Case 2: Residential Projects

Option 1
Size parking capacity to meet but not exceed minimum local zoning requirements. Provide infrastructure and support programs to facilitate shared vehicle use such as carpool drop-off areas, designated parking for vanpools, car-share services, ride boards, and shuttle services to mass transit.

OR

Option 2
Provide no new parking.

Case 3: Mixed Use (Residential with Commercial/Retail) Projects

Option 1
Mixed-use buildings with less than 10% commercial area must be considered residential and adhere to the residential requirements in Case 2. For mixed-use buildings with more than 10% commercial area, the commercial space must adhere to non-residential requirements in Case 1 and the residential component must adhere to residential requirements in Case 2.

OR

Option 2
Provide no new parking.

Baseline Reference
Municipality parking regulations.

Implementation Time Frame
Discussions regarding reduction of parking capacity are most productive at the project concept phase. Additionally, these design solutions should be incorporated during schematic design and design development phases.

Team Responsibility
The Architect, design team and owner choose the best options for reducing the parking capacity and most appropriate approach for future occupants. An additional team member should join the project team to develop a traffic study.

Applicability in Jordan
This credit is applicable and feasible but should be implemented with proficient study of the site with emphasis on the traffic report.
Credit Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Minimum parking is provided for each building but the fact that most people have their own cars has created a great deal of stand-alone parking lots. Carpooling is practiced only minimally.

- **Ease of Implementation**: Easy to implement, however, building a culture of carpooling is the biggest challenge.

- **Cost**: No added cost.

- **Feasibility**: Feasible with some difficulties which relate to other aspects such as public transportation and social & cultural obstacles.

Overall Prioritization

Based on the abovementioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**
   - Not applicable.

2. **Jordan Green Building Council**
   - Raise awareness on the importance of carpooling.
   - Promote ride sharing.
   - Lobby the government and municipalities to promote and implement carpooling and ride sharing programs.

3. **Government**
   - Offer carpooling incentives.
   - Introducing tolls which are free (or cost less) for carpool vehicles which can generate public infrastructure revenue, in addition to creating an incentive to carpool and rideshare.

4. **Local Rating System**
   - Keep this credit as is and perform a traffic study report before reducing parking.

Conclusion

This credit is dependent on other aspects such as the public and alternative transportation systems. Reducing parking spaces will increase pressure on these systems. If strong public transportation systems do not exist, as it is the case in Amman, there will be an increase in the dependency on private transportation, which would require additional parking facilities in or around the buildings. The credit’s intent is to make it inconvenient to use a car and encourage people to use alternatives, but alternatives have to be in place or developed to provide people with a viable choice.

As for carpooling, restrictions are essentially cultural and social. Carpooling is not widely practiced and should be encouraged and incentivized.
**SS Credit 5.1: Site Development—Protect or Restore Habitat**

**Intent**
To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

**Requirements**

**Case 1: Greenfield Sites**
Limit all site disturbances to the following parameters:
- 40 feet (12 meters) beyond the building perimeter.
- 10 feet (3.0 meters) beyond surface walkways, patios, surface parking and utilities less than 12 (0.30 meters) inches in diameter.
- 15 feet (4.6 meters) beyond primary roadway curbs and main utility branch trenches.
- 25 feet (7.60 meters) beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities and playing fields) that requires additional staging areas to limit compaction in the constructed area.

**Case 2: Previously Developed Areas or Graded Sites**
Restore or protect a minimum of 50% of the site (excluding the building footprint) or 20% of the total site area (including building footprint), whichever is greater, with native or adapted vegetation. Projects earning SS Credit 2: Development Density and Community Connectivity may include vegetated roof surface in this calculation if the plants are native or adapted, provide habitat, and promote biodiversity.

**Baseline Reference**
There is no baseline reference for this credit; however alignment of credit requirements with local open space regulations, e.g. Greater Amman Municipality (GAM) setback requirements must be achieved.

**Implementation Time Frame**
Preserve and enhance natural site elements, including existing water bodies, soil conditions, ecosystems, trees, and other vegetation. Identify opportunities for site improvement that would increase the area of native and adaptive vegetation or other ecologically appropriate features. Monoculture planting (e.g. turf) cannot contribute to the credit. Restoration and maintenance activities might include removing unnecessary paved areas and replacing them with landscaped areas. Consult landscape architects, ecologists, environmental and civil engineers and local professionals who can provide site specific expertise during the site design process.

**Team Responsibility**
Coordination between the owner and the project architect and landscape architect must be carried out to discuss various options to minimize building footprint and achieve credit requirements.

**Applicability in Jordan**
This credit is applicable to Jordan in most cases. Local setback and open space requirements vary across urban and rural areas and depending on building use (residential, commercial, industrial…etc), which may make this credit more difficult to achieve.

**Credit Prioritization**
This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:
• **Current Practices:** Dense urban areas with limited setbacks allow limited opportunity to restore parts of the site with native or adaptive vegetation.

• **Ease of Implementation:** Varies according to the context of the site.

• **Cost:** If proper site planning and design are undertaken at early stages during the design process, additional costs are minimal.

• **Feasibility:** Implementation of this credit is feasible.

**Overall Prioritization**

Based on the above mentioned analysis, this prerequisite was given a high priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   No specific market tasks have been identified at this stage

2. **Jordan Green Building Council**
   Raise awareness for drought resistant and native plants. The focus should be on local landscaping in cooperation with the Center for the Study of the Built Environment (CSBE), the Royal Botanical Gardens, and government to ensure consistency with building regulations.

3. **Government**
   Incorporate open space and building footprint requirements in master plan development and link them to incentives to encourage developers to comply with regulations.

4. **Local Rating System**
   Redefine the following: Provision of space for nature development, as specified by LEED.

**Conclusion**

One of the important aspects of any rating system for green buildings is its ability to link the built and natural environments to create a sense of balance and preserve various ecological features that may be found on site. Accordingly, it is important to promote building practices emphasized by such credits. Requirements for open space in the built environment can be achieved by considering them as early as possible during the design process.

**SS Credit 5.2: Site Development—Maximize Open Space**

**Intent**

To promote biodiversity by providing a high ratio of open space to development footprint.

**Requirements**

**Case 1: Sites with Local Zoning Open Space Requirements**

Reduce the development footprint and/or provide vegetated open space within the project boundary such that the amount of open space exceeds local zoning requirements by 25%.
**Case 2: Sites with No Local Zoning Requirements (e.g. some university campuses, military bases)**

Provide a vegetated open space area adjacent to the building that is equal in area to the building footprint.

**Case 3: Sites with Zoning Ordinances but No Open Space Requirements**

Provide vegetated open space equal to 20% of the project site area.

**All Cases:**

For projects in urban areas that earn SS Credit 2: Development Density and Community Connectivity, vegetated roof areas can contribute to credit compliance.

For projects in urban areas that earn SS Credit 2: Development Density and Community Connectivity, pedestrian-oriented hardscape areas can contribute to credit compliance. For such projects, a minimum of 25% of the open space counted must be vegetated.

Wetlands or naturally designed ponds may count as open space and the side slope gradients average 1:4 (vertical: horizontal) or less and are vegetated.

**Baseline Reference**

There is no baseline reference for this credit; however alignment of credit requirements with local open space regulations, e.g. Greater Amman Municipality (GAM) setback requirements must be achieved.

**Implementation Time Frame**

Perform a site survey to identify site elements and adopt a master plan for developing the project site. Select a suitable building location and design the building footprint to minimize site disruption. Strategies include stacking the building program, tuck-under parking and sharing parking facilities with neighbors to maximize the amount of open space on the site.

**Team Responsibility**

Coordination between the owner and the project architect and landscape architect must be carried out to discuss various options to minimize building footprint and achieve credit requirements.

**Applicability in Jordan**

This credit was found to be applicable to Jordan in most cases. Local setback and open space requirements vary from across urban and rural areas and depending on building use (residential, commercial, industrial…etc), which may make this credit more difficult to achieve.

**Credit Prioritization**

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
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<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
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- **Current Practices:** Dense urban areas with limited setbacks allow limited opportunity to restore parts of the site with native or adaptive vegetation.

- **Ease of Implementation:** Varies according to the context of the site for the reason above.
Cost: If proper site planning and design are undertaken at early stages during the design process, additional costs are minimal.

Feasibility: Implementation of this credit is feasible.

Overall Prioritization
Based on the above mentioned analysis, this prerequisite was given a high priority.

Recommendations to Achieve Credit Intent

1. Market
   No specific market tasks have been identified at this stage.

2. Jordan Green Building Council
   Advocate for proper implementation of building regulations through incentives for developers created by the government.

3. Government
   Incorporate open space and building footprint requirements in master plan development and link them to incentives to encourage developers to comply with regulations.

4. Local Rating System
   Redefine the following strategies bearing in mind local context requirements:
   • Cancel water ponds.
   • Nature developments on sloped sites.

Conclusion
One of the important aspects of any rating system for green buildings is its ability to link the built and natural environments to create a sense of balance and preserve various ecological features that may be found on site. Accordingly, it is important to promote building practices emphasized by such credits. Requirements for open space in the built environment can be achieved by considering them as early as possible during the design process.

SS Credit 6.1: Stormwater Design-Quality Control

Intent
To limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution form stormwater runoff and eliminating contaminants.

Requirements

• Sites with Existing Imperviousness 50% or Less:
  Implement a stormwater management plan that prevents the post development peak discharge rate and quantity from exceeding the predevelopment peak discharge rate and quantity for the for the 1 and 2 year 24 hour design storms.

• Sites with Existing Imperviousness is Greater than 50%:
  Implement a stormwater management plan that results in a 25% decrease in the volume of stormwater runoff from the 2 year 24 hour design storm.

Baseline Reference
No baseline reference is available for this credit.
Implementation Time frame

Ideally, the design of stormwater management systems will take place during the earliest planning phases of the project. The most effective designs are integrated with the landscape and building plans to maximize pervious areas and take advantage of possible reuse opportunities.

Team Responsibility

The civil engineer and the landscape architect design the stormwater management system and perform preliminary calculations to confirm compliance with this credit. During construction the project team should confirm proper installation and operation of the stormwater management system by reviewing the contractor’s as-built drawings.

Applicability in Jordan

This credit is extremely important in Jordan. Though stormwater management is not widely practiced, implementation of these systems is feasible in Jordan. The primary difficulties are in the availability of information about local definitions of the one & two year 24 hour design storms, lack of pervious pavement in the market, relevant knowledge of engineers and contractors of proper storm water design, in addition to the willingness of owners to adopt these practices. Despite these obstacles, the cost of implementation is within reach.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Storm water collection is not a current practice due to the limited materials for pervious pavement and local requirements which may prohibit rainwater collection in some cases.
- **Ease of Implementation**: This credit can be easily achieved if thought through from the beginning of the project, where the design team can integrate the most effective and feasible designs appropriate for the project.
- **Cost**: Costs can be minimized if systems are planned and integrated early in the design. Additionally, the use of stormwater for non-potable purposes, such as flushing urinals and toilets would reduce costs by reducing potable water use.
- **Feasibility**: Implementation of this credit is feasible.

Overall Prioritization

Based on the abovementioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:
1. **Market**  
Reduce or remove taxes on pervious paving materials to encourage their use by designers.

2. **Jordan Green Building Council**  
   - Develop awareness programs to encourage market transformation toward pervious pavement and collection systems.  
   - Provide awareness sessions about the importance of the water management in Jordan.  
   - Build the capacity of engineers and contractors in proper stormwater design practices.

3. **Government**  
Revise local codes and regulations to include requirements to encourage rainwater harvesting and link them to incentives for designers and developers who comply with the requirements.

4. **Local Rating System**  
Link local rating system requirements to water resource management plans that have been identified on a national scale, in order to contextualize credit requirements with Jordan’s water situation.

**Conclusion**

For a country like Jordan with limited rainfall each year, stormwater management strategies are important in order to maximize the sustainable use of stormwater in project sites, including both quantity and quality control measures. Costs of implementing such measures and strategies can be minimized by introducing them early in the design process and following up with proper implementation during construction and maintenance during a project’s post-occupancy phase. Local regulations should be developed to enforce the practice of rainwater harvesting, particularly for projects with larger site surface and roof areas.

**SS Credit 6.2: Storm Water Design-Quality Control**

**Intent**

To limit disruption and pollution of natural water flows by managing stormwater runoff.

**Requirements**

- Implement a stormwater management plan that reduces impervious cover, promotes infiltration and captures and treats the stormwater runoff from 90% of the average annual rainfall using acceptable best management practices.
- Best Management Practices (BMPs) used to treat runoff must be capable of removing 80% of the average annual post-development total suspended solids load based on existing monitoring reports.

**Baseline Reference**

No baseline reference is available for this credit.

**Implementation Time Frame**

This credit can be achieved using either nonstructural or structural stormwater management measures or both to minimize or mitigate impervious area. During the pre-design, setting goals related to water.

**Team Responsibility**

- The civil engineer and the landscape architect will determine the soil types, infiltration rates, and design stormwater management systems, including water quality treatment.
• The owner, architect and engineers will set the goals related to water, including stormwater management and water reuse.

• The civil and mechanical engineers along with the landscape architect will establish a comprehensive water budget for stormwater, irrigation water and the building’s water consumption.

Applicability in Jordan

This credit is extremely important in Jordan, however this practice is not widely utilized and limited to large developments and projects. This is primarily about the associated additional costs which makes the credit applicable with difficulty.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• **Current Practices**: This practice is limited to large scale projects with higher investments and capital costs.

• **Ease of Implementation**: Credit requirements and best management practices must be incorporated into the project as early as possible, otherwise they will be much more difficult to implement.

• **Cost**: Implementation of credit requirements entail higher capital costs which may be problematic for smaller projects.

• **Feasibility**: Implementation of this credit is medium.

Overall Prioritization

Based on the aforementioned analysis, this credit was given a high priority.

Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   If taxes on technologies and materials that meet credit requirements are reduced, it will encourage their use by designers.

2. **Jordan Green Building Council**
   Provide awareness sessions about the importance of water management in Jordan.

3. **Government**
   Revise local codes and regulations to include requirements to encourage rainwater harvesting and link them to incentives for designers and developers who comply with the requirements.

4. **Local Rating System**
   Link local rating system requirements to water resource management plans that have been identified on a national scale, in order to contextualize credit requirements with Jordan’s water situation.
Conclusion

For a country like Jordan with limited rainfall each year, stormwater management strategies are important in order to maximize the sustainable use of stormwater in project sites, including both quantity and quality control measures. Costs of implementing such measures and strategies can be minimized by introducing them early in the design process and following up with proper implementation during construction and maintenance during a project’s post-occupancy phase. Local regulations should be developed to enforce the practice of rainwater harvesting, particularly for projects with larger site surface and roof areas.

SS Credit 7.1: Heat Island Effect—Non Roof

Intent

To reduce the impacts on microclimates and human and wildlife habitats heat islands need to be minimized. Heat islands are defined as thermal gradient differences between developed and undeveloped areas. In other words, reducing heating of ground surface through solar gains and reflection contributes to a pleasant microclimate for humans and wildlife. Therefore hardscape surfaces on site should be minimized and/or shading needs should be implemented.

Requirements

Option 1

Use any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):

- Provide shade from the existing tree canopy or within 5 years of landscape installation. Landscaping (trees) must be in place at the time of occupancy.
- Provide shade from structures covered by solar panels that produce energy used to offset some nonrenewable resource use.
- Provide shade from architectural devices or structures that have a Solar Reflectance Index (SRI) of at least 29.
- Use hardscape materials with an SRI of at least 29.
- Use an open-grid pavement system (at least 50% pervious).

OR

Option 2

Place a minimum of 50% of parking spaces under cover. Any roof used to shade or cover parking must have an SRI of at least 29, be a vegetated green roof or be covered by solar panels that produce energy used to offset some nonrenewable resource use.

Baseline Reference

The hardscape surface and parking area of the site is the baseline reference. For shading projection June 21 is a standardized reference date for solar direction.

The solar reflectance index (SRI) of materials indicates the capacity of the material surface to reflect heat and light. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

Implementation Time Frame

Implementation of this credit has different stages where implementation must be secured:
1. The Terms of Reference for the Architectural and Site design. For instance whether Solar panels will be used, or that shading will be natural or constructed. Or even minimize the hardscape surface.

2. If no reference is provided, the Architect can secure the credit during the phase design, for landscaping and constructed shading devices. And during the preparation of tendering, by including proper material specifications in the Bidding document and technical specifications.

3. The last ‘time slot’ for implementation is during construction when final material selection is made; samples are approved, then specification needs to be checked (for SRI) and documented.

Team Responsibility

The owner and developer have responsibility for the Terms of Reference for the outdoor space.

The responsibility for implementation lies with the architect and /or landscape designer, to make sure surfaces are shaded and/or light and heat reflecting materials are utilized.

The supervising architect has the responsibility to check the specification when approving material samples on site during construction.

Applicability in Jordan

This credit is applicable for Jordan. Creating shading provides a more pleasant outdoor space and a pleasant outdoor space may attract people to use outdoor spaces, which could lead to decreased indoor cooling demands.

Also car users will benefit from enhanced comfort when their car is parked in the shade. Generally, people prefer shaded parking spots.

The difficulty may be the availability of information on the SRI of materials. In general it is not likely that suppliers are able to provide this information.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: In general this credit needs the attention of the architect; when working on the design. Currently, shaded car ports are common, thus this credit could be achieved easily. A shading device like a trellis with vines is also common in Jordan. Selection of light reflecting materials, for instance in pavement, is also common architectural vernacular. However, proof of reflectivity by specific material qualification like the SRI is uncommon.

- **Ease of Implementation**: Following the current practices this credit is easy to achieve from a design point of view. The difficulty might be the lack of information provided by material suppliers of SRI products for surface finishing. In some case installation of shading devices might affect the construction budget. It is up to the creativity of the architect to find optimal and cost effective solutions.

- **Cost**: The medium ranking for the cost aspect of this credit is related to constructed shading devices, which otherwise would not have been installed. As mentioned under ease of implementation, this part is to be effectively integrated by the architect.
• **Feasibility:** Achieving this credit is feasible, whether it is through shading of hardscape or selecting materials with a low light and heat reflection. This can be fulfilled by attention from the architect and may require some time researching SRI specification.

**Overall Prioritization**

This Credit was given a medium priority due to the climate and conditions in Jordan, where water and energy have a higher priority compared to many other considerations.

**Recommendations to Achieve Credit Intent**

1. **Market**
   Suppliers should provide material characteristics like the Solar Reflectance Index.

2. **Jordan Green Building Council**
   In order to make this credit easier to implement the JordanGBC can raise awareness on SRI and provide relevant information. For instance, JordanGBC can support the development of a database of materials and SRI specifications, or provide reference data in case specific material characteristics are not widely available.

3. **Government**
   - Building and setback regulations should not hinder the implementation of shading devices.
   - At a later stage incentives could be developed to motivate use of certain materials, though this is not the first priority to promote Sustainable Buildings.

2. **Local Rating System**
   Additional options or requirement for Jordan could be the introduce reflection limitations for elevations, especially South and West, like no dark or mirroring materials.

**Conclusion**

This credit to avoid Heat Island Effect (Non Roof) is in general achievable without difficulty, and can be promoted as one of the easier to achieve credits.

**SS Credit 7.2: Heat Island Effect—Roof**

**Intent**

To reduce the impacts on microclimates and human and wildlife habitats heat islands need to be minimized. Heat islands are defined as thermal gradient differences between developed and undeveloped areas.

In other words, to reduce the heating of the built environment through solar gains and reflection. This not only creates but contributes to a pleasant microclimate for humans and wildlife. For the roof surface it means a reduction of heat gain for the building.

**Requirements**

For the roof surfaces, utilize selected materials that reduce the heat reflection and absorption. The credit specifies the criteria related to the Solar Reflectance Index (SRI) and the calculation method. A vegetated roof that covers at least 50% of the roof area applies for this credit. Also a combination of both is possible.

**Baseline Reference**

The surface of the roof, related to its slope is the baseline for this credit.
The solar reflectance index (SRI) of materials indicates the capacity of the material surface to reflect heat and light.

SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

**Implementation Time Frame**

The implementation of this credit has different stages where the implementation must be secured:

1. In the Terms of Reference, for instance to define a Green Roof, the use of the roof and/or the slope of the roof.
2. During the design the materials for the roof are specified (Bidding Documents and Technical Specifications).
3. During construction when final material selection is made, samples are approved, specifications must be checked (for SRI) and documented.

**Team Responsibility**

The Owner or Developer is responsible for the Terms of Reference and can indicate the requirement of a green roof.

The responsibility for implementation lies with the architect and/or landscape designer, to make sure that light and heat reflecting materials and/or green roofs are incorporated in the design.

In case of the application of Green Roof the architect needs to coordinate with the structural designer to make sure the load baring capacity of the roof is suitable for a green roof.

The Supervising Architect is responsible for checking the specifications when approving material samples on site during construction.

**Applicability in Jordan**

This credit is applicable in Jordan. The difficulty may be the availability of information on the SRI of materials. In general it is not likely that suppliers are able to provide this information.

Green roofs are not common in the local market yet. Installation of green roofs requires specific technical detailing and appropriate material selection.

In general roofs in Jordan are designed to carry fill, screed and tiling material loads in addition to heavy water tanks. These loads can be replaced or partially exchanged by green roofs. Structural engineers should be consulted before applying green roof technology to confirm the ultimate carrying capacity of roofs, especially for areas originally designed as inaccessible roofs.

A concern for Jordan, often mentioned in relation to green roofs, is related to water consumption. Therefore it is important to select water efficient plants and shrubs for green roofs that require little to no irrigation after establishment.

**Credit Prioritization**

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:
• **Current Practices:** In general light materials are often used for roofs in Jordan, like the ‘Mosaico’ tiling. Although some green roofs have been installed already in Jordan, green roofs are not yet a common practice.

• **Ease of Implementation:** In terms of design this credit is easy to achieve, the major difficulty may be the lack of information provided by material suppliers regarding the SRI of materials for surface finishing. And installation of a green roof might affect the construction budget.

• **Cost:** Installing a green roof can be a cost influencing factor. However, this is very relative. Compared to an esthetic roof floor finishing, like ceramics tiles or natural stone, a simple green roof is comparable in terms of cost. However when compared to regular screed finishing, a green roof definitely has a higher installation cost per square meter. For simpler ‘Mosaico’ tiling there is no additional cost to meet this credit.

• **Feasibility:** The achievement of this credit is feasible, whether through shading, selecting materials with a low light and heat reflection, or the installation of a green roof.

**Overall Prioritization**

This Credit was given a medium priority due to the existing climate and conditions in Jordan, where water and energy have a higher priority compared to many other considerations.

**Recommendations to Achieve Credit Intent**

1. **Market**
   
   Suppliers need to provide material characteristics like the Solar Reflectance Index. There is an opportunity for the local market to provide custom made/ ‘off the shelf’ green roof packages.

2. **Jordan Green Building Council**
   
   In order to make this credit easier to implement the JordanGBC can raise awareness on SRI and provide information. For instance, JordanGBC can support the development of a database of materials and SRI specifications. Or provide reference data for installation of Green Roofs and applicable plant matching the water scarce conditions of Jordan.

3. **Government**
   
   - Building regulations should not hinder the implementation green roofs.
   - At a later stage incentives could be developed to motivate use of certain materials, though this is not the first priority to promote Sustainable Buildings.

4. **Local Rating System**
   
   Limiting water consumption of plantation on green roofs is recommended.

**Conclusion**

This credit, to avoid Heat Island Effect (Roof), is in general achievable without difficulty and could be promoted as one of the easier to achieve credits.

**SS Credit 8: Light Pollution Reduction**

**Intent**

To minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve nighttime visibility through glare reduction and reduce development impact from lighting on nocturnal environments.
Requirements

For interior lighting the credit specifies two options for interior lighting and one option for exterior lighting.

For each category the applicant must comply with one option to achieve the credit.

For interior lighting the input power (by automatic device) must be reduced for all nonemergency interior luminaires with a direct line of sight to any openings in the envelope (translucent or transparent) by at least 50% between 11 p.m. and 5 a.m.

OR

all openings in the envelope (translucent or transparent), with a direct line of sight to any nonemergency luminaires, must have shielding (controlled/closed by automatic device for a resultant transmittance of less than 10% between 11 p.m. and 5 a.m.).

Exterior Lighting must be limited to requirements for safety and comfort only and according to specified zones as defined in IESNA RP-33.

Baseline Reference

Lighting power densities must not exceed ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) for the classified zone. The exterior lighting control must meet requirements from ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) Exterior Lighting Section, without amendments.

Implementation Time Frame

Implementation of this credit begins with the definition of the Terms of Reference. The implementation is further defined during the architectural, design detailing, and construction drawings stages when lighting fixtures and luminaires are specified. During construction specifications must be checked and documented.

Team Responsibility

The owner (in the definition of the Terms of Reference), architect, electrical engineer, and construction supervisor.

Applicability in Jordan

This credit is applicable in Jordan. The difficulty may be the availability of information on the specification of lighting fixtures and luminaires, though most international brands provide these specifications.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices:** In general the requirements of this credit are not taken in consideration under current practices. It is not common to perform lighting modeling for the night time situation to assess the amount of light that radiates from the building at night.

- **Ease of Implementation:** In terms of design this credit can be achieved, the difficulty may be the lack of information provided by material suppliers on the specific lighting fixture specification. The implementation of an automatic control can complicate the electrical (lighting) design during design stage.
• **Cost:** An automatic control system for lighting installation can affect the construction budget if not considered up front. However, this measure will save on running costs during the operation of the building as all lighting will be shut off at night when light is not needed. This will in turn reduce the electricity bill, so there is a potential payback for this investment. Whether the specification for the lighting fixtures will have an increasing effect on the construction budget has yet to be assessed and the relevant information is not yet available.

• **Feasibility:** Achievement of this credit is feasible, whether through selection of luminaires, application of window shading (to reduce the opaque surface of the building at night), or installation of a building management system that controls lighting after operation hours of the buildings.

**Overall Prioritization**

This credit was given a medium priority as it deals more with light pollution than with the energy savings, which alongside water credits are of higher priority in Jordan.

**Recommendations to Achieve Credit Intent**

1. **Market**
   Provide information on luminaires and lighting fixtures specification and lighting modeling.

2. **Jordan Green Building Council**
   Raise awareness on proper specifications of applicable luminaires and lighting fixtures.

3. **Government**
   At later stage regulation on specification of lighting fixtures. Alternatively incentives could be developed to motivate the use of certain lighting fixtures.

4. **Local Rating System**
   No specific additional requirements.

**Conclusion**

In general this credit is relevant and achievable in Jordan.
WATER EFFICIENCY
WATER EFFICIENCY
Introduction

The issue of water efficiency is of utmost importance for a country like Jordan, which is widely acknowledged as among the most water-poor countries globally. Almost 75% of Jordan’s land area is considered to be within a desert or semi-arid region, where the average annual precipitation is less than 50 mm annually. In addition, recent studies have examined the linkages between climate change and adverse impacts on temperature/precipitation in Jordan and the region. Jordan lacks any significant surface water bodies, with the Yarmouk and Jordan rivers developing some temporary flows in response to sporadic rainfall events.

With these limited water resources, the Government of Jordan has set forth a National Strategy (Jordan’s Water Strategy 2008 – 2022, Water for Life) which sets strategies for improved use of resources, implementation of water demand management schemes and introduction of conservation techniques including rainwater harvesting and reuse of treated wastewater. The strategy also alludes to some strategic projects in the water sector, aimed at securing this valuable resource to the country’s growing populations. These include the supply of water to Amman by means of a conveyance system from the Disi aquifer, which is under way at the time of preparation of this publication. Another strategic mega-project is the Red-Dead canal, which aims at providing desalinated water and energy from hydropower.

Nonetheless, the efficient use of water remains a national strategy, with initiatives already being implemented on the ground related to upgrading building and plumbing codes, national awareness campaigns and numerous pilot projects across the kingdom. These include Greywater reuse systems for toilet flushing in hotels and other high-volume consumers, rainwater harvesting, the prevalence of water-saving fixtures and Greywater/wastewater treatment and reuse schemes. The LEED approach to Water Efficiency and the analysis presented below as part of the Gap Analysis exercise are both in line with Jordan’s commitment and strategy to improving water efficiency nationally.

Executive Summary

As identified by the USGBC, the Water Efficiency component of the LEED rating system has the main objective to “reduce the amount of potable water consumed in buildings.” This section presents the prerequisites and credits for achieving this target, with an analysis of suitable approaches in the Jordanian context.

Since Jordan is a water scarce country and potable water is the highest ranking priority; the Water Efficiency chapter was given the highest priority compared to other chapters. Generally speaking, the majority of the credits and prerequisite are applicable for implementation in the local Jordanian context. However, some adaptations to the local set-up have been incorporated.

The credits which are applicable:

- WE Prerequisite: Water use reduction achieves 20% reduction (plumbing fixtures) excluding irrigation:
  - WE Credit 2.1: Innovative wastewater technologies.
  - WE Credit 3: Further water use reduction (30%, 35% and 40%).

The credits which are applicable with difficulty are:

- WE Credit 1: Water efficient landscaping does not sufficiently address the critical water situation in Jordan. Therefore, recommendations for amending this credit have been put forth. It is recommended to modify the intent as follows: eliminate the use of potable water for landscape irrigation except in the first year of establishment.

- WE Credit 2.2: Innovative wastewater technologies (treat 50% of wastewater on-site to tertiary standards) is difficult to achieve because lack of common, affordable (practical) water recycling systems.

The two options were merged into one. This modification moved this credit to the achievable category.

Re-weighting of points is recommended for the following credits:

- WE Credit 1: Water efficient landscaping, the two options were merged into one and the total points allocated for this credit become (6) instead of (4).
• WE Credit 2: Innovative wastewater technologies, additional (3) points were given. The total number of points becomes (5).

Potable Water is scarce in Jordan and should be protected by preventing waste and avoiding using water for landscape irrigation. Reclaimed wastewater can be used as an alternative source for landscape irrigation and other outdoor water use. The process water use reduction credit is recommended to be applied in all types of buildings (existing and new construction).

The role that the JordanGBC could play relate to the Water Efficiency credits are:

1. **Awareness for professionals and practitioners (engineers, landscape designers, contractors, suppliers, plumbers, households, schools, etc) on the subjects of:**
   - Water saving devices and efficient plumbing fixtures.
   - Efficient water using appliances (Clothes washers, dishwashers, food equipment).
   - Water recycling and grey water reuse.
   - Rainwater harvesting for outdoor use.
   - Water-wise landscaping principles.
   - Water saving provisions in the plumbing code.

2. **Lobbying the government and local municipalities and other related government entities to:**
   - Enforce plumbing codes.
   - Develop labeling programs for water saving appliances and fixtures.
   - Waive customs and taxes on water saving devices and greywater treatment systems.

**WE Prerequisite 1: Water Use Reduction**

**Intent**

Increase water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

**Requirements**

Employ strategies that in aggregate use 20% less water than the water use baseline calculated for building (not including irrigation).

**Baseline Reference**

The Energy Policy Act (EPAct) of 1992 (and as amended): This act addresses energy and water use in commercial, institutional, and residential facilities.


UPC defines water-conserving fixtures and fitting for water closets, urinals and metered faucets. This ANSI-accredited code safeguards life, health, property and public welfare by regulating and controlling the design, construction, installation, materials, location, operation and maintenance or use of plumbing systems.


IPC defines maximum flow rates and consumption for plumbing fixtures and fittings, including public and private lavatories, showerheads, sink faucets, urinals and water closets.
Implementation Time Frame

During the predesign, setting water goals and strategy involves the owner, architect, and engineers. Identify local water utilities and governing authorities and research codes and applicable water laws.

During design development, the engineering team should develop and design water reuse and treatment systems, perform preliminary calculations, and confirm or reassess water use reduction objectives.

During construction, the design team and owner should confirm proper selection, installation, and operation of water fixtures, fittings, and systems.

Team Responsibility

Architect, mechanical engineer, civil engineer, owner, contractor, and operation & maintenance (O&M) team.

Applicability in Jordan

This prerequisite is particularly applicable to the Jordanian context, given the country’s overall water scarcity, the relatively low cost of adopting water saving fixtures and the ease of implementation. This intervention is already being implemented in many projects in Jordan.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: There is growing awareness of the effectiveness of onsite water recycling and water efficient landscaping, which are considered investments with reasonable payback periods that reap immediate benefits in terms of reducing water consumption. Thus, these measures are becoming more widely adopted, particularly with greater market availability. In addition, to increasing awareness, national strategies by Ministry of Water and Irrigation, such as, the Water Demand Management Policy, also support these measures. Greywater systems are not commonly implemented and relatively expensive taking into consideration the subsidized price of water in Jordan.

- **Ease of Implementation**: These practices are considered easy to implement. For example water saving fixtures are available in the Jordanian market for a number years. They are easy to install and maintain with a short pay pack period.

- **Cost**: Water efficient fixtures are considered relatively low cost, compared to a project’s overall budget. Water fixtures with aerators or water saving devices can be purchased from hardware and plumbing stores very inexpensively (less than 3 JD’s per piece).

- **Feasibility**: Implementation of this credit is feasible. Implementation of water efficient fixtures is considered a feasible intervention.

Overall Prioritization

Based on the above mentioned analysis and considering the critical nature of Jordan’s water supply, this prerequisite was given a high priority.
Recommendations to Achieve Prerequisite Intent

In order to facilitate the implementation of this prerequisite and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. Market
   Some efficient plumbing fixtures are available in the market, however in order for more market options to become available; the government should waive customs and taxes over these devices. Partnerships between vendors and water utilities will encourage the distribution of water saving kits to the subscribers (end-users).

2. Jordan Green Building Council
   • Awareness programs to promote efficient plumbing fixtures and use of non-potable water sources.
   • Public awareness, seminars about Jordan’s water scarcity situation.
   • Lobby government and municipalities to establish a regulatory framework.

3. Government
   • Remove-reduce customs and taxes on efficient plumbing fixtures.
   • Provide regulatory framework, plumbing code enforcement.

4. Local Rating System
   Keep prerequisite requirements with the above mentioned baselines standards.

Conclusion

Given the pressing challenges faced by Jordan’s water sector, national level water saving measures are critical, particularly when it comes to measures with reasonable or low payback periods. The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are considerable environmental, social, and economic benefits to water saving measures.

WE Credit 1: Water Efficient Landscaping

Intent

To eliminate the use of potable water or other natural surface or subsurface water resources available on or near the project site for landscaping irrigation.

Requirements

No potable water use for irrigation (except the first year of establishment).

Baseline Reference

No baseline reference is available for this credit. Using potable water for irrigation is prohibited.

Implementation Time Frame

During the design stage, water-efficient landscaping varies with the site and region. Design landscaping with climate-tolerant plants that can survive on natural rainfall quantities after initial establishment. Contour the land to direct rainwater runoff through the site to give vegetation an additional water supply. Minimize the amount of site area covered with turf, and use techniques such as mulching, alternative mowing and composting to maintain plant health. These practices conserve water and help foster optimal soil conditions.
Team Responsibility

Early in the design process, the landscape designer should determine the most appropriate use of native vegetation and efficient technology for the project site. Include the building owner, architect, civil engineer, and mechanical engineer in evaluating the feasibility of using non-potable water for irrigation.

Applicability in Jordan

With an integrated design approach to the project from early concept stages, this credit is easy to implement on the building level. However, due to the lack of proper infrastructure and market demand on a national level, on-site wastewater treatment units make it difficult to implement; however, water efficient landscaping is practiced in Jordan and applicable to use.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices:** There is growing awareness of the effectiveness of onsite water recycling and water efficient landscaping, which are considered investments with reasonable payback periods that reap immediate benefits in terms of reducing water consumption. Thus, these measures are becoming more widely adopted, particularly with greater market availability. In additional to increasing awareness, national strategies such as the Ministry of Water and Irrigation (MWI)’s Water Demand Management (WDM) Policy supports these measures. Greywater systems are not as common and also relatively expensive taking in consideration the subsidized price of water in Jordan.

- **Ease of Implementation:** Implementation of this credit is not easy but also not too difficult with proper consideration and attention to credit requirements during early design stages to provide proper space within buildings to separate the water plumbing system and collect recyclable water and install recycling (treatment) unit.

- **Cost:** To reduce the length of the payback period for this credit, this intervention should be considered early in the design process, where provisions can be made for the required space and in the design of the building’s systems. This will have a moderate impact on the initial cost. This credit may become even more feasible in the future when considering that water saving technologies are likely to become more cost effective as a result of reduced water subsidies.

- **Feasibility:** Implementation of this credit is medium if we consider water efficient landscaping principles.

Overall Prioritization

Based on the above mentioned analysis and the critical situation of water resources in Jordan, this credit was given a high priority.

Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:
1. Market
Increase demand through market transformation and providing competitiveness for water efficient landscaping design and wastewater/greywater treatment plants.

2. Jordan Green Building Council
- Awareness programs to encourage water recycling among members and community at large hence increasing demand in the market.
- Provide training courses on water efficient landscaping for landscape designers and other stakeholders.
- Provide opportunities for public-private partnerships in this sector.
- Lobby government and municipalities to establish a regulatory framework.

3. Government
- Enhance wastewater recycling infrastructure for various products by offering incentives for implementing water recycling.
- Adopt regulations which mandate using onsite wastewater/greywater treatment plants.
- Collaborate with the private sector to upgrade the capacity and knowledge of public sector in this field through training and awareness programs.

4. Local Rating System
WE Credit 1.1 and 1.2 in the LEED rating system were merged into one credit and the total points allocated for this credit become (6) instead of (4).

Conclusion
Generally speaking, this credit is applicable in Jordan, and in order to encourage the habit of water savings and wastewater/grey water recycling among building occupants and users it is important that all stakeholders exert efforts to encourage the advancement of the water management and wastewater recycling in Jordan. There are medium cost implications at the building level, which should be an opportunity for designers and architects to build on in order to include wastewater/grey water recycling as an integral part of the design and building program, which in turn, should be coupled with proper awareness and education for building users in its post occupancy stages.

WE Credit 2.1: Innovative Wastewater Technologies

Intent
To reduce wastewater generation and potable water demand while increasing the local aquifer recharge.

Requirements
Reduce potable water use for building sewage conveyance by 50% through the use of water-conserving fixtures (e.g dual-flush toilets, urinals) or non-potable water (e.g captured rainwater, recycled Greywater, on-site or municipally treated wastewater).

Baseline Reference
- UPC defines water-conserving fixtures and fitting for water closets, urinals and metered faucets. This ANSI-accredited code safeguards life, health, property and public welfare by regulating and controlling the design, construction, installation, materials, location, operation and maintenance or use of plumbing systems.

- IPC defines maximum flow rates and consumption for plumbing fixtures and fittings, including public and private lavatories, showerheads, sink faucets, urinals, and water closets.

**Implementation Time Frame**

During the predesign, setting water goals and strategy involves the owner, architect, and engineers. This is the time to obtain and study weather data (e.g., annual precipitation and patterns), identify local utilities, research applicable codes and laws, and study relevant permitting processes.

During the schematic design stage mechanical and civil engineers can establish the water budget and demands, and assess alternative water supplies like rainwater, stormwater, treated/untreated greywater, and treated blackwater.

During design development, the engineering team should develop and design water reuse and treatment systems, calculating impacts of introducing water saving fixtures on the overall water demand for the project and overall wastewater production. In construction documents, the architects, working with the owners, should specify suitable systems/fixtures and complete any calculations and documentation.

During construction, the design team and owner should confirm proper selection, installation and operation of water fixtures, fittings, and systems.

**Team Responsibility**

Architect, mechanical engineer, civil engineer, owner, contractor, and operation and maintenance (O&M) team.

**Applicability in Jordan**

This credit is particularly applicable in Jordan, given the country’s overall water scarcity, the relatively low cost of implementing water saving fixtures and the ease of implementation. This intervention is already being adopted in some projects in Jordan.

**Credit Prioritization**

This credit was evaluated based on a number of criteria in order to be assessed on a priority scale. The table below illustrates the priority evaluation criteria:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Easy</td>
<td>Low</td>
<td>Feasible</td>
</tr>
<tr>
<td>Partially Done</td>
<td>Med</td>
<td>Med</td>
<td>Med</td>
</tr>
<tr>
<td>Not Done</td>
<td>Hard</td>
<td>High</td>
<td>Not Feasible</td>
</tr>
</tbody>
</table>

- **Current Practices**: There is growing awareness of the effectiveness of onsite water recycling and water efficient landscaping, which are considered investments with reasonable payback periods that reap immediate benefits in terms of reducing water consumption. Thus, these measures are becoming more widely adopted, particularly with greater market availability. In addition to increasing awareness, national strategies such as the Ministry of Water and Irrigation (MWI)’s Water Demand Management (WDM) Policy supports these measures. Greywater systems are not as common and also relatively expensive taking in consideration the subsidized price of water in Jordan.

- **Ease of Implementation**: These measures are considered moderately easy to implement. For example, water saving fixtures and rainwater harvesting systems have been common practice in Jordan for a number of years. Other systems like greywater capture, treatment and recycling systems are not as commonly available at reasonable prices and require more advanced technical knowledge for design, installation, and operation & maintenance.

- **Cost**: Water efficient fixtures are considered relatively low cost, compared to a project’s overall budget. Other interventions like greywater capture and recycling may still be considered prohibitively expensive.
• **Feasibility**: Implementation of this credit is medium. Implementation of water efficient fixtures is considered a feasible intervention, while introduction of more “high-tech” systems may not be as feasible.

**Overall Prioritization**

Based on the above mentioned analysis, this credit was given a high priority, considering the critical nature of Jordan’s water supply.

**Recommendations to Achieve Credit Intent**

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   - Some efficient plumbing fixtures are available in the market, however, there is a need for the design of rainwater harvesting and greywater capture/recycling systems that are affordable and suitable for the Jordanian market.

2. **Jordan Green Building Council**
   - Awareness programs to promote efficient plumbing fixtures and use of non-potable water sources.
   - Public awareness seminars about Jordan’s water scarcity situation.
   - Lobby government and municipalities to establish a regulatory framework.

3. **Government**
   - Remove-reduce customs and taxes on efficient plumbing fixtures.
   - Provide regulatory framework to regulate the use of recycling units.

4. **Local Rating System**
   - Keep credit requirements, and weight was increased with additional (5) points.

**Conclusion**

Given the pressing challenges faced by Jordan’s water sector, national level water saving measures are critical, particularly when it comes to measures with reasonable or low payback periods. The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are considerable environmental, social, and economic benefits to water saving measures.

**WE Credit 2.2: Innovative Wastewater Technologies**

**Intent**

To reduce wastewater generation and potable water demand while increasing the local aquifer recharge.

**Requirements**

Treat 50% of wastewater on-site to tertiary standards. Treated water must be infiltrated or used on-site.

**Baseline Reference**

- The Energy Policy Act (EPAct) of 1992 (and as amended): This act addresses energy and water use in commercial, institutional, and residential facilities.
- UPC defines water-conserving fixtures and fitting for water closets, urinals and metered faucets. This ANSI-accredited code safeguards life, health, property and public welfare by regulating and controlling the design, construction, installation, materials, location, operation and maintenance or use of plumbing systems.

• IPC defines maximum flow rates and consumption for plumbing fixtures and fittings, including public and private lavatories, showerheads, sink faucets, urinals and water closets.

Implementation Time Frame

During the pre-design, setting water goals and strategy involves the owner, architect, and engineers. This is the time to obtain and study weather data (e.g. annual precipitation and patterns), identify local utilities, research applicable codes and laws, and study relevant permitting processes.

During the schematic design stage mechanical and civil engineers can establish the water budget and demands, and assess alternative water supplies like rainwater, stormwater, treated/untreated greywater, and treated blackwater.

During design development, the engineering team should develop and design water reuse and treatment systems, calculating impacts of introducing water saving fixtures on the overall water demand for the project and overall wastewater production. In construction documents, the architects, working with the owners, should specify suitable systems/fixtures and complete any calculations and documentation.

During construction, the design team and owner should confirm proper selection, installation and operation of water fixtures, fittings, and systems.

Team Responsibility

Architect, mechanical engineer, civil engineer, owner, contractor, operation and maintenance (O&M) team.

Applicability in Jordan

This credit is applicable in terms of being a water saving measure, which is needed in a water scarce country like Jordan. However, the lack of affordable options and the novelty of the concept prevent such strategies from receiving wider acceptance at the current time.

Credit Prioritization

This credit was evaluated based on a number of criteria in order to be assessed on a priority scale. The table below illustrates the priority evaluation criteria:

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• **Current Practices**: On-site treatment and reuse of wastewater on site is not commonly practiced in Jordan, though there are some examples of on-site greywater treatment in rural areas. Larger developments are also opting for their own decentralized treatment and reuse schemes.

• **Ease of Implementation**: These measures are difficult to implement, due to the lack of affordable options and lack of awareness of such systems.

• **Cost**: These measures are relatively high cost with long payback periods.

• **Feasibility**: Implementation of this credit is not feasible.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority, considering the critical nature of Jordan’s water scarcity and the potential to overcome some of the difficulties presented above through concerted efforts of stakeholders.
Recommendations to Achieve Credit Intent

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   The market is in need of Greywater/wastewater capture/recycling systems that are affordable and suitable for the Jordanian market.

2. **Jordan Green Building Council**
   - Promote greywater systems at low cost with conventional methods for rural areas.
   - Public awareness, seminars about Jordan’s water scarcity situation.
   - Lobby government and municipalities to establish a regulatory framework.

3. **Government**
   - Remove-reduce customs and taxes on greywater/wastewater recycling systems and rainwater harvesting systems.
   - Provide regulatory framework.

4. **Local Rating System**
   Keep credit requirements, and weight was increased with additional (5) points.

Conclusion

Given the pressing challenges faced by Jordan’s water sector, national level water saving measures are critical, particularly when it comes to measures with reasonable or low payback periods. The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are considerable environmental, social, and economic benefits to water saving measures. Tertiary treatment and on-site reuse/infiltration of wastewater are not currently common practice in Jordan. Nonetheless, water saving measures in any form are needed, however developments in technology, quality assurance and increased awareness are needed to mainstream such approaches.

**WE Credit 3: Water Use Reduction**

**Intent**

To further increase water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

**Requirements**

Employ strategies that in aggregate use 30, 35 and 45% less water than the water use baseline calculated for building (not including irrigation).

**Baseline Reference**

The Energy Policy Act (EPAct) of 1992 (and as amended): This act addresses energy and water use in commercial, institutional, and residential facilities.


UPC defines water-conserving fixtures and fitting for water closets, urinals and metered faucets. This ANSI-accredited code safeguards life, health, property and public welfare by regulating and controlling the design, construction, installation, materials, location, operation and maintenance or use of plumbing systems.


IPC defines maximum flow rates and consumption for plumbing fixtures and fittings, including public and private lavatories, showerheads, sink faucets, urinals and water closets.

Implementation Time Frame

During the predesign stage of any building, setting water goals and strategy involves the owner, architect, and engineers. Identify local water utilities and governing authorities and research codes and applicable water laws.

During design development, the engineering team should develop and design water reuse and treatment systems, perform preliminary calculations, and confirm or reassess water goals. Governmental approvals should only be issued according to designs that incorporate water efficiency measures.

During construction, the construction team and owner should confirm proper selection, installation, and operation of water fixtures, fittings, and systems. The government should implement Quality Assurance regulations/bylaw regarding codes and technical regulations.

Team Responsibility

Architect, mechanical engineer, civil engineer, owner, plumbing fixtures and fittings suppliers (for the selection of suitable fixtures and systems, the owner should collaborate with the architect and design engineer), contractor and O&M team.

Applicability in Jordan

This credit is particularly applicable in Jordan, given the country’s overall water scarcity, the relatively low cost of implementing water saving fixtures and the ease of implementation. This intervention is already being adopted in some projects in Jordan.

Credit Prioritization

This credit was evaluated based on a number of criteria in order to be assessed on a priority scale. The table below illustrates the priority evaluation criteria:

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</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
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</tbody>
</table>

- **Current Practices:** There is growing awareness of the effectiveness of onsite water recycling and water efficient landscaping, which are considered investments with reasonable payback periods that reap immediate benefits in terms of reducing water consumption. Thus, these measures are becoming more widely adopted, particularly with greater market availability. In addition to increasing awareness, national strategies such as the Ministry of Water and Irrigation (MWI)’s Water Demand Management (WDM) Policy supports these measures. Greywater systems are not as common and relatively expensive taking in consideration the subsidized price of water in Jordan. There is a rainwater harvesting chapter in the new Jordanian plumbing code as an alternative water source which demonstrates the idea is gaining momentum. Many retrofitting programs had been implemented in residential areas in Jordan.
• **Ease of Implementation:** These practices are considered easy to implement. For example water saving fixtures has been common in the Jordanian market for number years. They are easy to install and maintain with a short payback period.

• **Cost:** Water supply fittings are considered relatively low cost, compared to a project’s overall budget. Water saving devices can be installed by home owners or maintenance teams without training.

• **Feasibility:** Implementation of this credit is feasible. Water audit studies on different water using sectors in Jordan show a payback period of few months for adopting water saving devices which opens an avenue for significant savings.

**Overall Prioritization**

Based on the above mentioned analysis, this credit (2-4 pts.) was given a “high” priority, considering the critical nature of Jordan’s water supply.

**Recommendations to Achieve Credit Intent**

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**

   Some efficient plumbing fixtures are available in the market, however in order for more market options to become available; the government should waive customs and taxes on these devices. Partnerships between vendors and water utilities will encourage the distribution of water saving kits to the subscribers (end-users).

2. **Jordan Green Building Council**

   • Awareness programs to promote efficient plumbing fixtures and use of non-potable water sources.
   • Awareness programs for importers and local manufactures of water using equipment/appliances (clothing washers, dish washers, ice makers, etc) industries.
   • Public awareness, seminars about Jordan’s water scarcity situation.
   • Lobby government and municipalities to establish a regulatory framework and enforcement mechanism of codes and regulations.

3. **Government**

   • Remove-reduce customs and taxes on efficient plumbing fixtures and fittings.
   • Provide regulatory framework and enforcement mechanism of water supply and sanitation plumbing codes, in addition to technical regulations and standards for plumbing supply fittings and fixtures, water using equipment, and water saving devices.
   • Enforce the new quality assurance regulations/bylaws issued by the Ministry of Public Works and Housing.
   • Develop and implement a labeling standard on water using equipment regarding energy and water consumption.
   • Continue working on monitoring local market suppliers and imported water efficient fittings, fixtures, and water using equipments/appliances.

4. **Local Rating System**

   Maintain credit system with the above mentioned baselines standards. Weight was increased with additional (5) points.

**Conclusion**

Given the pressing challenges faced by Jordan’s water sector, national level water saving measures are critical, particularly when it comes to measures with reasonable or low payback periods. The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are considerable environmental, social, and economic benefits to water saving measures.

1 Source: the Ministry of Energy and Mineral Resources figures 2008
ENERGY & ATMOSPHERE
Introduction

Jordan is an energy impoverished country and the Kingdom imports approximately 96% of its energy resources from abroad to meet its oil, natural gas, and electricity needs. This poses a significant burden on the national economy and the internal stability of various sectors.

Jordan suffers from high energy prices and supply uncertainty and the government has pledged to develop its own domestic energy sources. Nuclear power, oil shale, natural gas, renewable energy, and energy efficiency projects are under consideration but until these programs move forward Jordan continues to depend on the fossil fuels (oil & gas) to cover its needs.

In 2008, Jordan imported 7,287,000 ton oil equivalent, while energy generation from the locally available resources was 281,0001 ton oil equivalent mainly from the natural gas and renewable energy.

The transportation sector is the major energy consumer in Jordan accounting for approximately 38% of the consumed energy. The industrial sector is second consuming approximately 23%, followed by the residential sector which consumes approximately 21% of the total energy in Jordan.

In terms of electricity, Jordan depends mainly on natural gas which contributes to around 70% of total electricity production. Heavy fuel oil and diesel are still utilized in some electrical power plants.

The residential sector in Jordan is the greatest electricity consumer, accounting for about 39% of the total consumed electricity. The industrial sector consumes about 27% and the commercial and water pumping sectors consume 17% and 15% respectively.

Distilling the figures above we find that buildings in Jordan consume approximately 56% of the total electricity country wide.

Green buildings address energy savings in two approaches; firstly they reduce the amount of energy required for building operations and secondly they utilize more benign forms of energy.

The better the energy performance of a building, the fewer greenhouse gases are emitted from energy production. Electricity generation from sources other than fossil fuels further reduces the environmental impacts from a building’s energy use. Additionally, improved energy performance results in lower operating costs. As global competition for fuel accelerates, the rate of return on energy efficiency measures will rise.

Executive Summary

Prerequisites and credits for energy and atmosphere section were given a priority scale based on different perspective evaluation, therefore most were maintained and some were re-weighted.

Green power credit was frozen due to the absence of green power resources in Jordan and the limited environmental benefits in the region in case of purchasing NEC certificate.

EA credit 1 and EA credit 2 were re-weighted and given less points which were allocated to the water efficiency section of the local rating system to encourage great water savings.

**EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems.**

**Intent**

To verify that the project’s energy-related systems are installed, calibrated, and perform according to the owner’s project requirements, basis of design and construction documents. Benefits of commissioning include reduced energy use, lower operating costs, reduced contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner’s project requirements.
Requirements

The following commissioning process activities must be completed by the project team:

1. Designate an individual as the Commissioning Authority (CxA) to lead, review, and oversee the completion of the commissioning process activities.
2. The CxA must have documented commissioning authority experience in at least two building projects.
3. The individual serving as the CxA must be independent of the project’s design and construction management, though the CxA may be an employee of any firms providing these services. The CxA may be a qualified employee or consultant of the owner.
4. The CxA must report results, findings, and recommendations directly to the owner.
5. For projects smaller than 5,000 gross square meters, the CxA may be a qualified person on the design or construction teams who has the required experience.
6. The owner must document the owner’s project requirements. The design team must develop the basis of design. The CxA must review these documents for clarity and completeness. The owner and design team must be responsible for updates to their respective documents.
7. Develop and incorporate commissioning requirements into construction documents.
8. Develop and implement a commissioning plan.
9. Verify the installation and performance of the systems to be commissioned.
10. Complete a summary commissioning report.

Commissioned Systems:

Commissioning process activities must be completed for the following energy-related systems, at a minimum:

1. Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls.
2. Lighting and day lighting controls.
3. Domestic hot water systems.
4. Renewable energy systems (e.g. wind, solar).

Baseline Reference

No Baseline Reference is available for this pre-requisite.

Implementation Time Frame

Implementation of this prerequisite should begin at the pre-design stage and continue over the life of the design and construction phases with different levels of involvement from the CxA. It is the responsibility of the project owner to assign the CxA at the pre-design stage to facilitate the design and construction process and avoid any possible delay that may occur due to the late involvement of the commissioning agent.

Applicability in Jordan

The credit requirements relate to the engineering process for testing, commissioning, and documentation of outcomes to ensure that energy consuming systems are installed, commissioned, and operated according to project owner requirements and in compliance with engineering disciplines. Some of the required activities are not currently implemented in Jordan; however with specialized training for the project team, the credit could be implemented easily. Therefore the analysis showed that this credit is applicable to Jordan.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:
• **Current Practices:** Current construction activity practices in Jordan involve some of the related activities for this prerequisite but the practices lack proper documentation.

• **Ease of Implementation:** Implementation of this prerequisite requires training for project stakeholders, primarily the design and construction team. Since there are some new concepts that should be implemented and managed well between all the project stakeholders and the project owner, this prerequisite was given a medium scale on the ease of implementation.

• **Cost:** Implementation of this prerequisite requires the assignment of a commissioning agent to conduct various activities over the life of the project which poses an additional cost to the project. Based on the conducted cost analysis, this prerequisite was given a medium scale on the cost evaluation.

• **Feasibility:** Implementation of this prerequisite is medium.

**Overall Prioritization**

Based on the above mentioned analysis, this prerequisite was given a medium priority.

**Recommendations to Achieve Prerequisite Intent**

1. **Market**
   The Jordanian market includes all the required instruments and equipments to achieve this prerequisite.

2. **Jordan Green Building Council**
   - Give multi-level training programs for engineers to familiarize them with this prerequisite and its requirements.
   - Train project stakeholders on how to develop the required documents and on implementation of this prerequisite and the benefits and challenges they may face.

3. **Government**
   Does not have a role in facilitating the achievement of this prerequisite.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

**Conclusion**

This prerequisite was found applicable in Jordan. However as it includes some non-traditional engineering over the life of the project, which equate to a marginal extra cost, it should be weighed alongside the significant benefits gained upon the implementation of this prerequisite, which include more reliable electromechanical systems, more comfort for building occupants, and fewer call backs for the contractor.

As mentioned before, due to some novel concepts in design and construction disciplines, engineers in Jordan should be trained more about the best approaches to facilitate and implement the prerequisite requirements. JordanGBC should consider multi-level training programs for engineers to familiarize them with this prerequisite and its requirements.

**EA Prerequisite 2: Minimum Energy Performance**

**Intent**

To establish the minimum level of energy efficiency for the proposed building and systems to reduce environmental and economic impacts associated with excessive energy use.

**Requirements**

Demonstrate a 10% improvement in the proposed building performance rating for new buildings compared to baseline energy consumption.
Calculate the baseline building performance rating according to the building performance rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project.

**Baseline Reference**

The reference codes of this prerequisite in Jordan are the thermal insulation code and the energy efficient building code; the gap analysis showed that the local codes were less stringent than the American standards (ASHRAE 90.1-2007).

**Implementation Time frame**

The requirements of this prerequisite should be addressed at early stages of the building design and should be updated throughout the design stage.

**Team Responsibility**

The project owner should address energy efficiency issues before starting the design process, however; it is the responsibility of the electrical & mechanical engineers and the architect to implement the prerequisite strategies.

**Applicability in Jordan**

The intent of this prerequisite could be easily implemented in Jordan to maximize energy savings, however special considerations should be addressed for economic feasibility issues and return on investment.

**Prerequisite Prioritization**

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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</table>

- **Current Practices**: Current building design practices in Jordan involve some of the strategies related to this prerequisite.
- **Ease of Implementation**: Implementation of this prerequisite is easy and does not require special expertise.
- **Cost**: Implementation of this prerequisite requires installing high efficiency energy consuming systems, generally the cost of these systems is higher than traditional systems. Cost implications are negligible for some issues, slightly higher for others, and some systems are remarkably higher than traditional systems. Considering the wide range of cost considerations, the project owner and design team are encouraged to consider reasonable cost strategies to achieve this prerequisite and study the economic feasibility for each strategy for each project taking into consideration the variation and customization for each project.
- **Feasibility**: Implementation of this prerequisite is feasible with a return on investment ranging from a few days all the way up to three years. There are certain strategies in which the payback period is beyond the three year mark, but in general the design team is encouraged to consider options that do not exceed this three year mark.

**Overall Prioritization**

Based on the above mentioned analysis, this prerequisite was given a high priority.
Recommendations to Achieve Prerequisite Intent

1. **Market**
   The Jordanian market includes many high efficiency energy consuming systems which vary according to cost and quality. Given the fact the some suppliers do not have technical knowledge and experience in their products, the Committee highly recommends providing capacity building and training for suppliers and contractors to familiarize them with the technical details about the products they supply.

2. **Jordan Green Building Council**
   JordanGBC, in addition to relevant NGOs, has a vital role in the abovementioned chain by providing training courses for suppliers to improve technical knowledge of energy efficient products and systems. Similarly, household consumers in Jordan (which are the major energy consumer in the Kingdom) are in the same position as suppliers, regarding technical knowledge of products. Therefore other awareness sessions and workshops targeting households should be implemented by JordanGBC and other relevant NGOs.

3. **Government**
   The government has a fundamental role in following up the implementation of this prerequisite and to ensure and enforce the consultants and contractors to abide by the design and this prerequisite requirement.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

**Conclusion**

This prerequisite was found applicable in Jordan. One of the major challenges for implementing the strategies related to this credit is the extra cost of high performance energy systems.

Despite the fact that cost implications are higher compared to traditional systems, the return on investment (payback period) ranges from just a few days to three years which is very encouraging.

Many high performance energy products are available in the market, but few suppliers have professional knowledge of and experience with their products. The same applies to many of households in Jordan. Therefore, training workshops and seminars in order to build consumer capacity should be considered in the implementation of this prerequisite.

**EA Prerequisite 3: Fundamental Refrigerant Management**

**Intent**
To reduce stratospheric ozone depletion.

**Requirements**
Zero use of Chlorofluorocarbon (CFC)-based refrigerants in new base building heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems.

**Baseline Reference**
No baseline standard is available for this prerequisite.

**Implementation Time Frame**

The requirements of this prerequisite should be addressed at the design stage to avoid using a CFC based refrigerants in the building.
Team Responsibility

The mechanical engineer should consider the requirements of this prerequisite in the design and selection of the HVAC&R systems.

Applicability in Jordan

This prerequisite is easily achievable in Jordan as most HVAC&R systems are CFC free. Moreover, the government of Jordan, through the Ministry of Environment, issued regulations on avoiding CFC based refrigerants in the HVAC&R systems. Furthermore the government plans to phase out CFC based refrigerants under a five year plan.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
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<tr>
<td>Already Done</td>
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- **Current Practices**: Current practices showed that CFC free HVAC&R systems are widely used and to a great extent, buildings in Jordan are designed and supplied with CFC free HVAC&R systems.
- **Ease of Implementation**: Implementation of CFC free HVAC&R systems is easy.
- **Cost**: The cost of the CFC free HVAC&R systems are almost the same as CFC based systems. The cost implications of this prerequisite are negligible.
- **Feasibility**: Implementation of this prerequisite is not associated with extra costs, and environmental benefits due to zero use of CFC based refrigerants are encouraging. Accordingly, this prerequisite was given a high grade on the feasibility scale.

Overall Prioritization

Based on the above mentioned analysis, this prerequisite was given a high priority.

Recommendations to Achieve Prerequisite Intent

1. **Market**
   The market has followed the lead of various governing bodies that have regulated or outlawed CFC based refrigerants. Non-CFC based systems are widely available in the market.

2. **Jordan Green Building Council**
   Support for completely phasing out CFC based systems in Jordan through advocacy and awareness.

3. **Government**
   Support for completely phasing out CFC based systems in Jordan.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

Conclusion

This prerequisite was found applicable in Jordan. The cost of the CFC free HVAC systems are the same compared to CFC based refrigerants.
**EA Credit 1: Optimize Energy Performance**

**Intent**

To achieve increasing levels of energy performance beyond the prerequisite EA Prerequisite 1 standard to reduce environmental and economic impacts associated with excessive energy use.

**Requirements**

Demonstrate at a minimum 12% improvement in the proposed building performance rating for new buildings compared the baseline energy consumption.

Calculate the baseline building performance rating according to the building performance rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project.

**Baseline Reference**

The reference codes of this credit in Jordan are mainly the Thermal Insulation Code and the Energy Efficient Building Code; the gap analysis showed that the current local codes were less stringent than the American standards (ASHRAE 90.1-2007).

**Implementation Time Frame**

The requirements of this credit should be addressed at early stages of the building design and should be updated throughout the design stage.

**Team Responsibility**

The project owner should address energy efficiency issues before starting the design process, however; it is the responsibility of the electrical & mechanical engineers, in addition to the architect to implement the credit strategies.

**Applicability in Jordan**

The intent of this credit could be easily implemented in Jordan to maximize energy savings, however special considerations should be addressed regarding economic feasibility and return on investment.

**Credit Prioritization**

This credit was evaluated from different perspectives before giving it a priority scale, the below table illustrates the priority evaluation criteria:

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<th>Current Practices</th>
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- **Current Practices**: Current building design practices in Jordan involve some strategies related to this credit.
- **Ease of Implementation**: Implementation of this credit is easy and does not require special expertise.
- **Cost**: The implementation of this credit requires installing high efficiency energy consuming systems.
The cost of these systems is generally higher than traditional systems, however; incremental levels of savings are associated with incremental costs. While the cost implications are negligible in some cases, the question is whether cost differences are slightly or considerably higher than traditional systems. Accordingly, the project owner and design team are encouraged to set a planned target for energy performance and consider reasonable cost strategies to achieve this credit. Furthermore, the project team should study the economic feasibility for each strategy on a project basis, taking into consideration variation and customization for each project.

- **Feasibility:** Implementation of this credit is feasible with a return on investment ranging from a few days to 3 years. There are certain strategies in which the payback period is beyond the three year mark, but in general the design team is encouraged to consider options that do not exceed this three year mark.

**Overall Prioritization**

Based on the above mentioned analysis, this prerequisite was given a high priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   The Jordanian market includes many high efficiency energy consuming systems which vary according to price and quality.

   Given the fact that some suppliers do not have technical knowledge in and experience with their products, the Committee highly recommends providing capacity building and training for suppliers and contractors to familiarize them with the technical details about the products they supply.

2. **Jordan Green Building Council**

   JordanGBC has a vital role in the abovementioned chain by providing training courses for suppliers to improve their knowledge. Similarly, the residential sector (which is the major energy consumer in the Kingdom) also lack technical knowledge of products. Therefore awareness sessions and workshops targeting households should be considered by JordanGBC, the government of Jordan, and other relevant NGOs.

3. **Government**

   The government has a vital role in following up implementation of this credit to ensure and enforce that consultants and contractors abide by design and the credit requirements.

4. **Local Rating System**

   This credit has the capacity to provide 19 project points under the LEED rating system V3, with an incremental level starting from 12% (1 point) to 48% (19 points), with a step of 1 point for each 2% of extra improvement.

   Due to the cost implications for higher percentages of savings, the Technical Committee decided to reweight this credit and limit the maximum energy savings for projects to 34% with a maximum of 12 points.

   Seven points were allocated under the water efficiency part of the local rating system to encourage greater savings in water.

**Conclusion**

This credit is applicable in Jordan. One of the major challenges for implementing strategies related to this credit is the extra cost of the high performance energy systems.

Despite the fact that cost implications are higher than with traditional systems, the return on investment (pay-back period) which ranges from just a few days to three years is very encouraging.
Many high performance energy products are available in the market, but that few suppliers have the professional knowledge and experience in their products. The same applies to many of the households in Jordan. Therefore, training workshops and seminars in order to build consumer capacity should be considered in the implementation of this credit.

Credit points were reweighted and this credit was given a maximum of 12 points compared to 19 points in the LEED rating system. These seven points were allocated to the water efficiency section to encourage greater water savings.

**EA Credit 2: On-Site Renewable Energy**

**Intent**

To encourage and recognize increasing levels of on-site renewable energy and reduce environmental and economic impacts associated with fossil fuel energy use.

**Requirements**

This credit requires using on-site renewable energy systems which will offset building energy costs. Project performance is calculated by expressing the energy produced by the renewable systems as a percentage of the building annual energy cost.

**Baseline Reference**

The baseline reference for this credit was not available in Jordanian codes, however; as a baseline figure the project might use the energy model to extract the energy consumption which could be covered by the renewable energy systems.

**Implementation Time Frame**

The requirements of this credit should be addressed at the design stage to carefully select technologies used to capture renewable energy.

**Team Responsibility**

According to the selected technology, the mechanical or electrical should consider the requirements of this credit in design.

**Applicability in Jordan**

Jordan is rich with solar and wind energy resources and thereby has great potential for these technologies, therefore this credit is easily achievable.

**Credit Prioritization**

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

The below table and analysis is based only on solar water heaters.

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<tr>
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• **Current Practices:** Solar energy is primarily used for domestic solar water heating. As for other types of renewable energies, a few projects have installed small systems for research and development purposes.

• **Ease of Implementation:** If on-site renewable systems are designed at the design stage and installed and commissioned at the construction stage, then implementation of this credit will be easy.

• **Cost:** The cost of renewable energy systems is generally higher than traditional systems. Solar thermal systems for domestic hot water usage are cost effective and widely utilized. Other systems cost considerably more and the payback period is significant.

• **Feasibility:** This credit was found feasible for domestic water solar heaters only.

**Overall Prioritization**

Based on the above mentioned analysis, this credit was given a high priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   Jordan and the region should focus on increasing renewable energy usage and reduce dependency on the fossil fuel. As mentioned before solar water thermal systems for domestic water purposes are one of the easiest approaches and a good first step.

   Penetration of solar water heaters is limited to middle to high income households and some commercial projects due to the initial capital investment.

2. **Jordan Green Building Council**
   JordanGBC and relevant NGOs have a major role in increasing awareness of households and facilitating penetration of the solar water heaters through incentives or loans.

   Currently, solar water heaters are exempted from customs and taxes, but this is not enough. Other incentive schemes or loans should be considered and evaluated to increase the adoption of renewable energy sources.

3. **Government**
   The government has a vital role in following up the implementation of this credit to ensure and enforce that consultants and contractors begin using renewable energy sources in the projects. A good starting point is using solar water heaters in all new projects which would have a great impact on the energy consumption.

4. **Local rating system**
   This credit has the capacity to provide a project with seven points under the LEED rating system V3 with an incremental level starting from 1% (1 point) to 13% (7 points) with a step of one point for each 2% of incremental improvement.

   Due to the cost implications of achieving higher percentage savings and the need for more renewable energy systems, the Technical Committee reweighted this credit to provide the project 1 point for 1% of renewable energy dependency which could be achieved through the use of solar water heaters.

   The remaining six points were allocated to the water efficiency section of the local rating system to encourage greater water savings.

**Conclusion**

This credit was found applicable in Jordan. One of the major challenges for implementing strategies related to this credit is the extra cost of renewable energy systems.

Despite the fact that cost implications are higher than traditional systems, the return on investment pay-back period for solar water heaters is approximately two to three years which is very encouraging.
Other renewable energy systems have considerable extra costs along with a longer payback period. Therefore, at this stage, JordanGBC decided to focus on increasing solar water heater penetration.

Credit points were reweighted and this credit was given one point compared to seven points in the LEED rating system. The remaining six points were allocated to the water efficiency section to encourage greater water savings.

**EA Credit 3: Enhanced Commissioning of Building Energy Systems**

**Intent**

To begin the commissioning process early in the design process and execute additional activities after systems performance verification is completed.

**Requirements**

Implement, or have a contract in place to implement, the following additional commissioning process activities in addition to the requirements of EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems:

1. Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities.
   - The CxA must have documented commissioning authority experience in at least two building projects.
   - The individual serving as the CxA:
     - Must be independent of the work of design and construction.
     - Must not be an employee of the design firm, though he or she may be contracted through them.
     - Must not be an employee of, or contracted through, a contractor or construction manager holding construction contracts.

2. May be a qualified employee or consultant of the owner.
3. The CxA must conduct, at a minimum, one commissioning design review of the owner’s project requirements basis of design, and design documents prior to the mid-construction documents phase and back-check the review comments in the subsequent design submission.
4. The CxA must review contractor submittals applicable to systems being commissioned for compliance with the owner’s project requirements and basis of design. This review must be concurrent with the review of the architect or engineer of record and submitted to the design team and the owner.
5. The CxA or other project team members must develop a systems manual that provides future operating personnel and building occupants with training. A plan for resolving outstanding commissioning-related issues must be included.
6. The CxA or other project team members must verify that the requirements for training operating personnel and building occupants have been completed.
7. The CxA must be involved in reviewing the operation of the building with operations and maintenance (O&M) staff and occupants within 10 months after substantial completion. A plan for resolving outstanding commissioning-related issues must be included.

**Baseline Reference**

No baseline reference is available for this credit.

**Implementation Time Frame**

The implementation of this credit should be before the start of the project design at the pre-design stage and continue over the life of design and construction phases with different levels of involvement from the CxA. It is the responsibility of the project owner to assign the CxA at the pre-design stage to facilitate the design and construction process in order to avoid delays which could occur due to the late involvement of the Commissioning Agent.
Team Responsibility

1. Project Owner: the project owner should issue the Owner Project Requirement OPR document.
2. Design team (Architect, Mechanical and Electrical Engineers): the design team is responsible for developing the Basis of design BoD Document.
3. Contractor: the contractor is responsible for coordinating with project team and the CxA to implement the credit requirement.

Applicability in Jordan

This credit requirement relates to the engineering process for testing, commissioning, and documenting outcomes to ensure that energy consuming systems are installed, commissioned, and operated according to the owner project requirements and in compliance with engineering disciplines. Currently, most of the required activities are not implemented in Jordan, however with specialized training; the project team could easily implement the credit. Therefore this credit is applicable to Jordan.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Current construction activity practices in Jordan rarely involve the activities of this credit. The resulting energy savings from implementation of this credit is minimal compared to other requirements presented later in this document.
- **Ease of Implementation**: Implementation of this credit requires training for project stakeholders, primarily the design and construction teams. Since there are some novel concepts that must be implemented and managed well between all the project stakeholders and the project owner, the ease of implementation is medium.
- **Cost**: Implementation of this credit requires the assignment of the Commissioning Agent to conduct various activities over the life of the project which poses an additional cost to the project. This credit was given a medium on the cost evaluation scale.
- **Feasibility**: Implementation of this credit is medium.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**

   The Jordanian market includes all the required instruments and equipment to achieve this credit, which is a point of strength toward achieving this credit in green projects. The design and construction team must be trained on using these instruments, the time frame of achievement, documentation, and best practices during the implementation phase.
2. **Jordan Green Building Council**  
   JordanGBC should consider multi-level training programs for engineers to familiarize them with this credit and its requirements.

3. **Government**  
   This will be addressed in future editions of the publication.

4. **Local Rating System**  
   This credit was reweighted to limit the achievable points from 1 point compared 2 points in the LEED rating system.  
   The remaining point was allocated to the water efficiency section of the local rating system to encourage greater water savings.

**Conclusion**

This credit is applicable in Jordan. However this credit includes some non-traditional engineering over the life of the project which is associated with extra costs. There are several benefits associated with the implementation of this credit requirement, such as more reliable systems, more comfort for building occupants, and less call backs for the contractor.

As previously mentioned, due to some novel concepts in the design and construction disciplines, engineers in Jordan should be trained about the best approach to facilitate and implement credit requirements. JordanGBC should consider multi-level training programs for engineers to familiarize them with this credit and its requirements.

**EA Credit 4: Enhanced Refrigerant Management**

**Intent**

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.

**Requirements**

Do not use refrigerants OR Select refrigerants and heating, ventilating, air conditioning and refrigeration (HVAC&R) that minimize or eliminate the emission of compounds that contribute to ozone depletion and global climate change ventilating, air conditioning and refrigeration (HVAC&R) systems.

**Baseline Reference**

No baseline standard was available for this credit.

**Implementation Time Frame**

The requirements of this credit should be addressed at the design stage to carefully select the refrigerants to have low global warming potential and zero ozone depletion potential.

**Team Responsibility**

The mechanical engineer in the project shall consider the requirements of this credit in the design and selection of the HVAC&R systems.

**Applicability in Jordan**

This credit is easily achievable in Jordan as most of the HVAC&R systems are manufactured based on the above
mentioned refrigerants.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Previously mentioned refrigerants are widely used and, to a great extent, all new buildings now are designed and supplied with such refrigerants.
- **Ease of Implementation**: Implementation of the previously mentioned refrigerants is easy.
- **Cost**: The cost of HVAC&R systems with low global warming potential and zero ozone depletion potential is almost the same as other type of refrigerants. The cost implication of this credit is negligible.
- **Feasibility**: Implementation of this credit is not associated with extra costs and the energy consumption improvements from the use of low global warming potential refrigerants are remarkable. Accordingly, this credit was found to be feasible.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a high priority.

Recommendations to Achieve Credit Intent

1. **Market**
   This will be addresses in future editions of the publication.

2. **Jordan Green Building Council**
   This will be addresses in future editions of the publication.

3. **Government**
   This will be addresses in future editions of the publication.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

Conclusion

This credit is applicable in Jordan and in large part the requirements are already common practice. The cost of CFC-free and low global warming potential refrigerants in HVAC systems are comparable in terms of availability and price compared to other refrigerants.

**EA Credit 5: Measurement and Verification**

**Intent**

To provide for the ongoing accountability of building energy consumption over time.
Requirements

This credit is achieved by developing and implementing a measurement and verification plan for energy consuming systems whether system by system or the whole building energy use. Measurement and verification must cover at least one year of post-construction occupancy. If results of the plan indicate that energy savings are not being achieved, provide a process for corrective action.

Baseline Reference

No baseline reference was available for this credit in Jordan. The baseline reference according to the LEED rating system was the “International Performance Measurements and Verification Protocol IPMVP”. There are two options for monitoring and verification of energy savings; option D & B.

Option D projects baseline energy use determined by energy simulation of the baseline under the post-construction operating conditions. While Option B is the projected baseline energy use determined by calculating the hypothetical energy performance of the baseline system under measured post-construction operating conditions.

Implementation Time Frame

The measurement and verification plan should be considered in the design stage to install the required systems to enable energy monitoring and verification (sub-metering). The plan itself should be developed after construction ends and cover at least one year of post-construction occupancy.

Team Responsibility

Responsibility for the design and coordination of the measurement and verification plan resides with design engineers. The project owner or facility manager is responsible for implementing the plan after construction.

Applicability in Jordan

Meters can be installed and tracked upon the request of the project owner. This credit could be implemented easily; therefore this credit is applicable to Jordan.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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</table>

- **Current Practices**: Certain projects install a sub-metering system for monitoring and verification of energy use, while the majority of projects do not provide the sub-metering system.

- **Ease of Implementation**: As previously mentioned this credit is applicable in Jordan, however installing meters and tracking the results periodically requires a person with specialized training that understands the purpose of sub metering. These requirements pose challenges for the implementation of this credit. Therefore, this credit was given a medium on the ease of implementation scale.

- **Cost**: Cost varies relative to the complexity of the installed sub metering system. In general the cost of the sub meters are not major compared to the benefits of utilizing the system.

- **Feasibility**: Implementation of this credit is feasible from an economic point of view.
Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

1. Market
   The Jordanian market has all the required instruments and equipment to achieve this credit. However, project owners, the design, and construction teams need to be educated on the benefits of sub-metering, relevant alternatives, and best practices to achieve this credit, through the commissioning agent.

2. Jordan Green Building Council
   This will be addresses in future editions of the publication.

3. Government
   This will be addresses in future editions of the publication.

4. Local Rating System
   This will be addresses in future editions of the publication.

Conclusion

This credit is applicable in Jordan, many benefits are gained by implementation of this credit as it will help building owners monitor and track energy consumption and identify future inefficiencies which may occur during daily operations. The cost implications are negligible when compared to the benefits of the sub-metering. To facilitate achievement of this credit, the project owner and design and construction teams should be trained on best practices to achieve this credit and on the benefits beyond this credit. JordanGBC and other relevant NGOs should play a major role in facilitating the achievement of this credit.

EA Credit 6: Green Power

Intent

To encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirements

Engage in at least a 2-year renewable energy contract to provide at least 35% of the building’s electricity from renewable sources, all purchases of green power shall be based on the quantity of energy consumed, not the cost.

Baseline Reference

No baseline reference is available for this credit.

Implementation Time Frame

The requirements of this credit could be at any time prior to occupancy for the purposes of the certification.

Team Responsibility

It is up to the project owner to decide whether or not to attempt this credit at any time during project design or construction.
Applicability in Jordan

This credit could be easily implemented in Jordan by purchasing renewable energy certificates (RECs) equal to 35% of the predicted annual electricity consumption over two years, even if green power sources are not generated in Jordan or the region. However, special attention should be given to the cost factor as mentioned below.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Currently, green power is not widely utilized in construction in Jordan.
- **Ease of Implementation**: Implementation of this credit is easy.
- **Cost**: The cost of implementing the requirements of this credit equals 35% of the building energy consumption for two years or 70% of the building energy consumption for one year. Therefore, the actual cost of this credit depends on the project capacity and its energy consumption.
- **Feasibility**: Green power is currently available from distant international sources and the only way to attain this credit is to purchase REC, therefore this credit is currently considered unfeasible.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a low priority.

Recommendations to Achieve Credit Intent

1. **Market**
   This will be addressed in future editions of the publication.

2. **Jordan Green Building Council**
   This will be addressed in future editions of the publication.

3. **Government**
   This will be addressed in future editions of the publication.

4. **Local Rating System**
   Due to the minimal economic benefits of this credit, in addition to the limited environmental benefits in the region, the associated LEED point for this credit was allocated to the water efficiency section to encourage water savings.

Conclusion

This credit is applicable in Jordan. One major challenge to implementing this credit in Jordan is the absence of green power sources. Currently, sources are only widely available in Europe, USA, and the Far East. Currently, projects attempting this credit purchase Renewable Energy Certificates (RECs) from distant green power sources, which poses an extra cost to the project without associated financial benefits.
MATERIALS & RESOURCES
Introduction

This section focuses on two main issues: the environmental impact of materials brought into the building and minimizing landfill and incinerator disposal for materials that leave the building. This credit category addresses environmental concerns relating to materials selection, waste disposal, and waste reduction.

During the life cycle of a material, material extraction, processing, transportation, use, and disposal can incur negative health and environmental impacts, which environmentally responsible procurement policies can significantly reduce. For example, purchasing products with recycled content expands markets for recycled materials, slows the consumption of raw materials, and reduces the amount of waste entering landfills. Use of materials from local sources supports local economies while reducing transportation impacts.

Source reduction, reuse, and recycling are the three preferred strategies for reducing waste. Source reduction is the most significant strategy, because it minimizes environmental impacts throughout the material’s life cycle. Reused materials are diverted from the waste stream and substituted for materials which would incur greater environmental impacts. Recycling does not possess all the same benefits as source reduction and reuse, but it diverts waste from landfills and incinerators and lessens the demand for virgin materials.

There are twenty one working landfill sites throughout Jordan, which are operated by joint service councils branching from the Ministry of Municipal Affairs. There is partial separation of useful materials, and the treatment of separated organic waste to generate biogas & electricity, for example, is in practice in the Russaifa Landfill.2 In Jordan, the per capita generation rate of solid waste is 0.9kg/day. Quantities of solid waste are 4600 tons/day, which is equal to 1,679,000 tons/year. 55-70% of the waste is organic, up to 17% is plastic, and 2.5% glass. Paper & cardboard constitute between 11-17% of waste in Jordan.3 Waste generation raises building costs in two ways: First, unnecessary materials (such as packaging) add to the cost of products purchased; second, fees for waste collection and disposal rise as the amount of waste increases. Reducing the amount of waste is an important component of sustainable construction practices.

Reuse of an existing building results in less habitat disturbance and, typically, less new infrastructure, such as utilities and roads. By reusing or recycling existing materials, an increasing number of public and private waste management operations have reduced the volume of construction debris.

Effective waste management benefits organizations by reducing the cost of waste disposal and generating revenue from recycling or resale proceeds. Equally important is material selection in order to evaluate new and alternative sources. Salvaged materials can substitute new materials, saving costs and adding a different character to the building. Recycled materials contain waste that would otherwise go to into landfill or incinerators. Use of local materials supports the local economy and reduces transportation impacts. Finally, the use of third-party certified wood bolsters stewardship of forests and related ecosystems.

Executive Summary

A sustainable building requires policies for responsible construction and material selection as well as effective waste management. The Materials and Resources (MR) prerequisites and credits establish the foundation for developing, implementing, and documenting these policies. Many of the credits in this category relate to the implementation of design strategies during construction and in order to ensure a full sustainable building cycle for projects in Jordan and the region, most of the credits were maintained. With the exception of just one credit point for Rapidly Renewable Materials, the credits under this category are encouraged to be implemented in order to encourage transformation in the industry to focus on the sustainable selection and use of materials and waste management. This requires collaborative effort of the private sector and the JordanGBC to spread awareness in addition to the role of the Government to provide supportive legislative frameworks and regulations.
**MR Prerequisite 1: Storage and Collection of Recyclables**

**Intent**

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

**Requirements**

Provide an easily-accessible dedicated area or areas for the collection and storage of materials for recycling for the entire building. Materials must include, at a minimum: paper, corrugated cardboard, glass, plastics and metals.

**Baseline Reference**

No baseline reference is available for this prerequisite.

**Implementation Time Frame**

Implementation of this prerequisite begins at the early concept design stage where the project designer must ensure that required space for storage and collection of recyclable materials is incorporated in the building’s space program and developed according to the allocated area requirements later in design development. Prior to occupancy, the owner must ensure that sufficient recycling containers are in place. During post occupancy, the project team should educate building occupants on the importance of recycling and the location of the container for each material. The process of recycling should be clarified in order to guarantee the success of the process over the building’s life cycle.

**Team Responsibility**

Architect, owner, and facility manager.

**Applicability in Jordan**

With an integrated design approach to the project from early concept stages, this prerequisite is easy to implement on the building level. However, due to the lack of proper infrastructure and market demand on a national level, recycling remains difficult to implement for all products including paper, plastics, metals, and other recyclable products. More initiatives are supported by a number of local companies and organizations, particularly in Amman, but until this becomes applicable on a national level, the value-chain will remain incomplete.

**Prerequisite Prioritization**

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices**: Paper recycling has been in practice in Jordan for quite some time, where a number of companies and organizations are in the business of collaborating with individuals and organizations to collect their recyclable paper waste. Recently, collection and separation services have been put in place for other products including plastics, metals, and other products. During the analysis and research into the applicability of this prerequisite in Jordan, it became evident that much of the recycling cycle actually takes place outside of Jordan, where some collected products are actually exported to neighboring countries with proper infrastructure to produce higher quality recycled products and materials.
• **Ease of Implementation:** Implementation of this prerequisite is easy with proper consideration and attention to prerequisite requirements during early design stages to provide proper space within buildings to collect recyclables that is both adequately sized and accessible to recycling trucks.

• **Cost:** If considered early in the design process, the provision of the required space and any related building systems (ventilation, heating or cooling), there is minimal cost impact.

• **Feasibility:** Implementation of this prerequisite is medium.

### Overall Prioritization

Based on the above mentioned analysis, this prerequisite was given a high priority.

### Recommendations to Achieve Prerequisite Intent

In order to facilitate the implementation of this prerequisite and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**  
   Increase demand through market transformation and providing competitiveness for recyclables (cost, appeal for recycled products).

2. **Jordan Green Building Council**  
   - Awareness programs to encourage recycling among members and the community at large, hence increasing demand in the market.  
   - Advocate for constructive public-private partnerships in this sector.  
   - Lobby the government and municipalities to establish a regulatory framework.

3. **Government**  
   - Enhance recycling infrastructure for various products by offering incentives for implementing recycling and using recycled products/materials.  
   - Adopt regulations to monitor and control the process particularly in urban areas.  
   - Collaborate with the private sector to upgrade the capacity and knowledge of public sector in this field through training and awareness programs.  
   - Direct investment in the process (recycling plants, recycling containers and trucks... etc).

4. **Local Rating System**  
   Keep prerequisite requirements to encourage advancement of the sector and habit of recycling among public.

### Conclusion

This prerequisite was found applicable in Jordan, and in order to encourage recycling practices among building occupants and users it is important that all stakeholders exert efforts to encourage the advancement of the recycling industry in Jordan. There are minimal cost implications at the building level, which should be an opportunity for designers and architects to build on in order to include recycling as an integral part of the design and building program, which should be coupled with proper awareness and education for building users in its post occupancy stages.

### MR Credit 1: Building Reuse—Maintain Existing Walls, Floors and Roof

**Intent**

To extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

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2. Al Fayez K, Solid Waste Management in Jordan: Current Situation and Future Challenges, Presentation, Ministry of Environment, Jordan

3. Al Fayez K, Solid Waste Management in Jordan: Current Situation and Future Challenges, Presentation, Ministry of Environment, Jordan
Requirements

Maintain the existing building structure (including structural floor and roof decking) and envelope (the exterior skin and framing, excluding window assemblies and non-structural roofing material). The minimum percentage building reuse for each point threshold is as follows:

<table>
<thead>
<tr>
<th>Building Reuse</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>55%</td>
<td>1</td>
</tr>
<tr>
<td>75%</td>
<td>2</td>
</tr>
<tr>
<td>95%</td>
<td>3</td>
</tr>
</tbody>
</table>

Hazardous materials that are remediated as part of the project must be excluded from the calculation of the percentage maintained. If the project includes an addition that is more than 2 times the square footage of the existing building, this credit is not applicable.

Baseline Reference

No baseline reference is available for this credit.

Implementation Time frame

Implementation of this credit must begin as early as possible in the design stage where the architect is required to develop detailed floor plans to show the location of the existing structural components, exterior walls, and exterior windows & doors to be reused. The drawings should be detailed enough to show the surface area of any element to be reused. Confirmation during the design phase is required from the structural engineer on the proposed reuse elements. During construction, these elements should be preserved in coordination with the contractor.

Team Responsibility

Architect, structural engineer, owner (for the selection of the building parts/elements to be reused in coordination with the architect and structural engineer) and the contractor.

Applicability in Jordan

The concept of reusing existing structures and buildings is of international applicability with measurable benefits in every region. This is the same in Jordan, particularly in projects that involve the adaptive reuse of existing building elements if not entire envelopes, especially in urban areas where it is more expensive to build on undeveloped plots.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices:** With current urban development patterns in major cities across the country and with the current economic situation casting its shadow on the construction industry, more projects are capitalizing on the benefits of reusing existing buildings for new uses, including the adaptive reuse of residential buildings into office and work environments. It is becoming common that these buildings are almost entirely maintained with changes to the interior spaces to suit their new function.
• **Ease of Implementation:** There are certain design challenges specific to working with an existing structure, where in some cases certain restrictions, not applicable to new construction, may apply. Nevertheless, with proper planning and an integrated approach to design, both the design and construction teams would be able to overcome any obstacles that they may face on site.

• **Cost:** If considered early in the design process, adapting an existing building to new use would have minimal initial cost impacts.

• **Feasibility:** Implementation of this credit is medium where depending on the situation, it may or may not be feasible to reuse an existing building or element.

**Overall Prioritization**

Based on the above mentioned analysis, this credit was given a medium priority.

**Recommendations to Achieve Credit Intent**

In order to facilitate the implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   - Encourage investment in renovation and building re-use in sectors like real estate and collaborate with government reuse programs and policies.

2. **Jordan Green Building Council**
   - Develop awareness programs to encourage building re-use and demonstrate economic and environmental benefits of adaptive reuse.
   - Lobby government and municipalities to establish a regulatory framework.

3. **Government**
   - Provide a regulatory framework that aims to protect and reuse historical buildings.
   - Incorporate existing buildings in planning initiatives and processes (land use schemes, zoning, master plan development...etc.).

4. **Local Rating System**
   - Keep credit requirements with possibility to revisit minimum percentage thresholds, if needed, or if credit proves difficult to achieve in the future.

**Conclusion**

The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are a number of environmental, social, and economic benefits related to the adaptive reuse of the existing buildings. Accordingly, it is important that this credit is maintained in order to highlight its benefits to a country like Jordan, where such a practice is applicable, and in some cases favored.

**MR Credit 1.2: Building Reuse—Maintain Interior Nonstructural Elements**

**Intent**

To extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.
Requirements

Use existing interior nonstructural elements (e.g., interior walls, doors, floor coverings and ceiling systems) in at least 50% (by area) of the completed building, including additions. If the project includes an addition with square footage more than 2 times the square footage of the existing building, this credit is not applicable.

Baseline Reference

No baseline reference is available for this credit.

Implementation Time Frame

Implementation of this credit must begin as early as possible in the design stage where the architect is required to develop detailed floor plans to show the location of the interior non-structural components and items to be reused. The drawings should be detailed enough to show the surface area of any element to be reused. During construction, these elements should be preserved in coordination with the contractor.

Team Responsibility

Architect, structural engineer, owner (for the selection of the building parts/elements to be reused in coordination with the architect) and the contractor.

Applicability in Jordan

The concept of reusing existing structures and buildings is of international applicability with measurable benefits in every region. This is the same in Jordan, particularly in projects that involve the adaptive reuse of existing building elements if not entire envelopes, especially in urban areas where it is more expensive to build on undeveloped plots.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices**: With current urban development patterns in major cities across the country and the current economic situation casting its shadow on the construction industry, more projects are capitalizing on the benefits of reusing existing buildings for new uses, including the adaptive reuse of residential buildings into office and work environments. It is becoming common that these buildings are almost entirely maintained with changes to the interior spaces to suit their new function.

- **Ease of Implementation**: There are certain design challenges specific to working with an existing structure, where in some cases certain restrictions, not applicable to new construction, may apply. Nevertheless, with proper planning and an integrated approach to design, both the design and construction teams would be able to overcome any obstacles that they may face on site.

- **Cost**: If considered early in the design process, adapting an existing building to new use would have minimal initial cost impacts.

- **Feasibility**: Implementation of this credit is medium, depending on the situation.
Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

In order to facilitate implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   Encourage investment in renovation and building re-use in sectors like real estate and collaborate with government reuse programs and policies.

2. **Jordan Green Building Council**
   - Develop awareness programs to encourage building re-use and demonstrate economic and environmental benefits of adaptive reuse.
   - Lobby government and municipalities to establish a regulatory framework.

3. **Government**
   - Provide a regulatory framework that aims to protect and reuse historical buildings.
   - Incorporate existing buildings in planning initiatives and processes (land use schemes, zoning, master plan development…etc).

4. **Local Rating System**
   Keep credit requirements with the possibility of revisiting the minimum percentage thresholds, if needed, or if credit proves difficult to achieve in the future.

Conclusion

The scope of a green building rating system should encompass a multitude of building types and functions and demonstrate to stakeholders that there are a number of environmental, social, and economic benefits related to the adaptive reuse of the existing building stock. Accordingly, it is important this credit is maintained in order to highlight its benefits to a country like Jordan where such a practice is applicable, and in some cases favored.

**MR Credit 2 – Construction Waste Management**

**Intent**

To divert construction and demolition debris from disposal in landfills and incineration facilities, redirect recyclable recovered resources back to the manufacturing process and reusable materials to appropriate sites.

**Requirements**

Recycle and/or salvage nonhazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout. The minimum percentage debris to be recycled or salvaged for each point threshold is as follows:

<table>
<thead>
<tr>
<th>Recycled or Salvaged</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>75%</td>
<td>2</td>
</tr>
</tbody>
</table>
Baseline Reference

No baseline reference is available for this credit.

Implementation Time Frame

A Construction Waste Management Plan should be developed by the project team during the design phase, after researching available recycling options in the project area. This plan should be followed through by the contractor and sub-contractors in order to make sure that its requirements are implemented on site. The process should be continuously tracked by the contractor who should also submit all required documentation to the team for review.

Team Responsibility

Architect, civil engineer and contractor.

Applicability in Jordan

This credit is applicable with difficulty in Jordan. The difficulty is due to the lack of infrastructure for waste separation. Currently, documentation is not in place but may be developed in time. At present, the credit is achievable for certain waste materials that are diverted to factories and plants. Steel is an example of this type of material.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices**: Implementation of a construction waste management plan is partially implemented in the Kingdom and limited to large scale projects that usually include an Environmental Impact Assessment as a requirement. Similar to recycling a large part of waste management is performed on site but the full process cycle remains difficult to track due to the lack of documentation in landfills.

- **Ease of Implementation**: If incorporated in the design and tender documents and followed through by the contractor, the requirements for this credit are easy to implement. However, the difficulty remains in the tracking process once construction waste material leaves the project site.

- **Cost**: As this is not common practice, particularly for small project sites, there are high initial costs to implement requirements that the contractor has to carry.

- **Feasibility**: This credit has been assigned medium feasibility due to the lack of documentation after products leave the site which renders it difficult to determine the feasibility of implementing this practice for projects in Jordan.

Overall Prioritization

Based on the above mentioned analysis and due to its impact during the construction process, this credit was given a high priority.
Recommendations to Achieve Credit Intent

In order to facilitate implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   - Adopt various market transformation tools and mechanisms like tax exemptions, pricing schemes and incentive programs for locally produced and manufactured recycled materials and products to encourage a wider range of recycling materials and products.

2. **Jordan Green Building Council**
   - Raise awareness for contractors and market stakeholders by emphasizing the importance of waste diversion, especially for materials that are still going into the landfills. In addition, looking into documentation and how it can be developed is an important step.

3. **Government**
   - Policy required for recycling infrastructure, material separation at landfills and official waste disposal policies. Encourage research and development in the reuse of construction debris.

4. **Local Rating System**
   - Keep credit requirements with possibility to revisit minimum percentage thresholds if needed or if credit proves difficult to achieve in the future.

**Conclusion**

Due to the importance of encouraging sustainable construction practices for projects in Jordan and the region, this credit is of high priority as it has an impact on a number of sectors including contracting and solid waste management. A proper legislative framework needs to be put in place to control the cycle of recycling and waste management on a national scale that would encourage more construction practitioners to take the initiative and implement construction waste management on site.

**MR Credit 3: Materials Reuse**

**Intent**

To reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby lessening impacts associated with the extraction and processing of virgin resources.

**Requirements**

Use salvaged, refurbished or reused materials, the sum of which constitutes at least 5% or 10%, based on cost, of the total value of materials on the project. The minimum percentage materials reused for each point threshold is as follows:

<table>
<thead>
<tr>
<th>Reused Materials</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>1</td>
</tr>
<tr>
<td>10%</td>
<td>2</td>
</tr>
</tbody>
</table>

Mechanical, electrical and plumbing components and specialty items such as elevators and equipment cannot be included in this calculation. Include only materials permanently installed in the project. Furniture may be included if it is included consistently in MR Credit 3: Materials Reuse through MR Credit 7: Certified Wood.
Baseline Reference

No baseline reference is available for this credit.

Implementation Time Frame

Materials reuse as a design strategy has an effect on the project’s cost estimate, the demolition process (if these materials are salvaged for the project site) and the design development of the project. Accordingly, coordination between the project architect, owner and contractor should begin as early as possible, preferably during pre-design, to identify the materials to be reused on the project and their implications on the design and cost. Documentation should also begin as early as possible and followed through on site when the contractor takes over and implements the requirements in project specifications and materials selection.

Team Responsibility

Architect, owner and contractor.

Applicability in Jordan

This credit is applicable with difficulty in Jordan, mainly due to the fact that reused materials that can be used for new construction are not properly identified and classified. Furthermore, there are cultural and social aspects related to preconceived notions on “new” construction (furniture for example) where reused products are often perceived to have lower quality and value.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices:** Due to social and cultural preconceived notions that most reused building materials are of lower quality and standard, it is not common to reuse such elements in the construction industry. In some case, salvaged materials on site are used but these are limited and do not meet the general credit requirements.

- **Ease of Implementation:** This credit is relatively easy to achieve, provided that requirements are incorporated in project specification and implemented on site by the contractor.

- **Cost:** In some cases, there may be higher initial costs related to using reused items or materials as the practice is not yet common in construction activities.

- **Feasibility:** Depending on which materials and/or products are actually reused, feasibility can vary and remains difficult to determine precisely based on current practice in the market. However, in most cases it is feasible to reuse existing materials, particularly in the case of materials salvaged on site.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority.
Recommendations to Achieve Credit Intent

In order to facilitate implementation of this credit and achieve its intent, the following are recommendations for the role that stakeholders can play:

1. **Market**
   Adopt various market transformation tools like tax exemptions, pricing schemes and incentive programs to encourage a wider range of reused materials and products to become more readily available with higher consumer appeal.

2. **Jordan Green Building Council**
   Raise awareness for contractors and market stakeholders by emphasizing the importance of providing and incorporating reused materials in construction and furniture. If the contractors and market stakeholders realize the benefits of reused materials, then they can convey their knowledge to the client.

3. **Government**
   Provide necessary legislation and incentives to support market transformation in this sector including tax exemption laws and by-laws, quality control regulation and incentive schemes for municipalities and city councils.

4. **Local Rating System**
   Keep credit requirements with possibility to revisit minimum percentage thresholds if needed or if credit proves difficult to achieve in the future.

Conclusion

This is one of the areas where sustainable design and construction awareness can have a major impact on transforming how materials and products are perceived and used in projects. This credit was maintained in order to encourage more market transformation and design innovation in the built environment. A collaborative effort between all of the abovementioned stakeholders is needed to drive the process forward.

**MR Credit 4: Recycled Content**

**Intent**

To increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

**Requirements**

Use materials with recycled content such that the sum of postconsumer recycled content plus 1/2 of the pre-consumer content constitutes at least 10% or 20%, based on cost, of the total value of the materials in the project.

**Implementation Time Frame**

Preliminary calculations are performed in the early design stage. Then materials are specified during construction documentation and tracked through the construction stage.

**Team Responsibility**

The responsible professionals from the project team are the following:

- Project Manager: as soon as project budget is available, identify materials that contain recycled content.
- Architect / Interior Designer: identify then specify products with recycled content.
- General contractor: the contractor is responsible for the materials specified by the Architect, in addition to documenting and tracking the cost and quantity of recycled materials. Afterwards the contractor provides this documentation to the project team.
All project team members, including the contractor and subcontractors, should consult suppliers prior to buy-out phase to determine the availability of materials and the specific amount of post-consumer and pre-consumer recycled content within each type of material.

Applicability in Jordan

This credit was assigned as “applicable with difficulty” due to the fact that recycling in Jordan is still a growing practice and the full value-chain is not yet fully accomplished. The market demand for recycled materials is still undeveloped and not yet a competitive alternative to other materials. Lack of a clear methodology for handling waste in Jordan as well as the limited infrastructure for recycling narrows the number of recycling projects to a few.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices:** Recycled materials are used but only to a limited extent as some materials are too expensive or simply not available.

- **Ease of Implementation:** Using recycled materials in construction is achievable but faces obstacles that should be overcome in the near future.

- **Cost:** Additional cost may be high since materials in the market are limited and expensive. Conversely, recycled materials may be imported which also comes with a premium.

- **Feasibility:** Recycling and recycled material used in construction will be possible and feasible when the full circle for recycling in Jordan is completed.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Greater demand from consumers will enhance competition in the market. Greater number of suppliers in the market will drive down costs.

2. **Jordan Green Building Council**
   - Raise awareness and emphasize the importance of recycling and recycling programs. The Council can prove a useful force in pushing for an appropriate waste management program which incorporates recycling.
   - Develop product database for construction materials that can be of use to designers and contractors.

3. **Government**
   - Identify and implement a recycling strategy which would apply to all Jordanians. The process should have incentives and tax deductions to help offer the users more options and competitiveness in the market. As well as direct investment in recycling infrastructure including plants, recycling containers and trucks... etc.
• Recycling is a national issue which involves every person in the country from citizens to business owners, and a successful policy will not be implemented unless the government plays a major role in it.

4. Local Rating System
Meeting the minimum LEED thresholds might prove difficult. Hence, reducing the thresholds will make this credit more attainable.

Conclusion
At the time of this publication, most recycling in Jordan is pre-consumer recycling, and since LEED’s equation for recycled content is post-consumer + 1/2 pre-consumer the credit is difficult to achieve. One example in Jordan is steel, which forms a large portion of the total material cost in a building, hence significantly contributes to achieving this credit. Steel in Jordan is recycled as standard process, but only after it is processed and is thus considered pre-consumer recycled content.

Recycling is a growing practice with a potential for great progress. If this development gains momentum, then the full recycling circle should be achievable in the near future.

**MR Credit 5: Regional Materials**

**Intent**
To increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing environmental impacts resulting from transportation.

**Requirements**
Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles (805 km) of the project site for a minimum of 10% or 20%, based on cost, of the total materials value. If only a fraction of a product or material is extracted, harvested, or recovered and manufactured locally, then only that percentage (by weight) can contribute to the regional value. The minimum percentage regional materials for each point threshold are 10% or 20%.

**Baseline Reference**
No baseline reference is available for this credit.

**Implementation Time Frame**
Preliminary calculations are performed in early design stage. Then materials are specified during construction documentation and tracked through the construction stage.

**Team Responsibility**
The responsible professionals from the project team are the following:

• **Project Manager:** run preliminary calculations, as soon as project budget is available, to set appropriate regional materials targets.
• **Architect / Interior Designer:** architects should specify in the construction documents products that are extracted/harvested/recovered and manufactured within 500 miles (805 km) and work with the general contractor on approved alternatives that meet the requirements of this credit.
• **General contractor:** during construction, the general contractor is typically responsible for documenting the amounts and values of regionally harvested and manufactured materials used in the project. The general contractor must track the materials cost of each locally harvested and manufactured product that will be applied to this credit.
Applicability in Jordan

Regional materials are easily procured in Jordan and the construction industry already uses most of its materials from the country or the region. Concrete, steel and cladding stone are examples of regional materials that are regularly utilized and make up a substantial portion of the budget; hence the credit is achievable without difficulty.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- **Current Practices**: Most materials used for construction in Jordan are regional or local.
- **Ease of Implementation**: Multiple sources for many materials facilitate the process of using local goods.
- **Cost**: Cost is definitely lower than importing materials from outside the region.
- **Feasibility**: Already done and feasible.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a high priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Present high competitiveness in the market gives the customer more options and better values for cost. The local market should keep the industry satisfied as long as the demand is stable.

2. **Jordan Green Building Council**
   Raise awareness by listing applicable local materials and possible alternatives to imported products.

3. **Government**
   Incentives are already in place due to high taxation of imported products and goods.

4. **Local Rating System**
   Calculations of the average percentage of regional materials already used in buildings should be carried out. If the resulting percentage proves lower than LEED’s standard, a new minimum threshold should be assigned. Therefore taking a step further and encouraging incorporating more regional materials in buildings.

Conclusions

The regional materials credit is a positive point in Jordan and is already established needing merely to be sustained and perhaps taken a step further.

One challenge is that more materials are becoming more simple to import (transportation evolution, more competition hence decreased prices...etc), or replaced with other materials. Using stone cladding was a common practice in Jordan. However, nowadays one can find more varieties such as glass and aluminum cladding. The market should keep local materials competitive or encourage local industry to manufacture extract these materials.
MR Credit 6: Rapidly Renewable Materials

Intent

To reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

Requirements

Use rapidly renewable building materials and products for 2.5% of the total value of all building materials and products used in the project, based on cost. Rapidly renewable building materials and products are made from plants that are typically harvested within a 10-year or shorter cycle.

Baseline Reference

No baseline reference is available for this credit.

Implementation Time Frame

Preliminary calculations are performed in the early design stage, to determine the feasibility of achieving this credit and identify the quantity of material (by cost) that must be purchased to meet the minimum threshold.

Team Responsibility

The responsible professionals from the project team are the following:

- Project Manager: as soon as project budget is available, identify materials that contain recycled content.
- Architect: identify and then specify rapidly renewable materials.
- General contractor: ensure specified rapidly renewable materials are properly installed and collect product documentation from manufacturers to give to the project team.

Applicability in Jordan

This credit was assigned as applicable with difficulty due to limited resources available in the Jordanian market. This in addition to high costs makes this credit difficult to achieve.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Rapidly renewable materials are not common in the Jordanian market and the cost is high, therefore stakeholders tend not use them.
- **Ease of Implementation**: Will be easier to implement with more competitive prices and tax deductions on these materials.
- **Cost**: Higher cost than alternatives due mostly to minimal demand.
- **Feasibility**: Implementation of this credit was medium.
Overall Prioritization

Based on the above mentioned analysis, this credit was given a low priority.

Recommendations to Achieve Credit Intent

1. Market
   Increased demand from consumers will create more competitively priced supplies.

2. Jordan Green Building Council
   Raise awareness on product labeling, rapidly renewable materials.

3. Government
   Financial incentives and tax deductions for consumers and producers of rapidly renewable materials to encourage market implementation.

4. Local Rating System
   Meeting the minimum LEED thresholds may prove difficult and so the associated LEED point for this credit was transferred to Water Efficiency category.

Conclusion

Rapidly renewable materials such as cork flooring and bio-based paint are more expensive than other less environmentally-friendly materials and will add significant costs to the owner to achieve the minimum threshold. Until rapidly renewable materials become competitive, whether in cost or variety of products, project owners will not be able to meet the minimum threshold with reasonable costs. As the market evolves, and the green movement continues to gain momentum in Jordan, rapidly renewable materials should become more attainable.

MR Credit 7: Certified Wood

Intent

To encourage environmentally responsible forest management.

Requirements

Use a minimum of 50% (based on cost) of wood-based materials and products that are certified in accordance with Forest Stewardship Council (FSC) principles and criteria, for wood building components. These components include at a minimum, structural framing and general dimensional framing, flooring, sub-flooring, wood doors, and finishes.

Baseline Reference

Forest Stewardship Council Principles and Criteria.

Implementation Time Frame

Coordination among the owner, architect or design team and contractor should begin early in the design development stage so that the availability, costs, and lead times of FSC-certified products can be anticipated and their purchase coordinated with the construction schedule. Throughout design phase, construction phase, and after construction phase, documents should be reviewed and kept for future submittal.

Team Responsibility

The responsible professionals from the project team are the following:
• Project Manager: as soon as project budget is available, identify materials that contain recycled content.
• Architect: during the design phase, incorporate certified wood product into the project plans and specifications.
• General contractor: during construction, the contractor should review the project cost to verify that 50% of wood costs are FSC-certified, as well as obtaining and retaining Chain-of-Custody (COC) certificates. After the end of construction, the contractor should provide the documentation needed for the LEED certification application.

Applicability in Jordan

This credit is not attainable in Jordan as there is no FSC or third-party certified wood. Additionally, due to limited supplies, the use of wood is minimal in the construction process compared to other regions like North America and Europe.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• **Current Practices**: Certified wood is not used in construction.
• **Ease of Implementation**: Third party certification is the major obstacle keeping this credit from being easy to implement.
• **Cost**: The added cost is the certification cost.
• **Feasibility**: Only feasible with a third party certification system in place.

Overall Prioritization

Based on the above mentioned analysis, this credit was given a low priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Local third-party certification system for wood products.

2. **Jordan Green Building Council**
   Raise awareness on product labeling and sustainable forestry.

3. **Government**
   Tax exemption on third-party certified wood. A local certification process which ensures responsible forest resource management should be implemented.

4. **Local Rating System**
   Not attainable until a method for certifying sustainable forestry is implemented.

Conclusion

Since there is limited use for wood in construction in Jordan, this credit is not essential. Nevertheless, the credit should be maintained as wood is mostly used as scaffolding and framing and is reused in local construction sites. When wood is used in the building, the project team should choose suppliers that comply with sustainable forestry management practices.
INDOOR ENVIRONMENTAL QUALITY
INDOOR ENVIRONMENTAL QUALITY
Introduction

The purpose of this section is to find strategies for localizing the Indoor Environmental Quality (IEQ). Knowing that the 2009 rating system is a combination of the New Construction, School, and Core & Shell Ratings, the below assessment reflects the changes for the purpose of localizing only on the New Construction rating. The IEQ section consists of two prerequisites and 8 credits with a total of 15 possible points. This section consists of a credit by credit analysis that looked at strategies for localizing the LEED 2009 New Construction. Many of the IEQ LEED credits have a direct link to other LEED credits and the design team needs to fully understand this during the pre-design phase to ensure all attempted credits are not put in jeopardy of being denied, these related credits will be found under the heading of Related Credits below.

The average person spends a great deal of time indoors, the U.S. Environmental Protection Agency has reported that levels of pollutants indoors may be as high as two to three times that of the outdoor rate and occasionally more than 100 times. In addition, The World Health Organization reports that an individual’s exposure to air pollutants comes directly from indoor air. It is imperative to address the Indoor Environmental Quality of buildings for occupants in Jordan. Preventing IEQ problems is generally achievable in Jordan, however many credits require several considerations when implementing the strategy. Creating healthier indoor environments reduces health problems, increases productivity, and occupant wellbeing.

It should be noted in this section there are direct quotes from the USGBC LEED BD+C v3 2009 reference guide and the LEED Addenda BD+C 2009.

Executive Summary

The Indoor Environmental Quality chapter includes prerequisites and credits that encourage the use of several approaches that reduces the amount of indoor pollutants. The IEQ prerequisites and credits attempt to limit occupant exposure to harmful pollutants; specify materials that release fewer and less harmful Volatile Organic Compounds (VOCs); protect absorptive materials and air handling systems during construction; increase air ventilation rates; maintain optimal air quality; provide views and natural light; and enhance occupant controllability of systems.

For Jordan credits related to low-emitting materials and controllability of systems are considered most important.

- **High Priority:**
  - Credit 4.2 ñ Low-Emitting Materials ñ Paints and Coatings.
  - Credit 6.1 ñ Controllability of Systems ñ Lighting.

- **Medium Priority:**
  - Credit 1 ñ Outdoor Air Delivery Monitoring.
  - Credit 2 ñ Increased Ventilation.
  - Credit 3.1 ñ Construction Indoor Air Quality Management Plan ñ During Construction.
  - Credit 3.2 ñ Construction Indoor Air Quality Management Plan ñ Before Occupancy.
  - Credit 4.1 ñ Low-Emitting Materials ñ Adhesives and Sealants.
  - Credit 6.2 ñ Controllability of Systems ñ Thermal Comfort.
  - Credit 7.1 ñ Thermal Comfort ñ Design.
  - Credit 7.2 ñ Thermal Comfort ñ Verification.
  - Credit 8.1 ñ Daylight and Views ñ Daylight.
  - Credit 8.2 ñ Daylight and Views ñ Views.

- **Low Priority:**
  - Credit 4.3 ñ Low-Emitting Materials ñ Flooring Systems.
  - Credit 4.4 ñ Low-Emitting Materials ñ Composite Wood & Agrifiber Products.
  - Credit 5 ñ Indoor Chemical & Pollutant Source Control.
IEQ Prerequisite 1: Minimum Indoor Air Quality Performance

Intent

To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and wellbeing of the occupants.

Requirements


- **Case 1: Mechanically Ventilated Spaces**
  Mechanical ventilation systems must be designed using the ventilation rate procedure or the applicable local code, whichever is more stringent.

  AND

- **Case 2: Naturally Ventilated Spaces**

Baseline Reference


Implementation Time Frame

Local codes may be used in lieu of ASHRAE when the local code is more stringent. For the purposes of this credit, the code that requires providing more outside air is considered more stringent. ASHRAE 62.1–2007 establishes minimum requirements for ventilation air rates in various types of occupied zones and building ventilation systems. The standard takes into account an area's square footage, number of occupants and their activities, and the ventilation system.

Time frame starts early in the design process, the architect and mechanical engineer teams determine and design the most appropriate ventilation system for the project building. The design team may include the building owner, tenants, facility manager, and maintenance personnel as applicable.

Team Responsibility

Architect, MEP design engineers.

Applicability in Jordan

This is a prerequisite, therefore it must be met, and this prerequisite requires applying ASHRAE 62.1-2007, which is easily applied to Jordan. According to LEED, a local code can be used in lieu of ASHRAE when the local code is more stringent; meaning more outside air is required in the local code. In Jordan codes from the United States (such as ASHRAE) are routinely adopted and used and Jordan does not have a robust alternative code.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• **Current Practices:** Currently, designed ventilation systems in Jordan are in practice; however, they do not meet the prescribed requirements of ASHRAE 62.1-2007. In Jordan, certain indoor occupancy rates are very dense and the correlation between ventilation rates and IAQ based on carbon dioxide (CO2) monitoring is not addressed. In addition, the impact of outside air quality is not considered when locating fresh air intakes. More public awareness is needed to convince owners, government and design engineers to implement this approach. The relevant bodies which review and approve project designs are not sufficiently active in the implementation stage. The assurance of an integrated approach to design requires the involvement of all disciplines at every stage (collaborative approach). Again it must be stated that few design firms, in Jordan, apply best design practices or proper inspection of onsite work.

• **Ease of Implementation:** The analysis showed that the implementation of this prerequisite is easy and needs awareness for the project stakeholders mainly the design and construction team. Since there are some new concepts that should be implemented and managed well between all the project stakeholders and the project owner, this prerequisite was given an easy scale on the ease of implementation. To reduce pressure losses careful design of the sizing and location of the balancing dampers will enhance the ventilation system.

• **Cost:** Implementation of this prerequisite requires following ASHRAE 62.1–2007 which establishes minimum requirements for ventilation air rates in various types of occupied zones and building ventilation systems which are negligible regarding project costs. In certain projects the cost is the real cause for not applying appropriate codes, let alone the installation of good/durable equipment. Again more awareness is required for both sides of the equation.

• **Feasibility:** Implementation of this prerequisite was very feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a high priority.

**Recommendations to Achieve Prerequisite Intent**

1. **Market**
   This prerequisite was found applicable in Jordan. However, it addresses Indoor Air Quality which is not typically considered during design in Jordan. The benefits and issues measured for occupants, such as, improved occupant comfort, wellbeing and productivity is not normally addressed and this requires the project team to implement the Indoor Air Quality Management Plan, which is linked to other IEQ credits. Any cost associated with providing minimum IAQ performance can require higher energy use to operate compliant HVAC systems. However, the design team should weigh the benefits of health, productivity, and comfort of the occupants alongside the investment inputs. Premiums associated with ensuring IAQ is insignificant. Poor IAQ can cause occupant illness and the additional energy cost of ensuring IAQ may be offset by improved occupant productivity and lower absentee rates. No additional design effort or cost will be required to meet this prerequisite in general. Its successful implementation reduces potential liability regarding IAQ issues for architects, builders, owners, building operators, and occupants. More public awareness is needed to encourage owners (clients), government, and design engineers to apply this approach.

2. **Jordan Green Building Council**
   This will be addresses in future editions of the publication.

3. **Government**
   This will be addresses in future editions of the publication.

4. **Local Rating System**
   The recommendation is to keep the prerequisite requirements to support Indoor Air Quality goals by designing effective ventilation systems. Mechanical and natural ventilation systems should provide adequate outside air to building occupants.
IEQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

Intent

To prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to Environmental Tobacco Smoke (ETS).

Requirements

Prohibit smoking in the building and prohibit on-property smoking within 25 feet (7.62 meters) of entries, outdoor air intakes and operable windows.

Baseline Reference

None.

Implementation Time Frame

Prohibit smoking in the building. Provide appropriately located designated smoking areas outside the building away from building entrances, operable windows, and ventilation systems. These designated areas should also be located away from concentrations of building occupants or pedestrian traffic. Information about the building’s nonsmoking policy should be posted for all occupants to read.

The building and site smoking policies should be drafted by the facility manager and signed by the facility manager, property manager, or owner. This policy should be in place over the life of the building. Enforcing the building policy is the responsibility of the facility manager. Enforcing the site policy is the responsibility of the groundskeeper. Any building modifications made to accommodate new smoking rooms should be coordinated by the facility manager in consultation with the building owner.

Team Responsibility

Architect, MEP design engineers and building management.

Applicability in Jordan

This is a prerequisite, therefore it must be met. The prerequisite is easily applied in Jordan.

Prerequisite Prioritization

This prerequisite was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- Current Practices: Currently in Jordan the practice of designating a smoke free building is not implemented. Restaurants in Jordan are required by law to provide smoke-free sections. However, according to LEED, a designated smoking area/room is self-contained and separate from other areas, thus a designated smoking section in a restaurant does not meet this prerequisite. Therefore this prerequisite is not current practice in Jordan. “Provide designated smoking rooms designed to contain, capture and remove ETS from the building. At a minimum, the smoking room must be directly exhausted to the outdoors, away from air intakes and building entry paths, with no recirculation of ETS-containing air to nonsmoking areas and enclosed with impermeable deck-to-deck partitions”. LEED BD+C V3 2009.
• **Ease of Implementation**: The analysis showed that implementation of this prerequisite is easy and requires awareness for the project stakeholders, specifically targeted to facility managers and owners. Implementation is easy, however smoking is prevalent and people are likely to ignore signs, therefore enforcement will be challenging. Building managers must enforce outdoor smoking area requirements.

• **Cost**: Implementation of this prerequisite requires posting information about the building nonsmoking policy and enforcing the policy, which requires no added cost.

• **Feasibility**: Implementation of this prerequisite was very feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a high priority.

**Recommendations to Achieve Prerequisite Intent**

1. **Market**
   The key here is to educate building owners, facilities managers, and the public on the serious health concerns associate with ETS. In addition, companies are encouraged to take a pro-active approach to encourage and support smoking cessation programs for their employees by developing a smoke-free policy to protect all employees, service users, customers and visitors from exposure to second-hand smoke. The most effective way to avoid health problems associated with ETS is to prohibit smoking indoors. The relationship between smoking and various health risks, including lung disease, cancer, and heart disease, is well documented. A strong link between ETS and similar health risks has also been demonstrated. The objective is to have a smoke free facility. More public awareness is needed to address the dangers and hazards of smoking. Hence, convince owners, government and design engineers to implement needed measures to address this issue. The absence of a real intention to implement the new laws by the officials with regard to smoking in public buildings is a hindrance. Nevertheless, some businesses are creating smoke free offices.

2. **Jordan Green Building Council**
   • Action items that the JordanGBC can adopt to encourage and facilitate achievement of the prerequisite include the following:
     • Cooperate with various stakeholders to build on possible public-private partnership opportunities in the sector to raise public awareness of the health benefits of a smoke free environment.

3. **Government**
   • The government should play a major role to drive more positive change and impact in the market. This could be achieved through the following:
     • Adopting regulations to monitor and restrict the use of ETS products in all government, non-government, and commercial buildings. Government should intervene sincerely.
     • Collaborate with the private sector to educate the public on the benefits of a smoke free building through training and awareness programs.

4. **Local Rating System**
   The recommendation is to improve the prerequisite by restricting smoking in buildings. This action limits the exposure of building occupants to Environmental Tobacco Smoke (ETS), or second hand smoke. The recommendation is to keep only the prerequisite requirement to prohibit smoking in the building and prohibit on-property smoking within 25 feet (7.62 meters) of entries, outdoor air intakes and operable windows.

**Conclusion**

See overall conclusion of the IEQ section.
IEQ Credit 1: Outdoor Air Delivery Monitoring

Intent

To provide capacity for ventilation system monitoring to help promote occupant comfort and well-being.

Requirements (from LEED v3 & LEED Addenda BD+C 2009)

Install permanent monitoring systems to ensure that ventilation systems maintain design minimum requirements. Configure all monitoring equipment to generate an alarm when the airflow values or carbon dioxide (CO2) levels vary by 10% or more from the design values. This will be achieved via a building automation system alarm to the building operator or a visual or audible alert to the building occupants.

AND

Case 1: Mechanically Ventilated Spaces

Monitor CO2 concentrations within all densely occupied spaces (those with a design occupant density of 25 people or more per 1,000 square feet (92.9 square meters)). CO2 monitors must be between 3 and 6 feet above the floor.

Provide a direct outdoor airflow measurement device capable of measuring the minimum outdoor air intake flow with an accuracy of plus or minus 15% of the design minimum outdoor air rate, as defined by ASHRAE 62.1-2007 for mechanical ventilation systems where 20% or more of the design supply airflow serves non-densely occupied spaces.

Case 2: Naturally Ventilated Spaces

Monitor CO2 concentrations within all naturally ventilated spaces. CO2 monitors must be between 3 and 6 feet above the floor. One CO2 sensor may be used to monitor multiple spaces if the natural ventilation design uses passive stack(s) or other means to induce airflow through those spaces equally and simultaneously without intervention by building occupants.

Baseline Reference


Implementation Time Frame

Implementation of the following strategies is recommended to achieve this credit:

- **Outdoor Air Flow Monitoring:** Monitoring the outdoor air flow rate confirms that the HVAC equipment is providing the required ventilation rate. To satisfy the requirements of this credit, the measurement devices must detect when the system is 15% below the design minimum outdoor air rate. When the ventilation system fails to provide the required levels of outside air, the monitoring system should be configured to deliver a visible or audible alert to the system operator to indicate that operational adjustments might be necessary.
  
  The minimum outdoor air rate might change based on the design and modes of the HVAC system. Constant volume systems with steady-state design occupancy conditions usually have different outdoor air rates for weekdays, nighttime, and/or off-peak conditions. In variable air volume systems, the rate of outdoor air must remain above the design minimum, even when the supply air flow is decreased because of reduced thermal load conditions.

- **CO2 Monitoring:** CO2 monitors can also measure the effectiveness of the ventilation system in delivering outdoor air. Properly placed CO2 monitors can confirm that a ventilation system is functioning properly. There are two typical system configurations that generally meet the requirements of this credit.
The first approach involves CO2 sensors that use measured concentration to provide an alert if the ventilation system is not functioning properly. Locate CO2 monitors so that they provide accurate representative readings of the CO2 concentrations in occupied spaces. Multiple CO2 monitoring stations throughout occupied spaces provide better information and control than a single CO2 monitor for the entire system.

The second approach for buildings with HVAC systems that have limited airflow monitoring capabilities (small capacity air handling units or split systems) is to use differential CO2 monitoring to satisfy the credit requirements. This approach requires CO2 monitors in all occupied spaces, an outdoor CO2 monitor, and a means by which the air handling units can provide a greater amount of outside air if the CO2 delta between spaces reaches or exceeds 530 ppm.

The placement of outdoor air sensors and intakes should be coordinated with the design team before construction documents are prepared. Engage a mechanical engineer to work on issues related to outdoor air delivery monitoring no later than the design development phase.

Team Responsibility

MEP design engineers and building management.

Applicability in Jordan

This credit requires the installation of permanent CO2 monitoring systems. The CO2 monitoring systems should be integrated into the computer based Building Management Systems to control systems installed in the building which control and monitor the building’s mechanical and electrical systems. Presently, these systems are not prevalent in Jordan. This credit will require adding sensors and making modifications to control systems. The standards and technologies required to achieve this credit are not standard specifications in most projects and are considered costly. However the credit could be applied for some specific projects.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices:** Although BMS is globally popular and widely implemented, currently few buildings are designed with a complete BMS in Jordan. Owners and other stakeholders must be informed on the cost and benefits required to become familiarized on such systems.

- **Ease of Implementation:** Implementation of this credit requires educating and training engineers on the mechanical and electrical components of BMS systems. An awareness program is required to familiarize all involved parties with the benefits of pursuing this credit.

- **Cost:** The cost of implementing this credit is directly related to several LEED credits and the overall cost is shared amongst them in designing the BMS. CO2 monitors are not costly, if included in the overall BMS design, the monitoring system will require additional investment. Currently, the price of CO2 monitors is well below this figure in Jordan.

- **Feasibility:** Implementation of this credit is “somewhat” feasible, based on the overall requirements and current practices.
Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

1. Market
   To effectively design a BMS it is imperative that mechanical and electrical engineers fully understand applications that use BMS or Environmental Management Systems (EMS). The design needs to maintain set-points to adequately control environmental conditions. Such systems must be inspected periodically to verify the system is functioning properly which will require training for the facilities manager. In Jordan, suppliers should understand the cost reductions related to applying Building Management System BMS to buildings. Provide the building owner and facility manager with the information needed to understand, maintain, and use the monitoring system. Establish appropriate set-points and control sequences, as well as recommendations for typical corrective actions in the facility operating plan. Establish procedures and schedules for inspecting CO2 monitors and airflow monitoring stations, recalibrating sensors based on the manufacturer’s requirements, and testing and maintaining exhaust systems. These procedures should be included in the building’s preventive maintenance plan.

2. Jordan Green Building Council
   The Jordan Green Building Council can lobby for customs reductions on imported related systems and should hold information sessions on the benefits of BMS/EMS systems.

3. Government
   The government should play a major role to drive more positive change and impact in the market. This could be achieved through providing incentives to offset added cost of BMS and by eliminating sales tax and custom duties for BMS systems.

4. Local Rating System
   This will be addresses in future editions of the publication.

Conclusion

See overall conclusion of the IEQ section.

IEQ Credit 2: Increased Ventilation

Intent

To provide additional outdoor air ventilation to improve indoor air quality (IAQ) and promote occupant comfort, well-being, and productivity.

Requirements (from LEED v3 & LEED Addenda BD+C 2009)

Case 1: Mechanically Ventilated Spaces.

Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2007 as determined by IEQ Prerequisite 1: Minimum Indoor Air Quality Performance.

Case 2: Naturally Ventilated Spaces.

Determine that natural ventilation is an effective strategy for the project by following the flow diagram process shown in Figure 2.8 of the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual 10: 2005, Natural Ventilation in Non-domestic Buildings.
AND

Option 1

Show that the natural ventilation systems design meets the recommendations set forth in the CIBSE manuals appropriate to the project space.


OR

Option 2

Use a macroscopic, multi-zone, analytic model to predict that room-by-room airflows will effectively naturally ventilate, defined as providing the minimum ventilation rates required by ASHRAE Standard 62.1-2007 Chapter 6, for at least 90% of occupied spaces.

Baseline Reference

Mechanically Ventilated: Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE 62.1-2007.

Implementation Time Frame

Providing adequate ventilation is a key to maintaining superior IAQ. Building ventilation systems, including both active HVAC systems and natural ventilation systems, are designed and installed to introduce fresh outside air into the building while exhausting an equal amount of building air. HVAC systems also typically provide thermal comfort.

Most project teams decide early on whether to have a mechanical ventilation system, a passive ventilation system, or a combination of the two. In addition, project teams considering natural ventilation should evaluate site conditions and building design.

Team Responsibility

MEP, design engineers and owner.

Applicability in Jordan

This credit requires exceeding the fresh air requirements 30% above ASHRAE 62.1-2007 requirements, which is applicable in Jordan. However, meeting these provisions increases energy use and cost.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• **Current Practices:** Currently in Jordan building ventilation systems, including both active HVAC systems and natural ventilation systems, exceeding ASHRAE 62.1 2007- requirements are partially measured and/or designed. Therefore the project design team should work in a collaborative manner to ensure that the design and installation of the ventilation system (as a part of the BMS) meets the credit requirement and as a team work through the challenges they might face.

• **Ease of Implementation:** Implementation of the credit requires education and training for engineers on the methods and benefits of designing ventilation rates prescribed by ASHRAE 62.1 2007-, taking into account the potential maximum occupancy rates and potential IAQ problems from traffic exhaust, nearby polluting industries, and neighboring sites.

• **Cost:** The cost of implementing this credit is directly related to several LEED credits and the overall cost is shared amongst them in designing the BMS. This credit has a direct effect on added energy cost.

• **Feasibility:** Implementation of this credit is “somewhat” feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a medium priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   The intent of the credit is to design a system to condition the building according to the design temperature and rate for the entire volume of conditioned space, this results in a higher energy load. With high energy costs in Jordan, use CO2 sensors to modulate the fresh air intake or usage of simple timer devices to control fresh air intake during operating hours by using Demand Control Ventilation (DCV). In addition, fresh air can be provided to pass through a Heat Recovery Ventilator (HRV) to help offset the additional energy expense. Explore strategies to improve the efficiency of air distributions systems and proper evaluation of the design to attain the needed conditions.

2. **Jordan Green Building Council**
   This will be addresses in future editions of the publication.

3. **Government**
   • The government should play a major role to drive more positive change and impact in the market. This could be achieved through the following:
   • Encourage the practice of design systems that increase ventilation by offering incentives, rebates, and tax breaks to offset any added cost.
   • Again weigh out the cost benefit analysis for the added energy costs versus the reduced carbon footprint on a case by case basis.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

**Conclusion**

See overall conclusion of the IEQ section.

**IEQ Credit 3.1: Construction Indoor Air Quality Management Plan – During Construction**

**Intent**

To reduce Indoor Air Quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.
Requirements

Develop and implement an IAQ management plan for the construction and preoccupancy phases of the building as follows:

- During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 0082008- (Chapter 3).
- Protect stored on-site and installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.21999-. Replace all filtration media immediately prior to occupancy.

Baseline Reference


Implementation Time Frame

Complete the construction IAQ management plan before construction begins. The plan should include agenda items to be discussed regularly at preconstruction and construction meetings.

This credit requires continually educating subcontractors and field personnel and giving them the proper resources (e.g., collection bins, cleaning tools and materials) to reinforce the importance of following the procedural plans and encouraging compliance. When possible, the design team should select a member of the contractor's team to serve as the indoor air quality manager and take responsibility for identifying problems and implementing solutions. The referenced SMACNA standard recommends control measures in 5 areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each control measure and include those that apply in the final construction IAQ management plan.

The intent of this credit is to reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants. This will require a commitment from the contractor to ensure that the provided Construction IAQ Management Plan is applied by providing monthly photos of the practices.

Scheduling aspects of this credit are related to sequencing of demolition and construction procedures, as well as the installation of finish materials. It is best to select low-emitting materials and install products that emit Volatile Organic Compounds (VOCs) before installing absorbent materials, such as ceiling tiles, gypsum wallboard, fabric furnishings, carpet, and insulation. If possible, these materials should be stored in an isolated area to minimize contamination.

Give subcontractors and field personnel copies of the construction IAQ management plan prior to the initiation of work, and contractually require them to implement the applicable plan components. Post a copy of the plan in an obvious location on the job site and conduct periodic visual inspections to help enforce compliance. Maintaining a regular photo log of the prescribed strategies is advised.

Team Responsibility

Contractor and construction manager.

Applicability in Jordan

This credit requires cooperation between the construction team to ensure all control measures are enforced. This is a project management credit and with due diligence can easily be achieved with a detailed oriented team. As with all LEED projects, this credit is easy to achieve by having an integrated team and a site LEED compliance officer to ensure measures are enforced.
Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<thead>
<tr>
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<th>Feasibility</th>
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</thead>
<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy Med Hard Low Med High Feasible Med Not Feasible</td>
</tr>
<tr>
<td></td>
<td>X</td>
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</table>

- **Current Practices**: In Jordan this particular credit requirement is not practiced.

- **Ease of Implementation**: The creation and implementation of an IAQ management plan for the construction process is not typical in Jordan. However, to implement the IAQ management plan is easy, it requires specifying the installation sequence of absorptive materials, temporary ventilation, and baseline indoor air quality; which should be included in the project specifications. It is important to note linkages between credits to fully understand actions taken for one credit can impact achieving another related credit. For example this credit requires filtration media of MERV 8 filter to be replaced immediately prior to occupancy. However, if the project is attempting IEQ Credit 5 the filtration media must be MERV 13 or higher prior to occupancy. Failing to see this linkage will result in not achieving IEQ Credit 5. Therefore, when managing a LEED project, one must fully understand all the linkages between each credit.

- **Cost**: Developing an IAQ management plan negatively impacts the project cost, as it is basically a ‘manageable’ credit. Added costs are associated with additional man-hours related to enforcing on-site compliance and filtration media.

- **Feasibility**: Implementation of this credit is very feasible.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**
   The intent of the credit is to develop and implement an IAQ management plan which can easily be achieved by the contractor. However, contractors in Jordan will need training and education on the requirements; sequencing of deliveries, protecting the HVAC system, keeping the site clean, protecting IAQ from contamination during construction by isolating construction areas, and monitoring the process of the IAQ management plan. The contractor should discuss the IAQ management plan during regular construction meetings. It is recommended that project stakeholders require contractors to submit IAQ management plan status reports monthly. Finally, it is recommended to hold a close out meeting once all the IAQ management plan elements are completed. Project stakeholders should require regular site meetings to educate contractors and sub-contractors of the requirements regularly; this can be done by the project manager and/or LEED AP. This credit needs to be carefully documented including maintaining a photo log of the process and compliance. Construction activities can affect the IAQ of the building long after occupancy. Successfully implementing a construction IAQ management plan, selecting low-emitting finish materials and furnishings, and isolating indoor pollutant sources will reduce levels of indoor contaminants. The purpose in doing an IAQ management plan is to reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.

2. **Jordan Green Building Council**
   JordanGBC can raise awareness among contractors on the implementation and management of an Indoor Air Quality Management Plan for the construction phase of the building.
3. Government
This will be addressed in future editions of the publication.

4. Local Rating System
This will be addressed in future editions of the publication.

Conclusion
See overall conclusion of the IEQ section.

IEQ Credit 3.2: Construction Indoor Air Quality Management Plan – Before Occupancy

Intent
To reduce Indoor Air Quality (IAQ) problems resulting from construction or renovation to promote the comfort and well-being of construction workers and building occupants.

Requirements
Develop an IAQ management plan and implement it after all finishes have been installed and the building has been completely cleaned prior to occupancy.

Option 1: Flush-Out (All finishes must be installed prior to flush-out).

Path 1
After construction ends, prior to occupancy and with all interior finishes installed, 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 (4267 cubic meter of outdoor air per square meter of floor area), while maintaining an internal temperature of at least 60 °F (15.5 °C) and relative humidity no higher than 60%.

OR

Path 2
If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area. Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic feet per minute (cfm) per square foot (0.0914 cubic meters per minute per square meter) of outside air or the design minimum outside air rate determined in IEQ Prerequisite 1: Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation must begin a minimum of 3 hours prior to occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outside air (4267 cubic meter of outdoor air per square meter of floor area) has been delivered to the space.

Baseline Reference
Building flush-out with fresh air by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area (4267 cubic meter of outdoor air per square meter of floor area), maintaining internal temperature of 60°F (15.5 °C) and relative humidity no higher than 60%.
Implementation Time Frame

Flush-Out Procedure:

This compliance path uses the building HVAC system to evacuate airborne contaminants. The flush-out can begin only after all construction work, including punch-list items, is completed. Finalize all cleaning, complete the final test and balancing of HVAC systems, and make sure the HVAC control is functional prior to the flush-out. Commissioning can occur during the flush-out if it does not introduce any additional contaminants into the building.

The flush-out procedure discussed below assumes that the building’s HVAC system will be used, but alternatives are acceptable if they meet the air quantity, temperature, and humidity requirements. One approach uses temporary supply and exhaust systems placed in windows or window openings.

If the space’s central HVAC system is used, remove any temporary filters and duct coverings installed as part of the construction IAQ management plan. Replace the HVAC filtration media with new media; if the system is configured to filter outside air only, the filters do not need to be replaced. New filters that meet the design specification and that were installed prior to the start of the flush-out will also satisfy the requirements of IEQ Credit 3.1, Construction IAQ Management Plan during Construction. When attempting to earn IEQ Credit 5, Indoor Chemical and Pollution Source Control, these filters must be MERV 13 or better. Depending on their condition following the flush-out, some or all of the filters may require replacement, but this is not a condition for satisfying the credit requirements.

Outside air is used to dilute and remove off-gassed contaminants. The quantity of outside air that must be introduced to the project space for the flush-out is 14,000 cubic feet of air per square foot of floor area (4267 cubic meter of outdoor air per square meter of floor area). Occupants may move in only after the initial flush-out phase, when 3,500 cubic feet of air per square foot has been replaced. However, the initial flush-out phase does not signal the completion of the flush-out. A total of 14,000 cubic feet of outside air must be supplied per square foot of floor area (4267 cubic meter of outdoor air per square meter of floor area) before the HVAC system is switched to its normal operational mode.

The rate of outside air should not cause the interior temperature to drop below 60ºF, and relative humidity should not exceed 60%.

During an occupied flush-out phase, a minimum ventilation rate must begin at least 3 hours before daily occupancy and continue while the space is occupied. The rate of outside air must be at least 0.30 cubic feet per minute per square foot (0.0914 cubic meters per minute per square meter) or the design minimum outside air rate, whichever is greater. The design minimum outside air rate should be determined using ASHRAE 62.1–2007, the same criteria for IEQ Prerequisite 1, Minimum Indoor Air Quality Performance, or the applicable local code if it is more stringent. The 0.30 cubic feet per minute per square foot (0.0914 cubic meters per minute per square meter) rate may be several times the ASHRAE 62.1–2007 requirement for a project’s planned occupancy. As a result, consider the minimum flush-out rate during the early stages of HVAC design.

During the design phase, the general contractor should develop and implement a construction IAQ management plan that includes a flush-out procedure that meets the requirements of this credit. After construction and installation of all finishes (including furniture and furnishings), conduct the flush-out procedure as per the construction IAQ management plan and in accordance with the requirements of this credit.

Team Responsibility

Contractor and construction manager.

Applicability in Jordan

This credit requires cooperation between the construction team to ensure all control measures are enforced. This is a project management credit and with due diligence can easily be achieved with a detailed oriented team. As with all LEED projects, this credit is easy to achieve by having an integrated team and a site LEED compliance officer to ensure measures are enforced.
Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
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</table>

- **Current Practices**: In Jordan this particular credit requirement is not in practice.

- **Ease of Implementation**: Implementing this credit in Jordan requires some effort to educate and train engineers and contractors of the methods and benefits of completing a flush-out. Input from the entire project team will help determine the best approach. When completed, make the evaluation and the resulting flush-out strategy part of the IAQ management plan. However, Option 2 Air Quality Testing is not attainable in Jordan due to lack of air testing equipment and qualified companies to perform air testing according to LEED requirements.

- **Cost**: The cost of doing a flush-out varies depending on expense and operational issues to consider, such as the rent or lease details or the HVAC system’s capacity to accommodate the flush-out criteria.

- **Feasibility**: Implementation of this credit is somewhat feasible.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Project teams should be aware that some additional time and labor may be required during and after construction to protect and clean ventilation systems. With early coordination for the sequencing of material installation and coordination between the contractor and subcontractors, the team can minimize or eliminate scheduling delays. In Jordan, there are concerns that there could be difficulty in maintaining internal temperature of 60°F (15.6 °C) and relative humidity no higher than 60%, during controlled flush-out, particularly making sure the HVAC system can maintain temperatures within a range that is comfortable for the occupants; opinions formed during this period may last long after the system is operating normally. During the analysis it was determined to eliminate Option 2 Air Quality Testing, because currently in Jordan companies required to perform air testing under option 2 are not available.

2. **Jordan Green Building Council**
   JordanGBC should raise awareness among contractors on the implementation of an Indoor Air Quality Management Plan for the preoccupancy phase of the building. This action will facilitate a clearer understanding of IAQ issues and management.

3. **Government**
   The government should play a major role to drive more positive change and impact in the market by mandating Flush-Out Procedures prior to and/or during occupancy.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

Conclusion

See overall conclusion of the IEQ section.
IEQ Credit 4.1 to 4.4: Low-Emitting Materials

The sections under IEQ Credit 4, Low-Emitting Materials, apply to products and installation processes that have the potential to adversely affect the IAQ of a project space and, subsequently, those occupants exposed to the off-gassing of contaminants from these materials. IEQ Credits 4.1, 4.2, 4.3 and 4.4 are an important part of the IAQ management plan.

IEQ Credit 4.1: Low-Emitting Materials – Adhesives and Sealants

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of installers and occupants.

Requirements

All adhesives and sealants used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must comply with the following requirements as applicable to the project scope. (The use of a VOC budget is permissible for compliance with this credit):

- Adhesives, Sealants and Sealant Primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168. Volatile organic compound (VOC) limits listed in the table below correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

Baseline Reference


Implementation Time Frame

Composition Limits:

All materials that emit contaminants that might enter the indoor air are considered indoor contaminant sources. They include all surfaces in contact with indoor air; such as flooring; walls; ceilings; interior furnishings; suspended ceiling systems and the materials above those suspended ceilings; ventilation system components that contact the ventilation supply or return air; and all materials inside wall cavities, ceiling cavities, floor cavities, or horizontal or vertical chases. This includes caulking materials for windows and ceiling or wall insulation. In this approach, the formulation of a product is controlled. The amount of VOCs permitted in a given volume of a product is limited. The threshold limits and content within a particular product are generally expressed in grams per liter (g/L).

IEQ Credit 4.1 requires the specification of adhesives and sealants that comply with listed VOC limits, and to ensure only those products are used on the project. Low-VOC products should be selected prior to the beginning of construction and the accepted product list is given to the contractor and sub-contractors. This credit requires a higher percentage of documentation requirements; due the tracking, collection and submittal of product cut sheets.

The requirements for products and activities covered in IEQ Credit 4, Low-Emitting Materials, should be noted in the project specifications and, ideally, within the specific section applicable to a particular trade or supplier. Clearly state the credit requirements in project specifications. Indicate what must be provided in the way of cut sheets, MSD sheets, certificates, and test reports. Consider making submittal of this compliance documentation a condition of product approval.
Team Responsibility

Contractor, construction manager, and specifiers.

Applicability in Jordan

To apply this credit in Jordan is achievable but with difficulty. This is due in part that complying products are not easily available in Jordan.

Credit Prioritization

IE This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

<table>
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- **Current Practices:** In Jordan, the requirements for IEQ Credit 4.1, Low-Emitting Materials-Adhesives and Sealants, are not typical practice for construction teams and suppliers.

- **Ease of Implementation:** To implement this credit requires the specification of adhesives and sealants that are low in total Volatile Organic Compounds (VOCs). Currently, in Jordan these products are not readily available and when specified will have to be shipped from abroad. The project owner should stress the importance of meeting the LEED requirements during pre-bid meetings and again at the time the contract is awarded. During these sessions, a LEED Accredited Professional should be available and ask for questions. Include requirements in subcontracts, construction specifications, and purchase orders. Contractors and the design team should communicate early in the process to ensure the availability of supplies. Complying products need to be tracked and there are many free tools online to assist in keeping track of all Credit 4 – low-emitting products.

- **Cost:** There are numerous costs associated with specifying versus not specifying low-emitting products. One must look at the transportation cost, environmental cost, and health cost. These costs have an impact on the overall approach to responsible design and construction. Importing these products increases the projects carbon footprint, price, and does not support regional materials. In general, these products are not an expensive item in the construction budget, however the true cost must be measured both financially, environmentally, and by the health of building occupants. It is important for project teams to discuss all the costs and especially not to ignore the health cost of the occupants before deciding whether or not to specify low-emitting materials. Using low-VOC products is beneficial to building occupants & construction workers and improves the air quality which assists the IAQ management plan.

- **Feasibility:** Implementation of this credit is somewhat feasible, due in part of the local market conditions.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a medium priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Materials with high-VOC content can threaten occupant health and may decrease productivity. Because of these issues, the construction market is driving product manufacturers to offer low-VOC alternatives to conventional building products. However, currently in Jordan such products are not widely available.
Low-VOC alternatives may also be difficult to obtain for some product types. Eventually, the hope is that manufacturers in Jordan will produce complying products to offset the negative environmental impacts of importing these products. In doing so Jordanian manufacturers will provide products to improve the indoor air quality thus creating healthier indoor environments for the building occupants as well as the construction team. These issues likely will fade as use of low-VOC products become more widely available and routine procedure.

2. Jordan Green Building Council
   JordanGBC should lobby for material labeling requirements as a regulated standard in Jordan.

3. Government
   4. The government should play a major role to drive more positive change and impact in the market by mandating:
      • Enforcing material labeling equipment.
      • Provide an incentive plan to offset added cost.
      • Provide tax exemptions on complying products.

5. Local Rating System
   This will be addresses in future editions of the publication.

Conclusion

See overall conclusion of the IEQ section.

IEQ Credit 4.2: Low-Emitting Materials – Paints and Coatings

Intent

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements (from LEED v3 & LEED Addenda BD+C 2009)

Paints and coatings used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must comply with the following criteria as applicable to the project scope, (The use of a VOC budget is permissible for compliance with this credit):


Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti Corrosive Paints, 2nd Edition, January 7, 1997.

Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established for those coatings types in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

Baseline Reference

Green Seal Standard GS–11, Green Seal Standard GC–03.

Implementation Time Frame

Composition Limits:

All materials that emit contaminants that might enter the indoor air are considered indoor contaminant sources. They include all surfaces in contact with indoor air; such as flooring; walls; ceilings; interior furnishings; suspended
ceiling systems and the materials above those suspended ceilings; ventilation system components that contact the ventilation supply or return air; and all materials inside wall cavities, ceiling cavities, floor cavities, or horizontal or vertical chases. This includes caulking materials for windows and ceiling or wall insulation. In this approach, the formulation of a product is controlled. The amount of VOCs permitted in a given volume of a product is limited. The threshold limits and content within a particular product are generally expressed in grams per liter (g/L).

IEQ Credit 4.2 – requires the specification of paints and coatings that comply with listed VOC limits, and to ensure only those products are used on the project. Low-VOC products should be selected prior to the beginning of construction and the accepted product list given to the contractor and sub-contractors. This credit requires a higher percentage of documentation requirements; due the collection, tracking and submittal of product cut sheets.

The requirements for products and activities covered in IEQ Credit 4, Low-Emitting Materials, should be noted in the project specifications and, ideally, within the specific section applicable to a particular trade or supplier. Clearly state the credit requirements in project specifications. Indicate what must be provided in the way of cut sheets, MSD sheets, certificates, and test reports. Consider making submittal of this compliance documentation a condition of product approval.

Team Responsibility

Contractor, construction manager, and specifiers.

Applicability in Jordan

To apply this credit in Jordan is achievable. This is due in part that complying products are widely available in Jordan.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<td>Easy</td>
</tr>
<tr>
<td>X</td>
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</table>

- **Current Practices**: In Jordan many project teams are specifying low VOC paints. However, finishes, coatings, stains, primers and shellacs are not currently being specified low-VOC. In Jordan low VOC paints are readily available in the market, the other complying products mentioned above are harder to find and have a slightly higher premium.

- **Ease of Implementation**: To implement this credit requires specification of selected materials that are low in total VOCs. Currently in Jordan most of these products are readily available, while some are harder to find than others. The project owner should stress the importance of meeting the LEED requirements during pre-bid meetings and again at the time of contract award. During these sessions, have LEED Accredited Professionals available and ask for questions. Include requirements in subcontracts, construction specifications and purchase orders. Contractors and the design team should communicate early in the process to ensure the availability of supplies. Complying products need to be tracked and there are many free tools online to assist in keeping track of all Credit 4 – low-emitting products.

- **Cost**: Making use of these products should have only minimal – if any – impact on cost, as these are usually widely available. It is important to note the gained costs associated to better occupant’s health when implementing this credit.

- **Feasibility**: Implementation of this credit is very feasible, due in part of the local market conditions.
Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a high priority.

Recommendations to Achieve Credit Intent

1. **Market**
   Materials with high-VOC content can threaten occupants' health and may decrease their productivity. Because of these issues, the construction market is driving product manufacturers to offer low-VOC alternatives to conventional building products. Currently in Jordan these products are widely available and cost effective.

2. **Jordan Green Building Council**
   JordanGBC should lobby for material labeling requirements as a regulated standard in Jordan.

3. **Government**
   The government should play a major role to drive more positive change and impact in the market by mandating:
   - Enforcing material labeling equipment.
   - Provide an incentive plan to offset added cost.
   - Provide tax exemptions on complying products.
   - Encourage the manufacturing and use of locally made low emitting flooring systems.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

Conclusion

See overall conclusion of the IEQ section.

**IEQ Credit 4.3: Low-Emitting Materials – Flooring Systems**

**Intent**

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

**Requirements (from LEED v3 & LEED Addenda BD+C 2009)**

**Option 1**

All flooring must comply with the following as applicable to the project scope:

1. All carpet installed in the building interior must meet the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
2. All carpet cushion installed in the building interior must meet the requirements of the Carpet and Rug Institute Green Label 1 program.
3. All carpet adhesive must meet the requirements of IEQ Credit 4.1: Adhesives and Sealants, which includes a volatile organic compound (VOC) limit of 50 g/L.
4. All hard surface flooring must meet the requirements of the FloorScore Standard (current as of the date of this rating system, or more stringent version) as shown with testing by an independent third-party. Mineral-based finish flooring products such as tile, masonry, terrazzo, and cut stone without integral organic-based coatings and sealants and unfinished/untreated solid wood flooring qualify for the credit without any IAQ testing requirements. However, associated site-applied adhesives, grouts, finishes and sealers must be compliant for a mineral-based or unfinished/untreated solid wood flooring system to qualify for credit.
5. Concrete, wood, bamboo and cork floor finishes such as sealer, stain, and finish must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
6. Tile setting adhesives and grout must meet South Coast Air Quality Management District (SCAQMD) Rule 1168 VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

OR

Option 2

All flooring elements installed in the building interior must meet the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda. Mineral-based finish flooring products such as tile, masonry, terrazzo, and cut stone without integral organic-based coatings and sealants and unfinished/unbated solid wood flooring qualify for credit without any IAQ testing requirements. However, associated site-applied adhesives, grouts, finishes and sealers must be compliant for a mineral-based or unfinished/untreated solid wood flooring system to qualify for credit.

Baseline Reference


Implementation Time Frame

Composition Limits:

All materials that emit contaminants that might enter the indoor air are considered indoor contaminant sources. They include all surfaces in contact with indoor air, such as flooring; walls; ceilings; interior furnishings; suspended ceiling systems and materials above those suspended ceilings; ventilation system components that contact the ventilation supply or return air; and all materials inside wall cavities, ceiling cavities, floor cavities, or horizontal or vertical chases. This includes caulking materials for windows and ceiling or wall insulation. In this approach, the formulation of a product is controlled. The amount of VOCs permitted in a given volume of a product is limited. The threshold limits and content within a particular product are generally expressed in grams per liter (g/L).

IEQ Credit 4.3 requires that all flooring and floor coverings meet the required standards. This credit requires sufficient time to research complying products, adhesives, sealants, and coatings that meet the listed standards. Many of the products used for this credit will have to be documented twice; once for IEQ Credit 4.1 or IEQ Credit 4.2. Complying products should be selected prior to the beginning of construction and the accepted product list is given to the contractor and sub-contractors. This credit requires a higher percentage of documentation requirements; due the collection, tracking and submittal of product cut sheets.

The requirements for products and activities covered in IEQ Credit 4.3, Low-Emitting Materials – Paints and Coatings, should be noted in the project specifications and, ideally, within the specific section applicable to a particular trade or supplier. Clearly state the credit requirements in project specifications. Indicate what must be provided in the way of cut sheets, MSD sheets, certificates, and test reports. Consider making submittal of this compliance documentation a condition of product approval.

Team Responsibility

Contractor, construction manager and specifiers.

Applicability in Jordan

To apply this credit in Jordan is achievable with difficulty. This is due in part that complying products and materials are not easily available; all CRI and FloorScore products, along with these products adhesives and coatings, must be imported.
Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<thead>
<tr>
<th>Current Practices</th>
<th>Ease of Implementation</th>
<th>Cost</th>
<th>Feasibility</th>
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<tbody>
<tr>
<td>Already Done</td>
<td>Partially Done</td>
<td>Not Done</td>
<td>Easy</td>
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- **Current Practices:** In Jordan the requirements of this credit are not addressed.
- **Ease of Implementation:** To implement this credit requires the specification of selected flooring and flooring coverings that meet the stated required standards. To implement this credit all complying products must be imported to Jordan. Hard flooring surfaces installed must be FloorScore certified. The only exception to the hard surfaces not being certified is newly installed raw materials, such as wood and concrete, however coatings and finishes apply to them must meet the requirements of IEQ4.2. Other hard flooring types that must be FloorScore certified is prefinished wood flooring, rubber flooring, and resilient flooring. All carpet installed must be certified Green Label Plus while padding must be certified Green Label. All adhesives and coatings associated with these products must meet the requirements of IEQ Credit 4.1 and/or IEQ Credit 4.2. The required products are not available in Jordan and not easily attainable, thus it is very difficult to implement this credit. However, this credit can be achieved in Jordan if concrete, wood, tile, masonry, terrazzo, cut stone, are installed “raw” using low-emitting coatings and sealants or installed without any coating or sealant.

- **Cost:** These products have a higher cost premium, in addition to the high cost of importing. However, cost can be low if regional concrete, wood, tile, masonry, terrazzo, cut stone, are installed using no coating or sealant.

- **Feasibility:** Implementation of this credit is not feasible, due in part of the stringent credit requirement and lack of available products in Jordan.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a low priority.

Recommendations to Achieve Credit intent

1. **Market**
   This credit’s intent is to reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants. Flooring materials with high-VOC content can threaten occupants’ health and may decrease their productivity. Currently in Jordan such products are not available locally and expensive to import and maintain. However, project teams in Jordan can achieve this credit by installing raw materials, as described above, and ensure all adhesives and coatings meet the requirement of IEQ Credit 4.2. However, it is important to note that this credit is for ALL flooring installed so if a non-complying floor, such as a carpeted office, is installed as part of the project the credit will not be achieved.

2. **Jordan Green Building Council**
   JordanGBC should lobby for material labeling requirements as a regulated standard in Jordan.

3. **Government**
   The government should play a major role to drive more positive change and impact in the market by mandating:
   - Enforce material labeling equipment.
   - Provide an incentive plan to offset added cost.
   - Provide tax exemptions on complying products.
   - Encourage the manufacture and use of locally made low emitting flooring systems.

4. **Local Rating System**
   This will be addressed in future editions of the publication.
Conclusion
See overall conclusion of the IEQ section.

IEQ Credit 4.4: Low-Emitting Materials – Composite Wood & Agrifiber Products

Intent
To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

Requirements (from LEED v3 & LEED Addenda BD+C 2009)
Composite wood and agrifiber products used on the interior of the building (i.e., inside the weatherproofing system) must contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde resins. Composite wood and agrifiber products are defined as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores. Materials considered fixtures, furniture, and equipment (FF&E) are not considered base building elements and are not included.

Baseline Reference
No Added Urea Formaldehyde resins in composite wood and agrifiber products.

Implementation Time Frame

Composition Limits:
All materials that emit contaminants that might enter the indoor air are considered indoor contaminant sources. They include all surfaces in contact with indoor air, such as flooring; walls; ceilings; interior furnishings; suspended ceiling systems and the materials above those suspended ceilings; ventilation system components that contact the ventilation supply or return air; and all materials inside wall cavities, ceiling cavities, floor cavities, or horizontal or vertical chases. This includes caulking materials for windows and ceiling or wall insulation. In this approach, the formulation of a product is controlled. The amount of VOCs permitted in a given volume of a product is limited. The threshold limits and content within a particular product are generally expressed in grams per liter (g/L). IEQ Credit 4.4 requires that ALL composite products and laminating adhesives must not have any added urea formaldehyde (UF) resins in the product. This includes products that are manufactured off site. This credit requires sufficient time to research complying products. Complying products should be selected prior to the beginning of construction and the accepted product list is given to the contractor and sub-contractors. This credit requires a higher percentage of documentation requirements; due to the collection, tracking, and submittal of product cut sheets.

The requirements for products and activities covered in IEQ Credit 4.4, Low-Emitting Materials – Composite Wood & Agrifiber Products, should be noted in the project specifications and, ideally, within the specific section applicable to a particular trade or supplier.

Clearly state the credit requirements in project specifications. Indicate what must be provided in the way of cut sheets, MSD sheets, certificates, and test reports. Consider making submittal of this compliance documentation a condition of product approval.

Team Responsibility
Contractor, construction manager and specifiers.
Applicability in Jordan

To apply this credit in Jordan is very difficult. This is due in part that complying products and materials are not easily available, are expensive, and not regularly used on a large scale to justify the added cost of importing them.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices:** In Jordan the requirements of this credit are not being addressed. Some composite wood material is being used on projects; however UF free products are not available in the market. As stated in the section for this credit, the requirement is NO added Urea Formaldehydes; other naturally occurring formaldehydes are permissible, such as Phenol and Melamine. Therefore, the product could have some other form of formaldehyde that is naturally found in the product, but cannot have any added Urea Formaldehyde.

- **Ease of Implementation:** In many composite wood products, including particleboard, wheatboard, and medium density fiberboard (MDF) urea formaldehyde-based resins are the typical binders used to glue the particles together. Urea formaldehyde has been linked to bronchial health problems and cancer. Currently, several manufacturers are changing the formulas and technology to reduce the emission from urea formaldehyde or to make products free of all added urea formaldehyde resins. To implement this credit in Jordan requires the specification and installation of ALL particleboard, MDF, plywood, wheatboard, strawboard, panel substrates, door cores, composite I-beams, and laminating adhesives used for assembles to be UF free. It is important to distinguish between other formaldehydes that occur naturally, such as phenol and melamine which are allowed. The contractor must have cut sheets on complying products to verify that the product is UF free 100%, not 99.8%. This is an all or nothing credit. Complying products must be imported to Jordan, which increases the product cost and lead time. Sometimes overlooked for this credit is the requirement that the adhesives used to laminate products such as, doors, flooring, countertops, millwork etc. also must not have UF which is challenging in Jordan because UF free adhesives are not readily available.

- **Cost:** These products have a higher cost premium, in addition to the high cost of importing.

- **Feasibility:** Implementation of this credit is not feasible, due in part of the stringent credit requirement and lack of available product in Jordan.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a low priority.

Recommendations to Achieve Credit Intent

1. **Market**
   The required products are not available in Jordan and not easily attainable thus it is very difficult to implement this credit. On a side note, exterior- grade plywood is routinely manufactured without added urea formaldehyde due to the fact that urea formaldehyde is not moisture-resistant. However, these products still need to be verified with manufactures cut sheets. The current condition in the Jordanian market does not support UF free practices in the manufacturing process. It is recommended to start moving manufacturers in the direction of producing products that are free of any resins that include added urea formaldehyde. There are several alternatives resins that are being used and
furthered developed as an alternative: methyl diisocyanate (MDI), a polyurethane binder, and soy-based binders. Both alternative binders are currently used by some manufactures with great results. Most alternative binders are more expensive than urea formaldehyde binders; the price of manufactured wood product will be higher as the market shifts from urea formaldehyde, which is less expensive resin. The result of using UF free resins/products is better indoor air quality for building occupants which equates to greater health benefits.

2. **Jordan Green Building Council**
   JordanGBC should lobby for material labeling requirements as a regulated standard in Jordan.

3. **Government**
   - The government should play a major role to drive more positive change and impact in the market by mandating:
     - Enforcing material labeling equipment.
     - Provide an incentive plan to offset added cost.
     - Provide tax exemptions on complying products.
     - Encourage the manufacturing and use of locally produced composite wood and agrifiber products made without added urea formaldehyde resins.
     - Monitor and inspect manufactures to ensure products are manufactured without added urea formaldehyde.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

**Conclusion**
See overall conclusion of the IEQ section.

**IEQ Credit 5: Indoor Chemical & Pollutant Source Control**

**Intent**
To minimize building occupant exposure to potentially hazardous particulates and chemical pollutants.

**Requirements (from LEED v3 & LEED Addenda BD+C 2009)**

Design to minimize and control the entry of pollutants into buildings and later cross contamination of regularly occupied areas through the following strategies:

1. Employ permanent entryway systems at least 10 feet (3.0 meters) long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Acceptable entryway systems include permanently installed grates, grills, and slotted systems that allow for cleaning underneath. Roll-out mats are acceptable only when maintained on a weekly basis by a contracted service organization (or school maintenance staff for school projects). Core & Shell projects that do not have entryway systems cannot achieve this credit.

2. Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g. garages, housekeeping and laundry areas, science laboratories, prep rooms, art rooms, shops of any kind, and copying & printing rooms) to create negative pressure with respect to adjacent spaces when the doors to the room are closed. For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling. The exhaust rate must be at least 0.50 cubic feet per minute (cfm) per/square foot, with no air recirculation. The pressure differential with the surrounding spaces must be at least 5 Pascals (Pa) (0.02 inches of water gauge) on average and 1 Pa (0.004 inches of water) at a minimum when the doors to the rooms are closed.

3. In mechanically ventilated buildings, each ventilation system that supplies outdoor air shall comply with the following:
   - Particle filters or air cleaning devices shall be provided to clean the outdoor air at any location prior to its introduction to occupied spaces.
   - These filters or devices shall be rated a minimum efficiency reporting value (MERV) of 13 or
• Clean air filtration media shall be installed in all air systems after completion of construction and prior to occupancy.

Baseline Reference


This standard presents methods for testing air cleaners for 2 performance characteristics: the device’s capacity for removing particles from the air stream and the device’s resistance to airflow. The minimum efficiency reporting value (MERV) is based on 3 composite average particle size removal efficiency points. Consult the standard for a complete explanation of MERV calculations.

Implementation Time Frame

The Indoor Air Quality (IAQ) of buildings can be adversely affected by daily occupancy and operations. Occupants and building visitors contribute to indoor IAQ issues by introducing contaminants via shoes and clothing. Daily copier, fax, and printer operations add contaminants to the building’s interior environment. This credit seeks to improve a building’s IAQ and limit the amount of particulate, chemical, and biological contaminants to which occupants are exposed.

During the early planning stage of a project, the design team should document the client’s equipment requirements and usage patterns. This information will be critical in determining whether dedicated isolated rooms will be required to house copier, fax, and printing equipment.

During the design phase, the architect should consider the location and type of entryway systems and allow adequate space for entryway systems. During the schematic design phase, the team should confirm the locations of areas where chemicals and high-volume copy, fax, and printing equipment will be used. It may be possible to locate such rooms above or adjacent to one another to make individual exhaust systems unnecessary and minimize exhaust ductwork. Also confirm that chemical and equipment rooms are properly isolated from adjacent spaces. The mechanical engineer should incorporate MERV 13 filters, dedicated exhaust systems; these elements will affect the fan sizing, shaft layout, and underground coordination. Install and then commission the space exhaust systems to ensure that they meet owner requirements and the design intent.

Team Responsibility

Owner, engineers, manager, contractor, and architect.

Applicability in Jordan

To apply some of the requirements of this credit in Jordan is somewhat difficult, and impacts project operations and design.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• **Current Practices:** In Jordan the requirements of this credit are not sufficiently addressed. This credit entails control of indoor pollutants, from the HVAC system, the walk-off system, and any chemicals that will be present in the building. Currently in Jordan there is an effort to control dirt and dust from entering buildings; however the protection of the ventilation system during construction is not typical to the degree that is outlined to meet this credit requirement. In addition, hazardous chemical areas defined by LEED are not perceived as hazardous in Jordan; high-volume copiers, printers, and faxes. According to LEED the distinction of what a high volume copier is one that produces 40,000+ pages per month. The practice of installing new filtration media (MERV 13+) prior to occupancy, if used during construction presently is not done. In Jordan entry carpets or mats are fairly common; however the requirement for LEED is very specific and not fully implemented in Jordan. Jordan currently does not have a Roll-out mat service company to facilitate the change-out of the mats on a weekly bases - This must be an independent contracted service, not in-house. The only option projects have in Jordan is to install a permanent walk-off grate system, which must be imported.

• **Ease of Implementation:** The implementation of this credit can be difficult and will necessitate proper planning and management. The concept presented in the credit is new for Jordan and will require design and construction teams to put forth effort as this is a fully integrated design credit. During design development all programming requirements will have to be addressed by all parties to ensure that identified hazardous rooms are incorporated into the design, all regularly used entries are designed with space requirements for the installed walk-off system, and the mechanical ventilation system is sized appropriately. This credit needs full collaboration between the design and construction teams. The challenge in Jordan is to educate the public on indoor environmental health issues that are a directly linked to indoor air quality. To achieve this credit all items outlined above must be fully met. The project team needs to review the requirements of the credit and decide if one LEED Point is worth the implementation and added cost associated with obtaining this credit. Nevertheless, all project teams need to be fully aware of the benefits of healthy indoor environment when applying such measures and to control the sources of pollutants whether implementing this credit or not.

• **Cost:** This credit is typically a low-cost credit, however in Jordan this is not the case. The added cost designing the exhaust systems for hazardous rooms, the cost of importing and installing permanent walk-off systems that comply with the credit requirement and the use of MERV 13 filters have significant associated costs.
  1. To control chemicals and hazardous gases in contained negative pressured rooms with self-closing doors and deck to deck partitions with no air recirculation, will require additional engineering.
  2. MERV 13 filtration media is available in the market and does not pose an issue with direct product cost. However, the use of MERV 13 or higher filtration media can have a direct impact on operational costs by the added use of energy and the need to change the filter frequently.
  3. Importing permanent entry-way systems is expensive. The systems typically are priced at a premium and must be climate specific.

• **Feasibility:** Implementation of this credit is not feasible, due in part of the stringent and multiple credit requirements.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a low priority.

**Recommendations to Achieve Credit Intent**

This will be addresses in future editions of the publication.

**Conclusion**

See overall conclusion of the IEQ section.
IEQ Credit 6.1: Controllability of Systems - Lighting

Intent

To provide a high level of lighting system control by individual occupants or groups in multi-occupant spaces (e.g., classrooms and conference areas) and promote their productivity, comfort, and well-being.

Requirements

Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.

Provide lighting system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Baseline Reference

None.

Implementation Time Frame

Many conventional buildings have only fixed-intensity general lighting systems that illuminate indoor spaces without consideration for specific tasks and individual occupant comfort or needs. A better approach provides uniform general ambient lighting, augmented with individually controlled task fixtures.

To comply with ANSI/ASHRAE/IESNA 90.1–2007, task lighting must be included in the lighting allowance. Daylighting can be integrated with this credit by using technologies and strategies to compensate for reduced luminance levels. It is important to determine if any installed lighting systems or controls will require special calibration, commissioning, or occupant training.

- Adjustable Task Lighting:
  - Identify workstation locations intended for individual use. Include every individual workspace (e.g., private offices, open plan workstations, reception stations, ticket booths). Confirm that 90% or more of the occupants of these spaces have task lighting that enables adjustment to suit individual needs. At a minimum, the occupant must be able to turn the fixture on and off.

- Shared Multi-occupant Spaces:

- In conference rooms, classrooms, lounges, and indoor spaces used for presentations and training, the group should have access to adequate controls to suit their activities.

- Offices and Other Regularly Occupied Spaces:

- Count the workstations intended for individual use. The office and equipment layout should be carefully analyzed to ensure that 90% or more of these occupants have individual lighting controls that enable adjustment to suit individual needs. At a minimum, occupants must be able to turn the fixture on and off.

During design, the layout of lighting and controls is the responsibility of the architect or lighting Designer, in consultation with the owner. Document the tasks specific to each space and the tools and equipment that occupants will use on a daily basis.

In design development, project teams should involve electrical engineers and coordinate power and circuitry requirements.

Once fixtures have been installed, coordinate the final calibration of the lighting controls with the installer and commissioning agent to ensure that the system operates as intended.

Team Responsibility

Owner and electrical engineer.
Applicability in Jordan

To apply this credit in Jordan is easily achievable. It is not a challenge to provide controlled task lighting by providing lighting controls for 90% of occupants and all shared multi-occupant spaces.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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<td>Partially Done</td>
<td>Not Done</td>
<td>Easy Med Hard</td>
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- **Current Practices**: Currently in Jordan controllable task lighting is provided for individual work stations, desks, and offices. The use of individual controlled lighting (dimmers etc.) in share multi-occupant spaces is installed on some projects.

- **Ease of Implementation**: To implement this credit in Jordan is extremely easy and requires very little effort by the design team. Design teams should look at the whole lighting scheme for the building when deciding which strategy will be most effective.

- **Cost**: Payback is less than a year - as an example; desk lamps can be purchased for under $8 per piece, and installing dimmers on light switches are affordable and readily available in the market.

- **Feasibility**: Implementation of this credit is very feasible.

Overall Prioritization

Based on the abovementioned analysis, this prerequisite was given a high priority.

Recommendations to Achieve Credit Intent

1. **Market**
   The required products are available in Jordan and easily attainable, thus it is not difficult to implement this credit. However, it is recommended that engineers check new lighting energy efficiency codes in Jordan as applies to the typically lower lighting levels (watts per sq. ft.) requirements by LEED which in turn affect energy modeling results.

2. **Jordan Green Building Council**
   JordanGBC should lobby the government for reduction of customs for Building Management Systems (BMS) and all related components/ancillaries.

3. **Government**
   The government should play a major role to drive more positive change and impact in the market by mandating the review of codes for lighting to reduce current lighting requirements and address building specific lighting requirements. Wattage allowable under Jordanian code is very low.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

Conclusion

See overall conclusion of the IEQ section.
IEQ Credit 6.2: Controllability of Systems – Thermal Comfort

Intent

To provide a high level of thermal comfort systems controlled by individual occupants or groups in multi-occupant spaces (e.g., classrooms or conference areas) and promote their productivity, comfort and well-being.

Requirements

Provide individual comfort controls for 50% (minimum) of the building occupants to enable adjustments (for workspaces only in Schools projects) to meet individual needs and preferences. Operable windows may be used in lieu of controls for occupants located 20 feet inside and 10 feet to either side of the operable part of a window. The areas of operable window must meet the requirements of ASHRAE Standard 62.1-2007 paragraph 5.1 Natural Ventilation.

Provide comfort system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Conditions for thermal comfort are described in ASHRAE Standard 55-2004 and include the primary factors of air temperature, radiant temperature, air speed, and humidity.

Baseline Reference


- IEQ Credit 6.1: Controllability of Systems—Lighting (New Construction and Schools only).
- IEQ Credit 8: Daylight and Views.

Implementation Time Frame

Give individuals the controls to adjust thermal conditions for a more comfortable environment. Individual thermal comfort can depend on air velocity, the direction and temperature of indoor air, and moisture content. The design team should determine the level of individual control desired, and should design the building with comfort controls to suit both individual needs and those of groups in shared spaces.

- Individual Thermal Comfort:
  To satisfy this portion of the requirement, start by identifying workstation locations that are intended for individual use, including private offices, open plan workstations, reception stations, ticket booths, etc. Confirm that 50% or more of individuals occupying these locations have at least one means of individual control over thermal comfort. Operable windows may be used in lieu of individual controls for those occupants located within 20 feet of the exterior wall and within 10 feet of either side of the operable part of the window. The operable portion of the window must comply with the free-opening size criteria of ANSI/ASHRAE 62.1–2007 section 5.1.

- ALL Shared Multi-occupant Spaces:
  Identifying areas where groups occasionally congregate, such as conference rooms, break rooms, and lecture halls. Specific types or numbers of controls are not listed in the credit requirements to allow for flexibility in designing to the unique uses of each project. Confirm that there is at least one accessible means of control over thermal comfort in the space; window access, thermostat, or another way to control one of the following in the space: humidity, radiant temperature, air speed, or air temperature.

During schematic design, building designers should evaluate the building’s orientation and consider how heat gain or loss will affect the occupants. Designers should also consider whether site-specific conditions, such as wind, sound, and odors, may affect the location of operable windows. During design development, locate the thermal comfort controls with electrical and mechanical engineers as well as the construction or development manager. Consider thermal comfort needs as they pertain to ANSI/ASHRAE 55–2004 requirements; survey future occupants’ desires. Evaluate the controls for each space, considering the specific tools and equipment that occupants will use on a daily basis. When evaluating shared occupant spaces, consider the occupancy schedule.
Post installation commissioning of all thermal comfort systems will ensure proper operation. During building operation, the owner should provide training for building maintenance staff in using the controls. Property managers and building engineers should periodically review of comfort control systems to ensure that occupant needs are met and controls are working according to design.

**Team Responsibility**

Owner, engineers, architect and manager.

**Applicability in Jordan**

To apply this credit in Jordan is achievable, but will require a collaborative effort by the design team. This credit will require enhanced thermal comfort controls for at least 50% of building occupants to allow for adjustments to suit individual task needs and preferences.

**Credit Prioritization**

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices:** Currently in Jordan thermal comfort control for individuals is not implemented.
- **Ease of Implementation:** To implement this credit in Jordan is relatively challenging. In Jordan, complex forced air systems is difficult to implement and expensive. The typical thermal system design presents difficulty in providing individual controls beyond opening a window and turning on an individually assigned heating/air wall unit. Some options are to install radiant panels over each working station (individual), or provide individual heating radiators. Operable windows are an easy means to meet the credit intent, however dust is a big issue and could possibly affect the indoor air quality. Adjustable air diffusers are an alternative; however few HVAC systems providing diffusers are installed in Jordan. Forced air mechanical systems are more difficult to incorporate individual thermal comfort controls without under-floor distribution. Installing ceiling or desk fans to control air speed is feasible in Jordan and meets credit intent. It is recommended that systems are designed to shut down in peripheral areas if windows are opened by occupants.
- **Cost:** The cost for implementing this credit in Jordan is dependent on the system or method selected by the design team and outlined in the Owner’s Project Requirements. The system can be simple and inexpensive or complex and expensive. Possible added cost to design of building and/or HVAC system.
- **Feasibility:** Implementation of this credit is somewhat feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a medium priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   Market conditions are such that without operable windows it will be difficult to meet the credit requirement without a mechanical system designed to provide comfort controls for individuals which would be incorporated into the BMS. The occupants, facilities managers, building owners and tenants must be educated on the need to adjust/control comfort levels. In addition, indoor conditions that support productivity and well-being need to be addressed by the project design team.
2. **Jordan Green Building Council**
   This will be addressed in future editions of the publication.

3. **Government**
   This will be addressed in future editions of the publication.

4. **Local Rating System**
   It is recommended to reduce the 50% to 30% due to lack of awareness of credit requirements, in Jordan. However, this is just a recommendation for LEED JOD, for all LEED projects registered as a LEED project with the USGBC; you MUST adhere to the 50% credit requirement to meet credit intent.

**Conclusion**
See overall conclusion of the IEQ section.

**IEQ Credit 7.1: Thermal Comfort - Design**

**Intent**
To provide a comfortable thermal environment that promotes occupant productivity and wellbeing.

**Requirements**
Design heating, ventilating and air conditioning (HVAC) systems and the building envelope to meet the requirements of ASHRAE Standard 55–2004, Thermal Environmental Conditions for Human Occupancy. Demonstrate design compliance in accordance with the Section 6.1.1 documentation.

**Baseline Reference**

**Implementation Time Frame**
The thermal comfort of building occupants is affected by environmental conditions (air temperature, radiant temperature, relative humidity, and air speed), personal factors (metabolic rate and clothing), and personal preferences. Thermal comfort can be controlled through both active (HVAC) and passive systems (natural ventilation). The best results are often achieved through a combination of the two systems: Using both can help reduce the building's energy consumption, as well as achieve optimum comfort levels.

A green building should provide its occupants with comfortable indoor conditions that support their productivity and well-being. Although often associated only with air temperature, thermal comfort is a complex issue, affected by environmental conditions (e.g., air temperature, radiant temperature, humidity, and air speed) and personal factors (e.g., metabolic rate, clothing, and preferences). There are three basic approaches to provide thermal comfort within a project space:

- Mechanical ventilation (i.e., active ventilation);
- Natural ventilation (i.e., passive ventilation); and
- Mixed-mode ventilation (i.e., both mechanical and natural ventilation).

The owner and project team should make a decision as to which of the conditioning approaches are appropriate for the building in pre-design. Using ASHRAE 55–2004, the design team and the owner should determine how to achieve the desired thermal comfort in the project space and identify the appropriate conditioning systems (whether active or passive). This decision might be influenced by the local climate, the size and type of the proposed building, and the nature of the operations it will host. The owner's project requirements should indicate the intended comfort criteria for the building and state assumptions regarding activity level and occupant clothing.
There are many well-established HVAC load calculation methods to assist designers in sizing and selecting HVAC equipment to provide thermal comfort conditions. Lighting and other internal HVAC loads are integrated into the calculations to enable adequate system capacity and meet thermal comfort criteria without oversizing the HVAC system.

**Team Responsibility**

Owner, architect, MEP design engineers and building management.

**Applicability in Jordan**

To apply this credit in Jordan is achievable; however to meet credit intent requires more rigorous examination. Thermal comfort is a complex issue which includes air temperature, radiant temperature, humidity, and air speed which could add costs to the design of a building and/or HVAC system. This credit requires providing a high level of thermal comfort system control by individual occupants or groups in multi-occupant spaces and promoting productivity, comfort, and well-being by designing according to ASHRAE 55-2004.

**Credit Prioritization**

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: When mechanical systems for thermal comfort are installed, they typically are for designated areas and users that do not have individual control over their thermal comfort. Some buildings have operable windows, however due to the climate conditions in Jordan (dust, noise, pollution etc.); many buildings do not use the windows for individual comfort; natural ventilation and thermal comfort control. The credit requires HVAC systems to be designed to meet ASHRAE 552004-, which is not the standard practice in Jordan. A typical practice in many buildings is that occupants bring their own portable heater and/or fan to control their comfort.

- **Ease of Implementation**: To implement this credit in Jordan requires the design team work on the solution very early in the design process to make sure targeted thermal conditions are met. A natural ventilation approach may be more difficult to evaluate in design and require more intensive analysis and/or reliance on experience and precedents. Review ASHRAE 552004- section 6.1 to fully understand the credit and all documentation required. The requirement for this credit will be outlined in the project's Owner's Project Requirements (OPR).

- **Cost**: When spaces have not been properly thermally zoned, occupants may try to heat and cool the same area at the same time, potentially resulting in greater energy use and additional costs to operate the building. Generally, HVAC and building envelope systems that do not adequately address the thermal comfort of occupants are less energy efficient, with the exception of passive or naturally ventilated spaces. Mechanical systems relying on natural ventilation typically have lower capital and construction costs and use less energy than mechanically ventilated systems. The buildings HVAC system will expend more energy trying to maintain a comfortable environment for those occupants on the perimeter, increasing the annual energy cost of the building. The cost to implement the credit in Jordan will depend on the experience of the team and design approach and if it was addressed early in the design process.

- **Feasibility**: Implementation of this credit is somewhat feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a medium priority.
Recommendations to Achieve Credit Intent

1. **Market**
   Indoor conditions that support productivity and well-being must to be addressed by the design team. Engineers should be trained and educated on individual thermal comfort design approaches that could easily be achieved in Jordan.

2. **Jordan Green Building Council**
   JordanGBC should provide verification / clarification through a survey on designs used for accessible controls for zones / spaces. As the “green” industry emerges in the built environment there will be lessons learned and JordanGBC can play an important role in collecting and distributing data on design evaluations in implementing some of the more complex LEED compliant strategies successfully used in Jordan, e.g. what works and what does not. This will provide valuable information for LEED project teams.

3. **Government**
   This will be addresses in future editions of the publication.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

**Conclusion**

See overall conclusion of the IEQ section.

**IEQ Credit 7.2: Thermal Comfort - Verification**

**Intent**

To provide for the assessment of building occupants’ thermal comfort over time.

**Requirements**

**Achieve IEQ Credit 7.1: Thermal Comfort—Design**

Agree to conduct a thermal comfort survey of building occupants within six to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building, including an assessment of overall satisfaction with thermal performance and identification of thermal comfort problems. Agree to develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004.

Provide a permanent monitoring system to ensure that building performance meets the desired comfort criteria as determined by IEQ Credit 7.1: Thermal Comfort—Design.

**Baseline Reference**


**Implementation Time Frame**

IEQ Credit 7.2, Thermal Comfort—Verification, is contingent on achieving IEQ Credit 7.1, Thermal Comfort—Design. The thermal comfort of building occupants is affected by factors such as environmental conditions (air temperature, radiant temperature, relative humidity, and air speed), personal factors (metabolic rate and clothing), and personal preference.
• Planning and Design Phase:
   Once the project has identified appropriate thermal comfort criteria (as part of compliance with IEQ Credit 7.1: Thermal Comfort—Design) and determined the appropriate conditioning system to meet the criteria, identify the key areas of focus for the occupant survey. Anticipate provisions for the analysis of environmental variables if the survey identifies problems.

• Survey Occupants:
   Facility operators or outside consultants should develop procedures to survey building occupants about thermal comfort conditions.

• Plan for Corrective Action:
   The survey responses will identify the nature and location of any thermal environmental problems. Use respondent suggestions to help guide corrective actions.
   The design team is primarily responsible for achieving this credit, which is based on the requirements of ASHRAE 55–2004. Additionally, a member of the building operations team, an owner agent, or a commissioning authority should administer the post occupancy survey to meet the requirements of this credit.

Team Responsibility and Timeline
Owner and manager.

Applicability in Jordan
To apply this credit in Jordan is achievable. Individual companies can provide their own survey, and the requirements are not complex. Web-based companies provide services which can be costly but efficient. This requires commitment from the owner to preparing a survey of building occupants thermal comfort after occupancy.

Credit Prioritization
This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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• Current Practices: Currently, in Jordan thermal comfort verification is not considered nor in practice. Some companies are beginning to address thermal comfort verification as a part of their corporate social responsibility and value engineering efforts.

• Ease of Implementation: To implement this credit in Jordan is relatively easy. The requirement to survey building occupants on satisfaction with the thermal properties in the building as defined by ASHRAE 55 2004- takes little time to implement and little cost if building owners have it done “in-house.” There are companies available online that will provide this service for a fee. Project teams need to design a permanent monitoring system as part of the credit requirement which can be incorporated into the BMS. Any corrective action plan must be selected and executed by the owner and operations staff and this typically occurs after the project is LEED certified. The owner must verify and confirm in writing that the survey will be performed and submit the strategy for corrective action.

• Cost: Monitoring, managing, and maintaining thermal comfort conditions in a building might increase or decrease operating costs slightly.

• Feasibility: Implementation of this credit is feasible.

Overall Prioritization
Based on the abovementioned analysis, this prerequisite was given a medium priority.
Recommendations to Achieve Credit Intent

1. **Market**
   Encourage companies to provide their own survey and/or the development of this service.

2. **Jordan Green Building Council**
   This will be addressed in future editions of the publication.

3. **Government**
   This will be addressed in future editions of the publication.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

**Conclusion**

See overall conclusion of the IEQ section.

**IEQ Credit 8.1: Daylight and Views - Daylight**

**Intent**

To provide for the building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

**Requirements**

Through one of the four options, achieve daylighting in at least the following spaces:
- Daylight for at least 75% Regularly Occupied Spaces.

**Option 1: Simulation**

Demonstrate through computer simulations that 75% (NC, Schools & CS) or 90% (Schools Only) or more of all regularly occupied spaces achieve daylight luminance levels of a minimum of 25 foot-candles (fc) and a maximum of 500 fc in a clear sky condition on September 21 at 9 a.m. and 3 p.m.; areas with luminance levels below or above the range do not comply. However, designs that incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 25 fc luminance level.

**OR**

**Option 2: Prescriptive**

**For the Side-lighting Daylight Zone:**

1. Achieve a value, calculated as the product of the visible light transmittance (VLT) and window-to-floor area ratio (WFR) of daylight zone 0.150 and 0.180. The window area included in the calculation must be at least 30 inches above the floor.
2. The ceiling must not obstruct a line in section that joins the window-head to a line on the floor that is parallel to the plane of the window; is twice the height of the window-head above the floor in, distance from the plane of the glass as measured perpendicular to the plane of the glass.
3. Provide sunlight redirection and/or glare control devices to ensure daylight effectiveness.

**For Top-lighting Daylight Zone:**

1. The daylight zone under a skylight is the outline of the opening beneath the skylight, plus in each direction the lesser of:
   - 70% of the ceiling height.
OR
• 1/2 the distance to the edge of the nearest skylight.

OR
• The distance to any permanent opaque partition (if transparent show VLT) that is farther than 70% of the distance between the top of the partition and the ceiling.

2. Achieve skylight roof coverage between 3% and 6% of the roof area with a minimum 0.5 VLT.
3. The distance between the skylights must not be more than 1.4 times the ceiling height.
4. A skylight diffuser, if used, must have a measured haze value of greater than 90% when tested according to ASTM D1003. Avoid direct line of sight to the skylight diffuser.

Option 3: Measurement

Demonstrate through records of indoor light measurements that a minimum daylight illumination level of 25 fc has been achieved in at least 75% (1 point) or 90% (2 points) of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and shall be recorded on building floor plans. Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements may be counted in the calculations.

For all projects pursuing this option, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by daylight are considered on their merits.

Option 4: Combination

Any of the above calculation methods may be combined to document the minimum daylight illumination in at least 75% (1 point) or 90% (2 points) of all regularly occupied spaces. The different methods used in each space must be clearly recorded on all building plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the requirements can be applied toward the total area calculation required to qualify for this credit.

In all cases, provide glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight are considered on their merits.

Baseline Reference

ASTM D1003 - 07e1, Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics. This test method covers the evaluation of specific light-transmitting and wide-angle-light-scattering properties of planar sections of materials such as essentially transparent plastic.

Implementation Time Frame

A building may have limited daylighting potential because of site constraints that restrict the orientation of the building and limit the number and size of building openings. Vertical site elements, such as neighboring buildings and trees, might reduce the potential for daylighting. The design of the exterior envelope and the depth of the floor plate can allow more daylight into the building, and are critical for credit achievement.

Evaluate the impact of the selected building’s orientation on possible daylighting options, and opt for designs with shallow floor plates, courtyards, atriums, clerestory windows, or skylights. Consider adding interior light shelves, exterior fins, louvers, and adjustable blinds if possible.

This credit requires a collaborative process by the design team to effectively meet the credit intent. Attention to daylight should also be addressed during the design phase of the building. Furniture systems, wall partitions, surface color, and texture all have the ability to reflect daylight into the space. Reflective surfaces should also be considered, as they can either hinder or enhance occupants’ thermal and visual comfort.
Team Responsibility

Owner and architect.

Applicability in Jordan

To apply this credit in Jordan is achievable; however it will require an integrated design approach. This credit requires providing the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight into regularly occupied areas of the building. Both Daylighting and views – Daylight – combining the energy modeling / simulation with the lighting simulation is important to weigh the added energy consumption versus daylighting achieved given that energy is a critical resource (cost benefit analysis).

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Currently in Jordan the need to provide daylight is not in the programming when buildings are designed. Orientation of the building is more site specific rather than looking at opportunities to optimize or capture daylight. Heat gain and glare issues created by providing expanses of windows (curtain windows) is not effectively recognized and controlled in Jordan. The perception that more windows means more daylight is not accurate, there are many design strategies that can assist in providing adequate daylighting without the need to fill a wall with windows.

- **Ease of Implementation**: To implement this credit in Jordan will require a collaborative design approach to be successful and cost effective. To meet the credit intent is not difficult but will require the team to fully understand how LEED credits affect the design of the building as a whole system, with components having a direct or indirect link to each other. An example would be, building mass versus curtain windows, each has a direct link to energy consumption, daylight and views, and will have an effect across several LEED credits criteria.

The design team can explore the use of design strategies to provide natural light in the interior zone of the building for sites with limited natural light. The use of light shelves, light redirecting glazing, clerestories, skylights, and light transport systems (light pipes/tubes) are very effective in providing daylight into a building. For both IEQ credit 8, the design team should develop glazing and sun control strategies to provide comfort for occupants. The team should look at incorporating occupancy sensors with daylight dimming controls.

Therefore, the biggest challenge present in implementing this credit is having the design team work as an integrated team working through design and holding design charrettes. The current practice of professionals working separately, in a linear pattern, does not work on a LEED project and will likely lead to denied credits and increased costs. The requirement for this credit will be outlined in the project’s Owner’s Project Requirements (OPR).

- **Cost**: Possible added cost to design of building and/or HVAC system (more building envelope mass, building orientation). In addition, in high density developed sites daylight can be limited. Specialized glazing can increase initial costs for a project and lead to excessive heat gain if not designed properly. Glazing provides less insulating effects compared to standard walls, which results in higher energy use and additional maintenance.

However, offices with sufficient natural daylight and a visual connection to outdoor environments have been proven to increase occupant productivity and comfort, leading to better employee retention. In
most cases, employee compensation significantly outweighs the initial costs of incorporating daylighting measures into a building design.

- **Feasibility**: Implementation of this credit is somewhat feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a medium priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   The design of the orientation of buildings and their openings must be considered carefully to ensure compliance. Train design and construction professionals on integrated design. The building site orientation and its specific regional location will directly influence the available daylight throughout the day and during the year. Seasonal variances in the sun’s daily path should be evaluated during the project design development to minimize the potential for glare inside the building while maximizing the use of functional daylighting.

2. **Jordan Green Building Council**
   JordanGBC should conduct discussions on site density factors, window ratios, and site conditions with window view with wall opposite the view.

3. **Government**
   The government should play a major role to drive more positive change and impact in the market by mandating minimum daylighting requirements for public buildings.

4. **Local Rating System**
   This will be addresses in future editions of the publication.

**Conclusion**

See overall conclusion of the IEQ section.

**IEQ Credit 8.2: Daylight and Views - Views**

**Intent**

To provide building occupants a connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

**Requirements**

Achieve a direct line of sight to the outdoor environment via vision glazing between 30 inches and 90 inches above the finish floor for building occupants in 90% of all regularly occupied areas. Determine the area with direct line of sight by totaling the regularly occupied square footage that meets the following criteria:

- In the plan view, the area is within sight lines drawn from perimeter vision glazing.
- In the section view, a direct sight line can be drawn from the area to perimeter vision glazing.

The line of sight may be drawn through interior glazing. For private offices, the entire square footage of the office may be counted if 75% or more of the area has a direct line of sight to perimeter vision glazing. For classrooms and other multi-occupant spaces, the actual square footage with a direct line of sight to perimeter vision glazing is counted.
Baseline Reference

None.

Implementation Time Frame

One successful design strategy is for designers to locate open plan areas, along the exterior walls, while placing private offices and areas not regularly occupied at the core of the building. This design maintains the optimum number of available views. The line of sight used for the determination of horizontal views is assumed to be 42 inches for the average seated adult. Design teams may want to use alternate view heights for areas with non-typical functions. Maintaining the views for spaces near the core is an important design objective.

Regularly occupied spaces include office spaces, conference rooms, classrooms, core learning spaces, and cafeterias. Areas that do not need to be considered include support areas for copying, storage, mechanical equipment, laundry and restrooms.

During schematic design, the architect, civil engineer, and landscape architect should orient the building to incorporate desirable views. During the building programming efforts, spaces and rooms that are regularly occupied should be identified as primary candidates for access to views. Determine how best to allocate interior building spaces and consider locating regularly occupied spaces along the building perimeter, with access to views. The owner, architect, and interior designer should assess the needs for views in all regularly occupied spaces.

Team Responsibility

Owner and architect.

Applicability in Jordan

To apply this credit in Jordan is achievable; however it will require an integrated design approach. This credit requires providing the building occupants a connection between indoor spaces and the outdoors through the introduction of views into the regularly occupied areas of the building.

Credit Prioritization

This credit was evaluated and given a priority. The table below illustrates the evaluation criteria:

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- **Current Practices**: Currently in Jordan the need to provide views is not in the programming when buildings are being designed. Orientation of the building is more site specific rather than considering opportunities to optimize or capture views for building occupants in maintaining a visual connection to the surrounding environment. Many of the IEQ LEED credits pertain to the comfort and well-being of the occupants, in Jordan this topic is not often considered and thus not designed accordingly on typical projects.

- **Ease of Implementation**: To implement this credit in Jordan will require a collaborative design approach to be successful and cost effective. To meet the credit intent is not difficult but will require the team to fully understand how LEED credits affect the design of the building as a whole system, with components having a direct or indirect link to each other. An example would be, building mass versus curtain windows, each has a direct link to the energy consumption, daylight and views, and will have an effect across several LEED credits criteria.
Therefore, the biggest challenge present in implementing this credit is having the design team work as an integrated team working through design and holding design charrettes. The current practice of professionals working separately, in a linear pattern, does not work on a LEED project which leads to denied credits and increased costs.

The requirement for this credit will be outlined in the project’s Owner’s Project Requirements (OPR). For both IEQ credit 8, the design team should develop glazing and sun control strategies to provide comfort for occupants.

- **Cost:** There is a possible added cost to designing a building to capture required views. In addition, in high density developed sites views are limited. Glazing provides less insulating effects compared to standard walls, resulting in higher energy use and requiring additional maintenance. However, offices with sufficient visual connection to outdoor environments have been proven to increase occupant productivity and comfort, leading to better employee retention. Additional glazing required to provide access to views can increase initial costs for a project and may lead to increased heat gain if not designed properly. In most cases, employee compensation significantly outweighs the initial costs of incorporating daylighting measures into a building design. Glazing provides less insulating effects compared to standard walls, resulting in higher energy use and maintenance costs. However, offices with sufficient natural daylight and a visual connection to outdoor environments have been proven to increase occupant productivity and comfort, leading to increased worker production and employee retention.

- **Feasibility:** Implementation of this credit is somewhat feasible.

**Overall Prioritization**

Based on the abovementioned analysis, this prerequisite was given a medium priority.

**Recommendations to Achieve Credit Intent**

1. **Market**
   Site constraints may restrict building orientation and limit the number and size of building openings. Train the design and construction professions on integrated design.

2. **Jordan Green Building Council**
   JordanGBC should conduct discussions on site density factors, window ratios, and site conditions with window view with a wall opposite the view.

3. **Government**
   This will be addressed in future editions of the publication.

4. **Local Rating System**
   This will be addressed in future editions of the publication.

**Overall Conclusion of the IEQ Section**

From the above assessment we conclude that the IEQ section does not require many changes in order to suit Jordan's needs, since most IEQ concerns relate to Improving Ventilation, Managing Air Contaminants, Specifying Less Harmful Materials, Allowing Occupants to Control Desired Settings, and Providing Daylight and Views. All these elements are applicable in Jordan.

The action items that the JordanGBC can adopt to encourage and facilitate the achievement of the prerequisites and credits of Indoor Environmental Quality are:

1. Cooperate with various stakeholders to build on possible public-private partnership opportunities in the sector to raise public awareness of the health benefits of a smoke free environment.
2. Lobby for customs reductions for imported related systems and hold information sessions on the benefits of BMS/EMS systems.

4. Lobby for material labeling requirements as a regulated standard in Jordan.

5. Lobby the government for reduction of customs for Building Management Systems (BMS) and all related components/ancillaries.

6. Provide verification / clarification through a survey on designs used for accessible controls for zones / spaces. As the green industry emerges in the built environment there will be lessons learned and JordanGBC can play an important role in collecting and distributing data on design evaluations in implementing some of the more complex LEED compliant strategies successfully used in Jordan, e.g. what works and what does not. This will provide valuable information for LEED project teams.

7. Conduct discussions on site density factors, window ratios, and site conditions with window view with wall opposite the view.
Going through this publication, it cannot be stressed enough that the applicability of the analysis completed goes just as well for the region as it does when taking Jordan’s codes and regulations as a case example, with little if any modification. The criteria adopted and methodology applied allowed for such flexibility, keeping in mind the added value of any modification taking regional contingencies into perspective.

It is clear that the ease of implementation and associated costs are highly correlated to the level of integration of sustainability concepts into the design right from the start of the project where user requirements are defined prior to conceptual design. A collaborative design and construction approach involving all disciplines early on is the key to a successful cost effective conclusion to the project. It is also key to have commissioning agents and contractors involved in the conceptual design review, final detailed design review, and maintaining an open channel of communication throughout the project life cycle with a responsive design team to concerns; suggestions can only help realize the project timeline and budgets.

Integrating sustainability elements into any design should not be perceived as an aesthetic luxury to the building. There should be hard and fast rules and calculations showing the economic feasibility of each addition with a reasonable payback time. If the implementation of such projects is to have a real effect on our neighborhoods and our life, they have to become mainstream with a large stock of the built environment developed “green”. Today in our region green development is an exception to the rule and the road to the mainstream is clearly a few steps ahead. Going the route of introducing non cost effective additions would lead us down a path where sustainability concepts are to be perceived as a nice to have feature and developers eventually shying away from a “foreign” approach.

Our efforts to localize the rating systems pulls us away from this path of being perceived as foreign and allows us to focus on local priorities that re-instill the developers belief in the importance of moving forward with sustainability requirements. Clarifying the payback of initially higher capital costs with significantly lower operating costs and environmental impacts, makes the life of the engineers/architects much easier to approve and finalize their designs.

When reviewing the feasibility of sustainability concepts a holistic approach should be adopted, not only by looking for potential incentives for their implementation, but also on the removal of current subsidies in our region that are a deterrent to resource consumption reduction. One good example is the subsidization of energy and water in many parts of our region. The feasibility calculations might lead to negative results at present time, yet might have quite different implications in the future. Accordingly, designers should take that into account and have some provisions for the addition of certain sustainability modules in the future. A global increase in energy prices, which occurred in the last two decades, would call for a provision of additional tubular connections on the roof as an example to provide for when the time comes to add domestic solar hot water panels.

When analyzing such systems pertaining to sustainable design, a long term perspective should always be the priority going forward. The status quo is not necessarily where we will end up and more importantly not where we need to steer the industry. A case in point being the current lack of infrastructure for the recycling industry should not shy away any prudent designer or developer from focusing on the incorporation of recycled material collection areas and other related design features that would encourage occupant behavior in that direction.

The foreseen benefits of making the green built environment mainstream are twofold; in addition to having a significant reduction on environmental degradation, economies of scale create a platform to optimize infrastructure related items such as the recycling system in the region/ local, waste diversion, landfill handling operation, and the pool of suppliers for lower environmental impact materials, fixtures and outfits. A cross sector impact can only be achieved by gathering momentum with a large building stock and not with a few scattered projects.
The Hashemite Kingdom of Jordan
The Deposit Number at the National Library
(20114334/12/)
LEED Gap Analysis
Respecting Diversity through the Localization of the LEED Rating System in the Region - Jordan as a Case Study