The Pearl Rating System for Estidama
Community Rating System
Design & Construction

Version 1.0
The Pearl Rating System for Estidama
Emirate of Abu Dhabi
His Highness General Sheikh Mohamed bin Zayed Al Nahyan
Crown Prince of Abu Dhabi, Deputy Supreme Commander of the UAE Armed Forces and Chairman of the Abu Dhabi Executive Council
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Introduction

**ESTIDAMA**

Estidama, which means ‘sustainability’ in Arabic, is the initiative which will transform Abu Dhabi into a model of sustainable urbanization. Its aim is to create more sustainable communities, cities and global enterprises and to balance the four pillars of Estidama: environmental, economic, cultural and social.

![Figure 1: The Four Pillars of Estidama](image)

The aspirations of Estidama are incorporated into Plan 2030 and other Urban Planning Council (UPC) policies such as the Development Code. Estidama began two years ago and is the first program of its kind that is tailored to the Middle East region. In the immediate term, Estidama is focused on the rapidly changing built environment. It is in this area that the UPC is making significant strides to influence projects under design, development or construction within the Emirate of Abu Dhabi. One of Estidama’s key initiatives is the Pearl Rating System.

**THE PEARL RATING SYSTEM FOR ESTIDAMA**

The Pearl Rating System for Estidama aims to address the sustainability of a given development throughout its lifecycle from design through construction to operation. The Pearl Rating System provides design guidance and detailed requirements for rating a project’s potential performance in relation to the four pillars of Estidama.

The Pearl Rating System is organized into seven categories that are fundamental to more sustainable development. These form the heart of the Pearl Rating System:

- **Integrated Development Process**: Encouraging cross-disciplinary teamwork to deliver environmental and quality management throughout the life of the project.
- **Natural Systems**: Conserving, preserving and restoring the region’s critical natural environments and habitats.
- **Livable Communities**: Improving the quality and connectivity of outdoor and indoor spaces.
- **Precious Water**: Reducing water demand and encouraging efficient distribution and alternative water sources.
- **Resourceful Energy**: Targeting energy conservation through passive design measures, reduced demand, energy efficiency and renewable sources.
- **Stewarding Materials**: Ensuring consideration of the ‘whole-of-life’ cycle when selecting and specifying materials.
- **Innovating Practice**: Encouraging innovation in building design and construction to facilitate market and industry transformation.
PEARL RATING LEVELS

Within each section there are both mandatory and optional credits and credit points are awarded for each optional credit achieved. To achieve a 1 Pearl rating, all the mandatory credit requirements must be met. To achieve a higher Pearl rating, all the mandatory credit requirements must be met along with a minimum number of credit points.

Table 1: Pearl Community Rating Levels

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Pearl Rating Achieved</th>
</tr>
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<tbody>
<tr>
<td>All mandatory credits</td>
<td>1 Pearl</td>
</tr>
<tr>
<td>All mandatory credits + 55 credit points</td>
<td>2 Pearl</td>
</tr>
<tr>
<td>All mandatory credits + 75 credit points</td>
<td>3 Pearl</td>
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<tr>
<td>All mandatory credits + 100 credit points</td>
<td>4 Pearl</td>
</tr>
<tr>
<td>All mandatory credits + 125 credit points</td>
<td>5 Pearl</td>
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</table>

SECTION WEIGHTINGS

The number of credit points available in a given section determines the weighting of that section.

Table 2: Maximum Credit Points Available for each Section

<table>
<thead>
<tr>
<th>Credit Section</th>
<th>Maximum Credit Points</th>
</tr>
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<tbody>
<tr>
<td>IDP – Integrated Development Process</td>
<td>10</td>
</tr>
<tr>
<td>NS – Natural Systems</td>
<td>14</td>
</tr>
<tr>
<td>LC – Livable Communities</td>
<td>38</td>
</tr>
<tr>
<td>PW – Precious Water</td>
<td>37</td>
</tr>
<tr>
<td>RE – Resourceful Energy</td>
<td>42</td>
</tr>
<tr>
<td>SM – Stewarding Materials</td>
<td>18</td>
</tr>
<tr>
<td>IP – Innovating Practice</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>159*</td>
</tr>
</tbody>
</table>

* Total : Excludes Innovating Practice credit points which are offered as bonus credits.
THE PEARL RATING SYSTEM DOCUMENTS

The Pearl Rating System comprises the following documents:

- Pearl Community Rating System: Design & Construction
- Pearl Building Rating System: Design & Construction
- Pearl Villa Rating System: Design & Construction

This document focuses on the Pearl Building Rating System. The Pearl Rating System documents are available to download from the UPC / Estidama website, which will also contain frequently asked questions, training information and any revisions to the documents. Please visit www.upc.gov.ae.

THE PEARL RATING STAGES

The Pearl Rating System recognizes the reality of ownership and responsibility transitions as a project evolves from a design team to a construction team to a facility management team. Accordingly, three rating stages have been established: Design, Construction and Operational.

Pearl Design Rating - The Design Rating rewards measures adopted during the design development of the project that meet the intent and requirements of each credit. The Design Rating recognizes the additional marketing value and branding a Pearl Rating will afford a development in its early sale or lease phase. A Pearl Design Rating is valid only until construction is complete and requires that all collateral, branding and communication materials identify the project as a Pearl Design Rated project.

Pearl Construction Rating - The Construction Rating ensures that the commitments made for the Design Rating have been achieved. The Construction Rating requires that all collateral, branding and communication materials identify the project as a Pearl Construction Rated project.

This document, the Pearl Community Rating System, addresses both the Pearl Design Rating and the Pearl Construction Rating. The Pearl Operational Rating is currently under development.

Pearl Operational Rating - The operational rating assesses the built-in features and operational performance of an existing building and ensures the building is operating sustainably. The operational rating can only be achieved a minimum of two years after construction completion and when the building has reached a minimum occupancy of 80%.

Figure 2: Links between the Pearl Rating Systems
KEY TEAM MEMBERS

The assessment process requires the following key team members:

Pearl Assessor
The Pearl Assessor is an Estidama representative who assesses the Pearl submission documents.

Pearl Qualified Professional
The Pearl Qualified Professional (PQP) is a member of the design team who facilitates the Pearl Rating System for both Design and Construction stages. To be a PQP, the individual must pass an exam which will test their administrative and technical knowledge of the Pearl Rating Systems.

The PQP’s role will be as follows:
- understand the requirements of the Pearl Building and Community Rating Systems and associated Guides;
- facilitate the rating process; and
- provide quality assurance to documents prior to submission to Estidama.

Communication with Estidama and the Pearl Assessor will generally be via email, with frequently asked questions available on the Estidama website. The website will also provide information to help guide design teams through the Pearl Rating Systems and will contain schedules of training sessions, seminars and event notices.
THE PEARL RATING PROCESS

The Pearl Rating System is designed to facilitate an effective and educational way to assess the sustainability of a specific development. The general steps required to be undertaken by developers and their consultants in the process are summarised as follows:

All Pearl Ratings
Step 1: Register the development with Estidama for the relevant Pearl Rating System. Each project will be provided with a unique identification number.
Step 2: Appoint a PQP to facilitate the rating process and co-ordinate the submission.
Step 3: Conduct workshops in compliance with the Estidama Integrated Development Process (EIDP) with facilitation by the PQP (compliant with IDP-R1).

Pearl Design Rating
Step DR4: Review and update credit submissions on a regular basis throughout the design process.
Step DR5: Issue the final design credit submissions to Estidama at the end of the construction documentation stage.
Step DR6: The submission will be reviewed by a Pearl Assessor, who may request clarifications or additional information from the PQP as necessary.
Step DR7: The Pearl Assessor will award a Pearl Design Rating based on the credits achieved by the development.

Pearl Construction Rating
Step CR4: Review and update credit submissions on a regular basis throughout the construction process.
Step CR5: Issue the final construction credit submissions to Estidama after construction is complete.
Step CR6: The submission will be reviewed by a Pearl Assessor, who may request clarifications or additional information from the PQP. Estidama reserves the right to undertake on-site verification if deemed necessary.
Step CR7: The Pearl Assessor will award a Pearl Construction Rating based on the credits achieved by the development.

Pearl Operational Rating
Two years following construction completion, once a building has reached a minimum occupancy of 80%, submissions can be made for the Pearl Operational Rating. The process for achieving a Pearl Operational Rating is set out in the separate Pearl Operational Rating guide (currently under development).
**The Development Review Process and the Pearl Rating System**

The Development Review Process has been introduced by the UPC to provide a streamlined process for reviewing development proposals. The process comprises four steps: Enquiry, Pre-Concept Stage, Concept Planning Review and Detailed Planning Review. The UPC uses this review process for two main purposes:

- To ensure development proposals comply with the Emirate’s urban planning policies (e.g. land uses, densities, Estidama); and
- To coordinate the review and approval of development applications by external government agencies.

There are mandatory Estidama elements within the Development Review Process, which ensure sustainability is considered throughout the planning process and that a minimum level of sustainability is achieved. The Pearl Rating System extends upon the minimum sustainability requirements embedded within the UPC’s Development Review Process.

**Figure 5: Relationship between the UPC Development Review Process, Estidama and the Pearl Rating System**
APPLICATION OF THE PEARL COMMUNITY RATING SYSTEM

Project Type:

The Community Rating System is designed to be used for development projects, which will support a minimum permanent residential population of 1,000 people, this being the minimum population for which community facilities are required to be provided in accordance with the UPC community facility requirements.

There is no maximum size of project which may apply for a Pearl Community Rating. However, for projects larger in size than a District, this being defined as a permanent residential population of between 20,000 and 30,000, the project is to be divided into individual Districts and a separate application made for each of these Districts. A project may also submit a community rating application for a single component or phase of the project. In these cases, the boundary of the component or phase is to be formed by a natural feature, boulevard or highway or significant land use change and must be clear and distinct.

Process:

The aim of the Community Rating System is to promote the development of sustainable communities and improve quality of life. Achievement of a sustainable community requires the integration of the four pillars of Estidama and a collaborative and inter-disciplinary approach to master planning. The EIDP will form the basis for the detailed submission requirements under the Community Rating System.

The proponent is to commence preparation for a Community Rating at the start of the project design process, in combination with the Estidama Integrated Development Process, to ensure all target credits may be achieved. The credits have been ordered based on the design process.

Figure 6: Integration of Community Rating System into the design process
The credit requirements under the Community Rating System are informed by UPC policy, regulatory requirements and guidance.

In order to proceed with a voluntary rating under the Community Rating System, it will be necessary for the project to be in compliance with the relevant Plan 2030. Where the relevant Plan 2030 is superseded by either a Development Code or Local Area Plan, these will apply. Where relevant, design aspects will need to be approved by the appropriate municipal department and evidence of approval in the form of No Objection Certificates (NOCs) will be required prior to submission of documentation for the Community Rating System.

It is the responsibility of the proponent to ensure the latest policy documents available on the day of application are applied. The UPC and Estidama Website should be used as the first point of reference to source the relevant UPC policy documents. In cases where resources are not available through the website, the proponent is to contact the UPC directly to obtain any required documents.

Current UPC policy documents requiring compliance through the design process include the following:

- Capital 2030 Master Plan
- Al Ain 2030 Master Plan
- Al Gharbia 2030 Master Plan
- UPC Community Facility Requirements
- Abu Dhabi Urban Street Design Manual
- Abu Dhabi Development Code
- Coastal Development Guidelines

Submission Requirements
Submission requirements for each of the stages of the Pearl Rating System are outlined under each credit area. The Design Rating submission should be made at the end of the detailed design and construction documentation stage and the Construction Rating submission should be made on completion of construction. Both the design and construction submissions should be made electronically from the PQP to the Pearl Assessor at Estidama.

Confidentiality
There will be no public disclosure of information provided or derived as part of the Submission Requirements. Information provided will remain confidential, except as required for identification of the project and its key participants for the purposes of Certification.
UNDERSTANDING THE CREDITS

The Pearl Community Rating System comprises the following two types of credits:

**Required Credits** - these must be met by every project submitting for a Pearl Rating. These occur at the front of each section and are designated with an ‘R’, for example SM-R1. While limited in number, they are essential to achieving a Pearl Rating and reflect existing or emerging UPC and other Abu Dhabi Government Agency policies. No credit points are awarded for achieving these required credits.

**Optional Credits** - these are the voluntary performance credits from which points may be accrued. Some credits, such as SM-8 shown below, award 1 point whereas other credits allow more than 1 point to be attained. Depending on the Pearl Rating level being pursued by a design and development team, the number of credits and the level of achievement will vary from project to project.

---

**SM-8: Hazardous Waste Management**

**Intent**

To ensure the safe handling of hazardous waste in order to minimize pollution to the ground, water and air.

**Credit Requirements**

Demonstrate the provision of at least one location point for the safe collection of potentially hazardous consumer waste such as paints, batteries and oil.

**Additional Requirement/Clarifications**

None

** Requirement Achievement**

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<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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<td>Design Rating</td>
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<tr>
<td>1</td>
<td>Allocate a location on the development for the safe collection of potentially hazardous consumer waste</td>
</tr>
<tr>
<td>1 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate adequate space on the development for the safe collection of potentially hazardous consumer waste</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

- Narrative describing how the project intends to meet the Credit Requirements, including details on the size and location of the storage area and the estimated amount of hazardous waste to be generated; and
- Drawings clearly indicating the proposed location and size of hazardous waste collection area(s).

**Credit Submission: Construction Rating**

- Updated narrative describing how the project meets the Credit Requirements, including details on the size and location of the storage area and the amount of hazardous waste to be generated; and
- As Built drawings clearly indicating the location and size of hazardous waste collection area(s).

**Clarification of any calculations or methodology**

None

**Calculations and Methodology**

- Centre of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
### Summary of Credit Points for the Pearl Community Rating System

<table>
<thead>
<tr>
<th>IDP</th>
<th>Integrated Development Process</th>
<th>Maximum Credit Points</th>
</tr>
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<tbody>
<tr>
<td>IDP-R1</td>
<td>Integrated Development Strategy</td>
<td>R</td>
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<tr>
<td>IDP-R2</td>
<td>Sustainable Building Guidelines</td>
<td>R</td>
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<tr>
<td>IDP-R3</td>
<td>Community-Dedicated Infrastructure Basic Commissioning</td>
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<td>IDP-1</td>
<td>Life Cycle Costing</td>
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<td>IDP-2</td>
<td>Guest Worker Accommodation</td>
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<td>IDP-3</td>
<td>Construction Environmental Management</td>
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<td>IDP-4</td>
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<tr>
<td>NS-R2</td>
<td>Natural Systems Protection</td>
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<tr>
<td>NS-R3</td>
<td>Natural Systems Design and Management Strategy</td>
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</tr>
<tr>
<td>NS-1</td>
<td>Reuse of Land</td>
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<td>Remediation of Contaminated Land</td>
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<td>Ecological Enhancement</td>
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<td>NS-4</td>
<td>Habitat Creation and Restoration</td>
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<table>
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<tr>
<th>PW</th>
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<tr>
<td>PW-R1</td>
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<td>PW-R2</td>
<td>Building Water Guidelines</td>
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<td>PW-2</td>
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<td>PW-3</td>
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<td><strong>TOTAL</strong></td>
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<td>------</td>
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<tr>
<td>RE-R1</td>
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<td>SM-6</td>
<td>Improved Operational Waste Management</td>
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<td>LC - Livable Communities</td>
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Total: Excludes Innovating Practice credit points which are offered as bonus credits.
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Credit Section

IDP: Integrated Development Process
An essential part of the strategy for achieving Estidama is to fundamentally change the way we approach design, construction and real estate development. The Pearl Community Rating System is meant to provide design and development teams with more than a checklist for development and green buildings. It is part of the overarching Pearl Rating System, a transformative tool aiming to improve the design and development process and provide more cost-effective, higher performing developments. The essence of this process is the Estidama Integrative Development Process (EIDP), which is a mandatory process as part of the UPC Development Review Process.

EIDP calls for cross-disciplinary teamwork and builds upon sound thinking, delivering quality and environmental management throughout the life of the project in order to achieve the successful integration of building, community, natural and economic systems. The process requires an integrated development approach from very early on in the design, a clear vision and sustainability targets. The main objective is to achieve significant environmental, social, economic and cultural benefits while ensuring that the costs of the development are minimized.

Implementing the IDP Credits will:

- establish a more collaborative and iterative design and development process;
- encourage construction activities that value workers’ welfare, quality and sound environmental management; and
- prepare the ground for good operation and maintenance where the user plays an informed active role.
## CREDITS COVERED IN THIS SECTION

<table>
<thead>
<tr>
<th>IDP</th>
<th>Integrated Development Process</th>
<th>Maximum Credit Points</th>
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<td>IDP-R2</td>
<td>Sustainable Building Guidelines</td>
<td>R</td>
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<tr>
<td>IDP-R3</td>
<td>Community-Dedicated Infrastructure Basic Commissioning</td>
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<td>Life Cycle Costing</td>
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<td>Guest Worker Accommodation</td>
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<td>IDP-3</td>
<td>Construction Environmental Management</td>
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</table>
## IDP-R1: Integrated Development Strategy

### Intent

To ensure new development adopts an Integrated Development Process (IDP) as a way of attaining greater synergy between project systems resulting in high performance communities.

### Credit Requirements

**GENERAL**

Demonstrate that the design and development team and development process are organized and programmed to gain full benefit from an integrated development approach, from project inception through to final delivery.

Develop an implementation strategy to facilitate an effective transition between project stages (e.g. from master planning to construction to operation) and project packages (e.g. infrastructure to buildings), to ensure that the initial vision, objectives and targets are carried through to completion.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

### Requirement Achievement

This is a requirement. There are no Credit Points awarded.

### Credit Submission: Design Rating

- Process chart for the IDP, developed at project inception, detailing:
  - Team structure listing team members, and their roles;
  - Design milestones and workshops listing participants, goals, expected outcomes, required actions with tasks assignments; and
  - Methodology for ensuring appropriate stakeholders are involved, including construction team, commissioning agent, potential building owners, operators and relevant regulatory authorities and permit agencies.
- Narrative summarizing initial vision, objectives and targets set jointly by the project team for the project;
- Implementation strategy for achieving transition between project stages and project packages;
- Meeting minutes, action items and team member responsibilities from key workshops held as part of the IDP; and
- Narrative highlighting the reasons for any changes from the initial IDP process chart.

### Credit Submission: Construction Rating

- Narrative showing an updated process chart of the IDP highlighting changes from the design stage and listing successes and challenges during construction stage; and
- Updated implementation strategy.

### Calculations and Methodology

The IDP is a mandatory process as part of the UPC Development Review Process.

### References

- Estidama Website, [www.upc.gov.ae](http://www.upc.gov.ae)
### IDP-R2: Sustainable Building Guidelines

**Intent**  
To ensure that the design and construction of buildings will contribute to the overall community’s sustainability objectives and targets.

<table>
<thead>
<tr>
<th>Credit Requirements</th>
<th>GENERAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building on the requirements of the IDP-R1, develop Sustainable Building Guidelines to formally communicate the requirements for the project in relation to sustainable design, construction and operation to New buildings design and development teams and Existing buildings’ managers/operators. These guidelines must be issued to each building owner/developer and must cover the following at a minimum:</td>
<td></td>
</tr>
<tr>
<td>▪ The IDP planned for the project and building design and development team’s role as part of this process;</td>
<td></td>
</tr>
<tr>
<td>▪ Sustainability vision and objectives for the project;</td>
<td></td>
</tr>
<tr>
<td>▪ A summary of targets for the project. This can be represented in the form of scorecard(s) highlighting credits targeted based on the Pearl Building Rating System, Pearl Villa Rating System or the Pearl Operational Rating System, as appropriate;</td>
<td></td>
</tr>
<tr>
<td>▪ The certification process for the community and its various milestones;</td>
<td></td>
</tr>
<tr>
<td>▪ Technical guidance on how building design and construction measures can contribute to each credit targeted, where relevant;</td>
<td></td>
</tr>
<tr>
<td>▪ Technical guidance on how existing building upgrade measures can contribute to each credit targeted, where relevant; and</td>
<td></td>
</tr>
<tr>
<td>▪ The owner’s / developer’s quality assurance procedure for verifying the requirements have been implemented.</td>
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**ADDITIONAL REQUIREMENT/CLARIFICATIONS**  
None

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<tr>
<th>Requirement Achievement</th>
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</table>

<table>
<thead>
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<th>□ Sustainable Building Guidelines</th>
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<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
<th>□ Updated Sustainable Building Guidelines</th>
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</table>

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
<th>None</th>
</tr>
</thead>
</table>

| References | None |
IDP-R3: Community-Dedicated Infrastructure
Basic Commissioning

Intent
To ensure that the infrastructure systems perform as designed, thereby protecting occupant health and providing ongoing efficiency.

Credit Requirements

**GENERAL**

Demonstrate that:
- One or more independent commissioning agent(s), reporting to the project owner, is/are engaged as part of the project design team throughout the design stages to verify performance of community-dedicated energy, water and waste infrastructure;
- Comprehensive commissioning requirements are included in specifications of community-dedicated energy, water and waste infrastructure and construction contracts or provide a Commissioning Plan for the infrastructure at construction completion.
- At completion, the community-dedicated energy, water and waste infrastructure has been commissioned by independent commissioning specialists; and
- The commissioning report has been reviewed and verified prior to completion of community-dedicated energy, water and waste infrastructure;

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

Requirement Achievement

This is a requirement. No Credit Points are awarded.

Credit Submission: Design Rating

☐ CV of commissioning agent(s);
☐ Copy of the contract(s) with the Commissioning Agent(s);
☐ Copy of the Design Documents reviews; and
☐ Commissioning Plan clearly indicating commissioning requirements for the project, including:
  ☐ Owner’s Project Requirements;
  ☐ Basis of Design narrative.

Credit Submission: Construction Rating

☐ CV of commissioning agent(s);
☐ List of all meetings attended by the commissioning agent(s) through commissioning period and project handover, including dates; and
☐ Final Commissioning Report, including:
  ☐ Owner’s Project Requirements;
  ☐ Project commissioning specifications;
  ☐ Verification of installation;

Calculations and Methodology

Commissioning is a collaborative effort. Specific roles played by various project team members are as follows:

The independent commissioning agent must oversee and lead the commissioning process as follows:
- Review Design Documentations and make recommendations to the design team;
- Review Construction Documentations and make recommendations to the design team;
• Prepare or review the Commissioning Plan; and
• Review and approve the results of commissioned systems.

The contractor must perform the following prior to construction completion of the commissioned infrastructure:
• Employ independent commissioning contractor(s) to commission the installed systems as part of community-dedicated infrastructure.

The design team must perform the following prior to infrastructure completion:
• Review and approve submittals from relevant subcontractors during construction;
• Visually review the results of selected commissioned systems; and
• Review final commissioning documents, including but not limited to the operations and maintenance manual(s) and staff training materials.

The independent commissioning agent(s) must have a minimum of 2 years experience in their specialist commissioning fields and can be an employee of one of the companies involved in the project as long as this/these individuals is/are not involved in the project design and/or construction.

References
None
IDP-1: Life Cycle Costing

**Intent**

To enable effective long-term decisions about infrastructure design and construction in order to maximize efficiency over the whole life of the development.

**Credit Requirements**

**GENERAL**

Demonstrate that Life Cycle Costing was undertaken as part of the IDP as follows:

- Demonstrate that a life cycle cost (LCC) analysis was started during concept master planning by a qualified professional to evaluate and compare various design options. The LCC model developed must be maintained and upgraded throughout the design stages in option appraisals;
- Provide evidence from the IDP that the LCC analysis was used to verify design, technology and process decisions. Meeting minutes and documentation (reports, presentations) submitted as part of IDP-R1 may be used for the purpose of demonstrating compliance; and
- At the end of construction, update the LCC report with final construction costs.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

**Awarding Credit Points**

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<tr>
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<td>Use Life Cycle Cost analysis in design.</td>
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<td>Construction Rating</td>
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<tr>
<td>4</td>
<td>Update Life Cycle Cost report with final construction costs.</td>
</tr>
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</table>

**Credit Submission: Design Rating**

☐ LCC report produced at the end of design with summary history of the progressive decisions that benefited from LCC.

**Credit Submission: Construction Rating**

☐ Updated LCC report reflecting final construction costs.

**Calculations and Methodology**

The qualified professional must be a Chartered Surveyor with previous experience with LCC modeling on at least 2 similar projects. The qualified professional must also be familiar with internationally recognized LCC standards such as the ISO 15686 Building and Constructed Assets - Service Life Planning Part 5: Life Cycle Costing, the Standardized Method of Life Cycle Costing for Construction Procurement supplement to ISO 15686 published by the Building Cost Information Service (BCIS) and the Building Standards Institute (BSI) or similar standards.

**References**

- Standardized Method of Life Cycle Costing for Construction Procurement - supplement to ISO 15686 published by the Building Cost Information Service (BCIS) and the British Standards Institute (BSI).
IDP-2: Guest Worker Accommodation

Intent
To promote fair labor practices in construction.

Credit Requirements

GENERAL
2 Credit Points: Develop and implement a Construction Guest Worker Accommodation Plan that, at a minimum, addresses the following:

- The provision of accommodation facilities for all construction guest workers on the project. Facilities must be located within suitable walking distances. Appropriate shade must be provided in circulation areas, parks, play fields and waiting/gathering areas such as bus stops. The facilities must provide dedicated and adequate areas for:
  - food preparation,
  - personal hygiene
  - religious services,
  - healthcare,
  - recreation, and
  - entertainment.
- An ongoing maintenance plan of guest worker housing facilities and total budget allocated to maintenance services;
- Inspection schedules and auditing mechanisms for the guest worker housing facilities with minimum annual inspections required; and
- A formal protocol for engaging with facility residents and other stakeholders to address their requests, concerns and petitions, including the formation of a Workers’ Representative Committee and the development of a Workers’ Social & Welfare Program to address the following issues at a minimum:
  - Health, safety and security;
  - House rules;
  - Drugs and alcohol awareness;
  - Education programs;
  - Recreation activities; and
  - Transport within, to and from the housing facilities outside working hours.

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Awarding Credit Points

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<td>Implement the Guest Worker Accommodation Plan.</td>
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</table>

Credit Submission: Design Rating

- Guest Worker Accommodation Plan;
- Narrative describing how all requirements of Abu Dhabi Cabinet Decision No. (13) of 2009 are met or exceeded;
- For new facilities, a signed copy of tender agreements with housing contractors and subcontractors, stipulating the standards and requirements for the provision of guest worker housing, its ongoing maintenance and engagement with residents and stakeholders; and
- For existing facilities, photographs and other documentation as listed under ‘Credit Submission - Construction Rating’.
Credit Submission: Construction Rating

- Photographs illustrating how all requirements of Abu Dhabi Decision No. (13) of 2009 are met or exceeded;
- Record of all maintenance visits and inspections, including dates and actions taken and summary of invoices associated with maintenance expenditures;
- Narrative describing how the Contractor applied the stakeholder-engagement protocol; and
- Record of the formation of a Workers' Representative Committee and development of a Workers' Social & Welfare Program.

Calculations and Methodology

The provision of accommodation facilities for all construction guest workers on the project must meet or exceed the requirements of Abu Dhabi Cabinet Decision No. (13) of 2009.

References

IDP-3: Construction Environmental Management

Intent
To reduce the environmental impacts associated with construction practices.

Credit Requirements

**GENERAL**
- 1 Credit Point: Demonstrate that the project’s Construction Environmental Management Plan (CEMP) is prepared in accordance with Environment Agency Abu Dhabi’s (EAD) Construction Environmental Management Plan Technical Guidance Document by an EAD-approved and registered consultant and that:
  - the Plan has been approved by EAD, for projects required to produce a CEMP; or
  - the Plan has been peer reviewed by an EAD-approved and registered consultant.
- 2 Credit Points: In addition to achieving the above, demonstrate that the project lead contractor is either ISO 14001 or EHSMS certified.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

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<td>Project Lead Contractor is ISO 14001 or EHSMS Certified.</td>
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<td>Provide evidence that the CEMP has been properly applied to the site.</td>
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<tr>
<td>1</td>
<td>Confirm that Project Lead Contractor is ISO 14001 or EHSMS Certified.</td>
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</table>

Credit Submission:
- **Design Rating**
  - CEMP, including:
    - Statement from EAD or a suitably qualified peer reviewer that the project’s CEMP meets the Abu Dhabi CEMP standard; and
    - CV and EAD registration of the peer reviewer.
  - Certified Contractor’s ISO 14001 or EHSMS certification.

- **Construction Rating**
  - Signed off audit of the CEMP that verifies the project’s performance was in compliance with the CEMP, including photographs and narrative of construction practices.
  - Certified Contractor’s ISO 14001 or EHSMS certification.

Calculations and Methodology
None

References
IDP-4 Sustainability Awareness

Intent
To promote the efficient ongoing operation of the community by enabling site residents, workers and visitors to appreciate, understand and therefore contribute to responsible resource use in the community.

Credit Requirements

**GENERAL**

- Demonstrate that a Sustainability Awareness Strategy was developed by the design team and updated at the end of construction. This Strategy must address the education of site users on the following topics as a minimum:
  - Ecological features of the site, their ecological value within the local, regional and global context and ways for site users to preserve/protect these features;
  - Energy and water efficiency measures in buildings and onsite and how residents and other site users’ behavior affects performance;
  - Information on materials used in the community, including environmental and social benefits, as appropriate;
  - Waste and recycling policies and information such as location, sorting requirements (if any) and the use of green waste (if applicable);
  - Location of nearby amenities and community facilities; and
  - Alternative transportation offered to site users including locations of nearby public transport, shuttle service, car-pooling and on-site bicycle facilities.

- Demonstrate use of the following communication mechanisms:
  - Static Communication – educational kiosks, interpretative signs, displays and information packs;
  - Ongoing Communication – continually updated information through digital display, internet and/or newsletter with information on performance measures such as ongoing energy and water consumption or generation of energy from renewable sources.

<table>
<thead>
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<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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<td>2</td>
<td>Provide an outline Sustainability Awareness Strategy indicating the communication mechanisms to be used.</td>
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<tr>
<td>2 (maximum)</td>
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<td>2</td>
<td>Provide details of implementation of the Sustainability Awareness Strategy as set out in the design stage.</td>
</tr>
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</table>

Credit Submission: Design Rating

- Narrative describing the Sustainability Awareness Strategy setting out the communication mechanisms to be used to raise sustainability awareness.
- Where Static Communication will be applied, provide a site plan, signage drawings and renderings illustrating the elements of the Sustainability Awareness Strategy and summary of the content of the information pack.
- Where Ongoing Communication will be applied, provide samples of digitally displayed messages, website template and structure or template of Newsletter.

Credit Submission: Construction Rating

- Updated narrative describing the Sustainability Awareness Strategy setting out the communication mechanisms to be used to raise sustainability awareness.
- Where Static Communication will be applied, provide a site plan, photographs illustrating elements of the Sustainability Awareness Strategy and a copy of an information pack.
- Where Ongoing Community Communication will be applied, provide a summary of
<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>References</td>
<td>None</td>
</tr>
</tbody>
</table>
One of the fundamental building blocks of Plan 2030 is the need to foster careful, sensitive growth that will conserve, preserve, and restore the region’s critical natural environments and habitats. The ecosystem services provided by these unique marine and desert systems are invaluable and their ongoing viability is essential to maintain a high quality of life in the region.

Plan 2030 calls for the creation of a national park system to preserve key areas, but goes beyond that with the concept of a ‘green gradient.’ This gradient designates levels of conservation, preservation and restoration and development for each of five zones, ranging from the most intensely developed urban core to the natural areas that must be preserved. This concept and its policy objectives are more clearly defined in the Conservation Development Guidelines issued by UPC in January of 2009.

Plan 2030 also proposes an open space framework — a system of formal and informal spaces in communities that connect and augment a broader national park system and the resources it protects. This ‘green infrastructure’ strategy should be reflected not only in plan and form, but also in implementation, leading to healthier ecosystems, habitats and ultimately communities.

“The islands, sand dunes, sea, coast lines, and native wildlife all blend to create Abu Dhabi’s incredibly intricate, sensitive and unique natural environment. This extraordinary mix has coexisted with the people living within it for thousands of years.”

— Capital 2030, A Sustainable Foundation

The Natural Systems Credit Section is intended to encourage natural resource management and sustainable land use through:
- thorough analysis and assessment of natural systems as part of the pre-conceptual master planning and development process;
- encouraging reuse of land;
- remediation of contaminated land;
- conservation of existing valuable features through protection or mitigation;
- enhancement in ecological value; and
- habitat creation, restoration and provision of habitat connections.

In addition, the credits encourage landscape designs which minimize resource and management requirements and celebration of local food production.

The overarching hierarchy followed is illustrated below:
## Credits Covered in this Section

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<thead>
<tr>
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<th>Natural Systems</th>
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<td>NS-R3</td>
<td>Natural Systems Design and Management Strategy</td>
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</tr>
</tbody>
</table>
## NS-R1: Natural Systems Assessment

### Intent
To ensure that before the design process begins, the environmental baseline conditions surrounding, connected to and on the site are considered and assessed.

### Credit Requirements

#### GENERAL
Demonstrate that, before the start of the design process and site clearance, an assessment of the natural systems (NS) has been carried out at the:
- project site,
- area of probable impact surrounding the project site,
- sub-regional, and
- regional scale.

Based on a NS analysis, identify opportunities, constraints and carrying capacity associated with the development, through the results of the assessment and present in a Natural Systems Assessment Report.

Key performance indicators (KPIs) must be prepared to guide the design of the development, based on the results of the opportunities and constraints analysis. These are to be measurable targets against which future design or construction works can be assessed.

The assessment is to be carried out by a suitably qualified environmental professional trained to complete such analysis and assessment.

### Additional Requirement/Clarifications
None

### Requirement Achievement
This is a requirement. There are no Credit Points awarded.

### Credit Submission: Design Rating
- Natural Systems assessment report including:
  - Narrative;
  - Maps; and
  - Site photographs.
  Maps and site photographs must clearly identify the extent of different habitats and/or other significant natural system features.
- Review of the site against Environmental Policy Statements included in Plan 2030.
- CV of the appointed suitably qualified environmental professional.

### Credit Submission: Construction Rating
There is no required submission at this stage.

### Calculations and Methodology
Information contained in the following documents may provide the foundation for this credit.
- Preliminary Environmental Review (PER) or Environmental Impact Assessment (EIA) as may be required by the Environment Agency Abu Dhabi (EAD);
- The contextual natural systems analysis as a part of the UPC’s Development Review Process;
- An Environmental Context Statement as required by the UPC Coastal Development Guidelines.
The NS assessment is to cover the following environmental components, as a minimum:

- Topography;
- Geology / geomorphology;
- Soils and geotechnical attributes;
- Hydrology and groundwater;
- Waste and contamination;
- Coastal conditions;
- Microclimate (such as prevailing winds, solar orientation and solar shading);
- Priority species, habitats and ecosystems (both onsite and those influenced by the site);
- Flora and fauna (including wildlife corridors, seasonal uses);
- Archaeological features.

The NS assessment is to be undertaken in combination with LC-R2 Urban Systems Assessment.

The assessment is to be based on a field survey as well as a desk top study using historical and /or other data. As a minimum a field survey is to be carried out on the project site and include a Phase I Habitat Survey, or similar. A desk top study is sufficient for the area of probable impact, sub-regional and regional analysis.

The NS assessment shall illustrate the inter-relationships between environmental components and identify the carrying capacity of the site based on the following:

- Significant Assets - Assets which are of significant importance (internationally, nationally, regionally and/or locally), including:
  - Priority Habitats – Habitats identified in Abu Dhabi Emirate which are of exceptional value and are highly threatened, including Intertidal Mudflats, Mangrove, Vegetated Sandy Beaches, Marine (seagrass, coral), Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes, Alluvial Plains and Jebels. Reference is to be made to Brown and Boer, 2004 for detailed habitat types.
  - Any other habitat identified as significant through the Development Review Process, the Coastal Development Guidelines, an EIA, a PER or a Strategic Environmental Assessment.
  - Priority Species – A protected species (flora or fauna) or species determined to be critically endangered, endangered, vulnerable, threatened, near threatened or sensitive (as defined by the Union for Conservation of Nature (IUCN), UAE Red Data list and / or Abu Dhabi Emirate Environment, Health and Safety Management System (AD EHSMS).
- Valuable Assets - Any valuable assets, such as features of ecological value, including healthy native trees or shrubs.

The assessment is to identify and map areas to be:

- protected;
- used as mitigation areas;
- enhanced;
- remediated; and/or
- allocated for habitat creation or restoration beyond mitigation and / or compensation requirements.

The assessment must then clearly identify and justify the following, as applicable, in addition to the above:

- Developable land and intensity of proposed use, associated with carrying capacity;
- Buffer areas;
- Reclaimed land;
- Connections; and
- Areas subject to environmental constraints, including high groundwater, flooding, steep slopes, etc.

KPIs are to be prepared to guide the design of the development, based on the results of the opportunities and constraints analysis. These are to include indicators and targets relating to the following, as a minimum:
- Soil;
- Flora;
- Fauna;
- Microclimate;
- Topography and views;
- Drainage;
- Other targets relating to mitigation of identified environmental constraints; and
- Area of site to be protected, maintained, created or restored.

KPIs are to be simple, clear, measurable targets against which future design or construction works can be assessed. They also need to be site specific and reflect the particular attributes of a site.

A suitably qualified environmental professional is an individual with:
- a degree in a relevant subject;
- a minimum of five years relevant work experience (for the ecological component of the assessment this is to include experience of carrying out habitat surveys as well as providing advice on ecological protection, enhancement and mitigation measures); and
- a proven track record on working on similar projects in the region.

The Environment Agency Abu Dhabi (www.ead.ae) holds a list of consultants carrying out a range of environmental services within the Emirate of Abu Dhabi.

References
- Environment Agency Abu Dhabi (for EIA and PER guidelines), www.ead.ae
- Living systems, James Grier Miller, 1978
- The Terrestrial Mammals, Reptiles and Amphibians of the UAE - Species list and status report, Environmental Research and Wildlife Development Agency, January 2005
- Handbook for Phase 1 Habitat Survey - a technique for environmental audit, JNCC, 2007, www.jncc.gov.uk
- Vascular Plants of Abu Dhabi Emirate, Gary Brown and Sabitha Sakkir, August 2004
NS-R2: Natural Systems Protection

**Intent**

To protect significant and valuable natural systems assets identified in NS-R1, Natural Systems Assessment.

**Credit Requirements**

**GENERAL**

Demonstrate that significant or valuable natural systems assets, as identified in NS-R1, are adequately protected or that the impacts are either mitigated or compensated.

This credit contains three types of strategies. Proponents must demonstrate one of the three:

- **Strategy 1 - Protection**
- **Strategy 2 - Onsite Mitigation**
- **Strategy 3 - Offsite Compensation**

The Natural systems protection and/or mitigation / compensation plan and supporting studies must be prepared by a suitably qualified ecological professional.

**Strategy 1 - Protection:**

- Demonstrate that 100% of each and every significant asset identified in NS-R1 is retained and protected from damage and destruction sufficient to maintain its structure and function (including any reclamation and dredging works at the project site or source location of dredged material).
- Demonstrate that 80% of each and every valuable asset identified in NS-R1, is retained and protected from damage and destruction sufficient to maintain its structure and function.
- Only 25% of the project’s total land area shall consist of reclaimed land.

OR

- Demonstrate that no significant or valuable assets for protection were identified in NS-R1.

**Strategy 2 - Onsite Mitigation:**

Applies to sites where onsite mitigation is required due to the impracticality of protection (as determined through consultation with the UPC).

- Demonstrate the natural systems asset to be impacted is not located within a protected or proposed protected area or national park, a coastal park or ecological hotspot, or a coastal conservation zone, as defined by the UPC Coastal Development Guidelines.
- Demonstrate minimum 70% of each and every significant asset identified in NS-R1 is retained on-site and protected from damage and destruction sufficiently to maintain its existing structure and function (including any reclamation and dredging works at the project site or source location of dredged material);
- Demonstrate minimum 50% of each and every valuable asset identified in NS-R1, is retained on-site and protected from damage and destruction sufficiently to maintain its existing structure and function;
- For projects that develop land adjacent to the coast, demonstrate that impacts affect no more than 20% of the coastal edge;
- Only 25% of the project’s total land area shall consist of reclaimed land;
- Mitigate for impacts (for the loss of up to 30% of significant assets and 50% of valuable assets) through on-site re-establishment of habitat, using similar species.
diversity as the lost habitat at an area replacement ratio of 2:1;
- Provide for an ecological corridor between the protected habitat area (significant assets) and the mitigation area; and
- Provide confirmation of the appointment of a management and maintenance organization (with a contract running for at least 5 years) for the project site, if management not to be undertaken by the local municipality.

Strategy 3 – Offsite Compensation:

Applies to sites where offsite compensation is required, due to the impracticality of protection or mitigation (as determined through consultation with the UPC). UPC’s Estidama Assessor must provide approval before the compensation strategy can be pursued.
- Demonstrate compliance with requirements for Strategy 2, but instead of onsite mitigation, compensate offsite.
- Compensate for impacts (for the loss of up to 30% of significant assets and 50% of valuable assets) through off-site re-establishment of habitat, using similar species diversity as the lost habitat at an area replacement ratio of 2:1.
- The Compensation site must be:
  - located within the Emirate of Abu Dhabi;
  - a degraded habitat;
  - located outside an area allocated for development within a 2030 plan.
- The habitat to be created in the compensation site must be:
  - a similar type to the habitat lost at the development site;
  - of a type appropriate to the compensation site location; and
  - ideally be located in an area surrounded and connected to a similar habitat.

Additional Requirement/Clarifications

None

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<tr>
<th>Requirement</th>
<th>Achievement</th>
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<td>This is a requirement. There are no Credit Points awarded.</td>
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Credit Submission: Design Rating

- Supporting calculations, summarizing total site area, protection area and / or mitigation area / compensation area in hectares.
- Construction strategy to protect significant and valuable assets from construction impacts.
- CV of the appointed suitably qualified ecological professional, if different to the details provided in NS-R1.

Strategy 1:

- Protection Strategy Report which identifies the potential risks to the natural systems asset from development to inform setback requirements including:
  - narrative and location maps which detail the boundaries of the asset;
  - extent of habitats and species to be protected;
  - limits of development, buffer areas and setbacks. Works areas shall be clearly identified on an aerial photograph of existing conditions; and
  - any features of ecological value to be lost.

Strategy 2:

- Mitigation Strategy Report which details the reasons for requiring mitigation for loss of habitat and includes:
  - narrative and maps of the area of natural system asset to remain protected;
- the area and value of habitat to be lost to development;
- the area allocated for re-establishment;
- limits of development, buffer areas and setbacks. Works areas shall be clearly identified on an aerial photograph of existing conditions;
- a strategy for habitat re-establishment, including source of plant stock and establishment of soil base; and
- five year strategy for on-going management and monitoring following completion of construction, including confirmation of management organization.

**Strategy 3:**

- Compensation Strategy Report which details the reasons for requiring compensation for loss of habitat and includes:
  - narrative and maps of the area of natural system asset to remain protected;
  - the area and value of habitat to be lost to development;
  - limits of development, buffer areas and setbacks. Works areas shall be clearly identified on an aerial photograph of existing conditions;
  - details on the compensation area allocated for re-establishment, including site location and confirmation of approval from landowner to establish habitat;
  - strategy for habitat re-establishment, including source of plant stock and establishment of soil base; and
  - five year strategy for on-going management and monitoring following completion of construction, including confirmation of management organization.

**Credit Submission:**

- Evidence that on and off site features of ecological value have been protected during construction; for example, a construction management plan and dated photographs of successfully protected areas/features.
- Updated development map delineating the built limits of all proposed development and disturbance, setback zones, and buffer areas.
- Supporting calculations summarizing final total land area and protected areas.
- Confirmation of the appointment of a management and maintenance organization (with a contract running for at least 5 years), if management not to be undertaken by the local municipality. The confirmation should contain details of individuals responsible and their duties in line with the strategy.

**Calculations and Methodology**

Only species within the project site boundary need to be protected, not those within the Area of Probable Impact as defined in NS-1 Natural Systems Assessment credit.

For mitigation or compensation, calculate the original area of the ecological habitat to be re-established. Re-establish the habitat on two times the surface area of the original habitat area. The mitigation or compensation area must have a similar hydrological function and soil type as the original area.

Setback requirements are to be determined by a suitably qualified ecologist depending on the nature of the asset (in consultation with UPC). In the absence of any policy for a specific habitat type, or clear justification for setback, any component of the proposed development is to be:

- setback at least 100 meters from identified coastal and marine priority habitats (intertidal, coral, seagrass);
- setback at least 50 meters from mangrove and vegetated sandy beaches;
- setback at least 10 meters from wadis, sand-sheets and low dunes, interdunal plains and high dunes, alluvial plains and jebels;
- setback from trees to be protected through use of barriers located either at the outer edge of branch spread or half the height of the tree, whichever is the greater;
- setback from other habitat areas through use of barriers located minimum 1 meter
from the outer edge.

References
See NS-R1
NS-R3: Natural Systems Design & Management Strategy

Intent
To minimize demand for resources, promote soil protection and enhancement and ensure the long term survival and management of landscaped / habitat areas.

Credit Requirements

GENERAL
Demonstrate that a Natural Systems (NS) design and management strategy has been prepared that promotes the following whilst ensuring the long term survival and management of the landscape and habitat areas within the site:
- Soil protection and enhancement;
- Low maintenance requirements; and
- Low demand for resources.

The NS design and management strategy must cover all landscape areas, including the management of:
- protected, mitigated or compensated assets identified under NS-R2 as a minimum,
- any areas of ecological enhancement as identified under NS-3;
- any areas of habitat creation and restoration as identified under NS-4; and
- any areas identified for food production as identified under NS-5.

The NS design and management strategy is to be prepared by a suitably qualified professional.

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Requirement Achievement
This is a requirement. There are no Credit Points awarded.

Credit Submission: Design Rating
- NS Design and Management Strategy that includes:
  - Plans and drawings illustrating layout and design of landscaped and habitat areas;
  - Details of soft and hard landscaped areas;
  - Details and justification of plant selection (ensuring that only native and adaptive drought and saline tolerant species are specified for habitat areas);
  - Details of strategy for soil testing, protection, enhancement and maintenance;
  - Irrigation strategy;
  - Details of landscape maintenance procedures including fertilizer, herbicide and pesticide application;
  - Details of specific establishment, maintenance and protection requirements for sensitive areas; and
  - Details of monitoring requirements.
- CV of the appointed suitably qualified environmental professional, if different to the professional’s details provided in NS-R1 or NS-R2.

Credit Submission: Construction Rating
- Updated Natural Systems Management Strategy, including:
  - Reporting of any landscape/ habitat design alterations or procedures; and
  - Report on any failures and rectification work undertaken.
- Confirmation of the appointment of a management and maintenance organization (with a contract running for at least 5 years), if management not to be undertaken by the local municipality. The confirmation should contain details of individuals responsible and their duties in line with the strategy.
The Landscape Design and Management Strategy is to include the following, as a minimum:

- A landscape design influenced by the assessment undertaken at NS-R1;
- A strategy for soil testing, protection and enhancement of site soils;
- Details of plant palette for landscape and / or habitat areas and sources of plant stock or seeds;
- Planting design which groups together species with similar soil and microclimatic requirements and water demands;
- An irrigation design and management strategy which promotes low water demand through species selection and efficient irrigation networks;
- A strategy for avoidance of pesticide and herbicide application. If required, identify potential impacts and outline strategy to be adopted to minimize environmental impact;
- A strategy for the establishment, survival, generation and protection of the landscape and / or habitat areas that require specific monitoring and maintenance (as identified by NS-R1 and NS-R2), identifying the establishment and maintenance periods and a performance criteria for establishment;
- Maintenance duties required to be carried out in the various landscaped areas considering species type, soil type, requirements and season;
- Monitoring strategy for the landscape / habitat areas and species for annual monitoring of health, species diversity and abundance and soil condition; and
- Identification of monitoring and maintenance organization.

References

See NS-R1
NS-1: Reuse of Land

Intent
To encourage new developments to reuse land that has already been built on and infill existing urban areas rather than using undisturbed land.

Credit Requirements

GENERAL
Demonstrate that at least 75% of the site area has been previously developed.

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Awarding Credit Points

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<tr>
<th>CREDIT POINTS</th>
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<td>Design Rating</td>
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<td>Demonstrate that at least 75% of the site area has been previously developed.</td>
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<td>Construction Rating</td>
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<td>Demonstrate and confirm that at least 75% of the site area has been previously developed.</td>
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</tbody>
</table>

Credit Submission: Design Rating

☐ Brief narrative of previous uses on the site, outlining existing structures and hard landscaped areas;
☐ Plan drawing of the existing, or previous development, on the site (or an aerial photograph, including graphic scale) illustrating the proposed development boundary; and
☐ Calculations demonstrating that the previously developed area is at least 75% of the new site area.

Credit Submission: Construction Rating

☐ Plan drawing of the existing, or previous development, on the site (or an aerial photograph, including graphic scale) with the final development boundary outlined; and
☐ Calculations confirming that the previously developed area remains at least 75% of the site area.

Calculations and Methodology

Previously developed land is classified as any land that is or was occupied by a permanent structure, or impervious surfaces such as hardscape and/or parking areas, including the land up to the plot boundary of the permanent structure and any associated fixed surface infrastructure. It excludes any land occupied by agriculture or forestry and any parks or recreation grounds.

References
None
NS-2: Remediation of Contaminated Land

**Intent**

To encourage and reward the remediation of land for building development.

**Credit Requirements**

**GENERAL**

Demonstrate the site has been identified as contaminated by undertaking an investigative analysis through completion of a Phase I and Phase II American Society for Testing and Materials (ASTM) analysis, or similar. A site contamination assessment report is to be provided identifying, estimating and evaluating the hazard risks on site. Demonstrate that the results of the contamination assessment report have informed the overall design and layout of the development.

Demonstrate that adequate remedial steps will be taken to decontaminate, or safely encapsulate, the site prior to construction through a Phase III ASTM report, or similar. The remediation strategy must be suitable for the proposed land use. The report is to state the scope of engagement, the person or organization responsible for overseeing the decontamination operation (from commencement to completion) and confirmation that the site will be appropriately remediating for the proposed land uses.

All assessments, analysis and reporting must be carried out by a suitably qualified environmental professional trained to complete such analysis and assessment.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

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<td>2 (maximum)</td>
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<td>Demonstrate the site is contaminated and an assessment report and remediation strategy has been prepared.</td>
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<td>Construction Rating</td>
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<td></td>
<td>Demonstrate that the land, prior to development, was identified as contaminated through the site contamination assessment report and that adequate remedial steps were taken to decontaminate or safely encapsulate the site prior to construction.</td>
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</table>

**Awarding Credit Points**

- Site contamination assessment report that clearly documents the pre-existing contamination on site.
- Certificate of engagement and Phase III remediation strategy from a suitably qualified environmental consultant.

**Calculations and Methodology**

A site contamination assessment protocol is to be followed to evaluate hazardous material pollution.
A Phase I analysis includes the identification of the potential for contamination through former land uses and/or through preliminary site analysis;

A Phase II analysis includes the completion of site surveys to determine the presence and extent of contamination on a site;

A Phase III assessment demonstrates the remedial steps to be taken to decontaminate, or safely encapsulate, the site prior to construction. An example of such a protocol is the ASTM Environmental Site Analysis Process, which includes E 1903 - 97 Phase II Environmental Site Assessment.

A remediation strategy is to be developed specific for the contaminated site; guidance can be found in the Model Procedures for the Management of Land Contamination (CLR 11).

Asbestos qualifies as contamination where it occurs in the ground.

The Environment Agency Abu Dhabi (www.ead.ae) holds a list of consultants carrying out a range of environmental services within the Emirate of Abu Dhabi.

References

- Environment Agency Abu Dhabi www.ead.ae
- Model Procedures for the Management of Land Contamination (CLR 11) www.environment-agency.co.uk
**NS-3: Ecological Enhancement**

**Intent**
To enhance the ecological value of the site.

**Credit Requirements**

**GENERAL**
Demonstrate enhancement of the ecological value of the site by planting native or adaptive species.

- 1 Credit Point: 50% plants specified for planting on the site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 5 different types of species.
- 2 Credit Points: 70% plants specified for planting on the site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 10 different types of species.

Integrate management requirements for ecological enhancement areas in NS-R3.

The ecological enhancement recommendations must be prepared by a suitably qualified ecologist and/or Landscape Architect.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Awarding Credit Points**

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<td>50% plants specified for planting on the site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 5 different types of species.</td>
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<tr>
<td>1</td>
<td>70% plants specified for planting on the site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 10 different types of species.</td>
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<tr>
<td>2</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>50% plants planted on site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 5 different types of species.</td>
</tr>
<tr>
<td>2</td>
<td>70% plants planted on site to comprise native and adaptive drought and/or saline tolerant species, including a minimum of 10 different types of species.</td>
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**Credit Submission: Design Rating**
- Ecological/landscape report and plant palette highlighting the proposed species, identifying those that are native, drought tolerant and saline tolerant;
- Drawings highlighting the location and area coverage of the proposed species; and
- Confirmation of integration of monitoring and management requirements in NS-R3.

**Credit Submission: Construction Rating**
- Photographs and as built landscape drawings clearly indicating the planted species.
Calculations and Methodology

The species qualifying for this credit must be native or adaptive plant species which are drought and / or saline tolerant with a proven track record to survive and thrive in an environment similar to the proposed site. A number of publications listing suitable species can be found under NS-R1 under References.

No species known to be of an invasive nature are to be included in the plant palette.

References

See NS-R1
NS-4: Habitat Creation and Restoration

**Intent**

To restore or re-create a habitat that is connected to other similar habitats and is self-sustaining.

**Credit Requirements**

**GENERAL**

4 Credit Points:

Demonstrate measurable strategies to increase the ecological value of the site by creating habitat or restoring pre-existing or degraded remnant natural areas on the site. The creation of habitat must use native or adaptive drought and/or saline tolerant species.

To gain this credit, the habitat type to be created or restored is to be a Priority Habitat of a type appropriate to the site location. Where there is no suitable area onsite for restoration or habitat creation, suitable offsite areas may be used to meet this credit.

The ecological restoration or creation recommendations must be prepared by a suitably qualified ecological professional.

**Onsite habitat creation or restoration**

Demonstrate habitat creation/restoration equivalent to the minimum habitat size for effective habitat function or two (2) times the Minimum Landscape Area, whichever is the greater. Habitat creation or restoration area is to be within areas as identified in NS-R1.

**Offsite habitat creation or restoration**

Demonstrate habitat creation/restoration equivalent to four (4) times the area of the Minimum Landscape Area.

Demonstrate the off-site habitat creation or restoration area is:
- located within the Emirate of Abu Dhabi;
- a degraded habitat;
- located in an area surrounded and connected to a similar habitat to that being created; and
- located outside an area allocated for development within a 2030 plan.

2 Credit points:

In addition to the above, demonstrate that through collaboration with neighboring land owner(s), ecological corridors are to be created linking the habitat creation/restoration site to similar habitat types located near but beyond the site. Ecological corridors are to be minimum 40m width and landscaped with native and adaptive species.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

Where possible, the habitat type to be created is to be located in one area of the site and be connected to the same or similar habitat type either within the site or adjacent to the site.
### Awarding Credit Points

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<tr>
<td>4</td>
<td>Prepare habitat creation or restoration strategy; Allocate on-site habitat creation or restoration site of minimum area as defined above.</td>
</tr>
<tr>
<td>4</td>
<td>Prepare habitat creation or restoration strategy; Allocate off-site habitat creation or restoration site equivalent to four (4) times the area of the Minimum Landscape Area.</td>
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<tr>
<td>2</td>
<td>Demonstrate that through collaboration, off-site ecological corridors have been designed to link similar habitat types.</td>
</tr>
<tr>
<td>6 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate on-site habitat creation or restoration of minimum area as defined above.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate off-site habitat creation or restoration equivalent to four (4) times the area of the Minimum Landscape Area.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that through collaboration, off-site ecological corridors have been created to link similar habitat types.</td>
</tr>
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#### Credit Submission: Design Rating

- A Habitat Creation or Restoration strategy including:
  - Calculations;
  - Photographs and maps illustrating habitat creation areas or pre-existing natural resource areas requiring restoration;
  - Plant palette highlighting the proposed species;
  - Methodology for habitat creation or restoration of functional habitat;
  - KPIs for assuring performance through monitoring and management; and
  - Maps illustrating connections between habitats on-site.

For ecological corridors credit points:

- Details of monitoring and management requirements for minimum 10 years for ecological corridors (to be incorporated into NS-R3);
- Ecological/landscape report and plant palette describing the design of the offsite ecological corridors and proposed species, with details of native and adaptive plant species;
- Drawings highlighting the location and area coverage of the off-site ecological corridors and habitat areas connected by the corridors, as appropriate; and
- Confirmation of the agreement with neighboring land owner to reserve and permanently protect land and create ecological corridors.

#### Credit Submission: Construction Rating

- Plans, narrative and photographic evidence of implementation of habitat creation / restoration strategy; and
- Documentation of any failures identified during construction and proposed rectification strategies of habitat creation / restoration.

For ecological corridors credit points:

- Photographs and as built landscape drawings clearly indicating the ecological corridors and planted species.

#### Calculations and Methodology

Appropriate candidate areas for habitat creation or restoration include but are not limited to the following Priority Habitats: Intertidal Mudflats, Mangroves, Vegetated Sandy Beaches, Seagrass, Coral, Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes, Alluvial Plains, Jebels, or other significant habitat types, to be agreed.
Land allocated for habitat creation or restoration must be in addition to land allocated for mitigation or compensation as required under NS-R2.

The Minimum Landscape Area is as defined in the UPC Development Code for different development types.

The habitat creation or restoration strategy is to include the following:

- The existing condition of the habitat creation / restoration area and the impacts that have caused or are continuing to cause the degradation or loss of habitat on the site;
- The habitat to be created or restored, including justification for the habitat type;
- Plans illustrating the location of the habitat creation / restoration area in relation to other areas of the same or similar habitat type and a description of the existing or proposed connections between them (where applicable);
- A description of the structure and function of the habitat type, including inter-relationships between topography, soil, microclimate, light and shade, flora and fauna and minimum habitat size for effective habitat function;
- A strategy for re-creation of the structure and function of the habitat type, linked to a series of KPIs providing the measurement tool for monitoring success of habitat creation or restoration of the site. These are to be based on the KPIs established in NS-R1 and are to include the following as a minimum:
  - Soil,
  - Flora,
  - Fauna,
  - Microclimate,
  - Topography,
  - Drainage, and
  - Minimum habitat size for effective habitat function.
- Plant palette to be used;
- The methodology for habitat creation or restoration, including grading, soil restoration and seeding or planting of the site and the proposed strategies to mitigate the existing degrading factors; and
- A 10 year monitoring and management strategy, including monitoring of soil conditions, health, species diversity and abundance and protection requirements (to be incorporated into NS-R3).

The species proposed for this credit must be native or adaptive plant species and drought and / or saline tolerant, with a proven track record to survive and thrive in an environment similar to the proposed site.

The Credit can also be awarded if a combination of on-site and off-site measures have been implemented but this has to be approved in advance by the UPC.

Ecological corridors may be fragmented by roads up to Boulevard width, as defined by the UPC Urban Street Design Manual. Underpasses or ‘green bridges’ are to be provided under/over highways to provide continuous habitat.

References

See NS-R1
NS-5: Food Systems

**Intent**

To create a more localized approach to food with sustainable food production and resident access to high-quality foods.

**Credit Requirements**

**GENERAL**

1 Credit Point:

Demonstrate that an appropriate site, based on the Environment Agency Abu Dhabi (EAD) Soil Survey and/or local hydrological, soil and microclimatic conditions, has been allocated for food production. Food production may be in the form of agricultural production or community garden, or similar.

Prepare a strategy for the establishment and long-term management of the site.

The food production strategy must be prepared by a suitably qualified professional.

1 Credit Point:

Demonstrate that a public space has been allocated for food sale, distribution or exchange and celebration. This is to be a permanent space for a regular feature such as a weekly market.

Prepare a strategy for the use of the public space which identifies the following, as a minimum:

- The source of local food crops to be sold or used for celebration purposes at the public space. Locally grown crops are to be from either within the Emirate or at least grown with the Gulf Cooperation Council (GCC) region;
- The ownership, management strategy and program for use of the public space; and
- Strategy for educational awareness associated with local food production.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td><strong>Design Rating</strong></td>
</tr>
<tr>
<td></td>
<td>A suitable site is allocated for food production and a strategy for long-term management and ownership has been prepared.</td>
</tr>
<tr>
<td>1</td>
<td><strong>Construction Rating</strong></td>
</tr>
<tr>
<td></td>
<td>A suitable site for food production has been created and the ownership and strategy for long-term management has been allocated.</td>
</tr>
<tr>
<td>1</td>
<td>A suitable public space has been provided for food sale and celebration and the ownership and strategy for use has been allocated.</td>
</tr>
</tbody>
</table>

**Strategy 1 - Food Production**

- Plans and drawings illustrating layout and design of food production areas; and
- Report which details crop types, ownership strategy, management strategy and
maintenance requirements.

**Strategy 2 - Food Celebration**

- Plans and drawings illustrating location of public space for food celebration; and
- Report which details source of local food crops, ownership strategy, program and strategy for environmental awareness.

<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy 1 - Food Production</strong></td>
</tr>
<tr>
<td>- Confirmation of site for food production; and</td>
</tr>
<tr>
<td>- Confirmation of ownership, management and maintenance organization (with a contract running for at least 5 years) and long-term management strategy.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy 2 - Food Celebration</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Plan to show confirmation of site for food celebration; and</td>
</tr>
<tr>
<td>- Confirmation of ownership, management and maintenance organization (with a contract running for at least 5 years) and strategy for use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food is to be defined as any food grown for human consumption.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
</tbody>
</table>
Creating Livable Communities is a cornerstone of Plan 2030. The need to accommodate growth whilst preserving the sense of community is fundamental to a successful future. This section focuses on the urban elements that influence the quality of the urban and built form, which through direct and deliberate control of the planning and design process has significant influence on the quality of place and hence on the overall quality of human life.

“Our ultimate goal is to create a cohesive, contemporary and sustainable urban fabric.”

In order to create sustainable cities, development must go beyond environmental aspects and address the other key pillars of Estidama - social, cultural and economic. This requires sensitive design and master planning. It demands a human scale urban environment that provides community focused facilities within comfortable walking distances of people. It requires designs that respect the cultural identity of the region and reflect the importance of family structure and religion on built form. As the towns and cities of the Emirate grow there is a need to create an urban fabric that supports mass transit modes of movement. Sound master planning also involves a response to the climate of the region, recognizing the role that design can have in reducing the worst effects of the arid climate, learning from traditional design responses so as to reduce the reliance upon technology. It also involves consideration of issues such as adoption of sustainable urban planning principles as base practice, focus on transit supportive and compact development, connected vehicular and pedestrian networks, increased access to community facilities and promotion of vibrant communities.

Resolving the complex issues associated with creating sustainable communities is at the essence of the urban planning and design process, establishing an iterative and inclusive design process, where stakeholders and key design professionals can contribute to, and help evaluate, a range of alternative solutions which will enhance a development’s success and contribute to creating sustainable cities.

The Livable Communities section is intended to encourage responsive design and sustainable land use through the following:

- Thorough analysis and assessment of the social, economic, design and policy context;
- Provision of community facilities in the right place, time and at the right level;
- Analysis and appreciation of the climatic conditions;
- The efficient and effective use of land;
- Creating a community that is easy to move around by all modes including pedestrian and cycling and enables excellent connections to the wider sub region;
- Providing for a diverse and inclusive population; and
- Providing opportunities for commerce and trade at an appropriate level.
<table>
<thead>
<tr>
<th>Credit Code</th>
<th>Credit Title</th>
<th>Maximum Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC-R1</td>
<td>Plan 2030</td>
<td>R</td>
</tr>
<tr>
<td>LC-R2</td>
<td>Urban Systems Assessment</td>
<td>R</td>
</tr>
<tr>
<td>LC-R3</td>
<td>Provision of Amenities and Facilities</td>
<td>R</td>
</tr>
<tr>
<td>LC-R4</td>
<td>Outdoor Thermal Comfort Strategy</td>
<td>R</td>
</tr>
<tr>
<td>LC-R5</td>
<td>Minimum Pearl Rated Buildings Within Communities</td>
<td>R</td>
</tr>
<tr>
<td>LC-1</td>
<td>Transit Supportive Practices</td>
<td>2</td>
</tr>
<tr>
<td>LC-2</td>
<td>Neighborhood Connectivity</td>
<td>3</td>
</tr>
<tr>
<td>LC-3</td>
<td>Open Space Network</td>
<td>3</td>
</tr>
<tr>
<td>LC-4</td>
<td>Accessible Community Facilities</td>
<td>2</td>
</tr>
<tr>
<td>LC-5</td>
<td>Housing Diversity</td>
<td>2</td>
</tr>
<tr>
<td>LC-6</td>
<td>Community Walkability</td>
<td>4</td>
</tr>
<tr>
<td>LC-7</td>
<td>Active Urban Environments</td>
<td>1</td>
</tr>
<tr>
<td>LC-8</td>
<td>Travel Plan</td>
<td>1</td>
</tr>
<tr>
<td>LC-9</td>
<td>Improved Outdoor Thermal Comfort</td>
<td>4</td>
</tr>
<tr>
<td>LC-10</td>
<td>Regionally Responsive Planning</td>
<td>2</td>
</tr>
<tr>
<td>LC-11</td>
<td>Pearl Rated Buildings Within Communities</td>
<td>10</td>
</tr>
<tr>
<td>LC-12</td>
<td>Safe and Secure Community</td>
<td>1</td>
</tr>
</tbody>
</table>

**TOTAL**  35
# LC-R1: Plan 2030

## Intent

To ensure that all new development supports the vision for the Emirate of Abu Dhabi, as defined by the applicable Plan 2030, and/or Development Code, and/or Area Plan.

## Credit Requirements

### GENERAL

Demonstrate that the proposed development is located within an Urban Growth Boundary as identified by UPC’s adopted Framework Plans.

Demonstrate that the proposed development’s Floor Area Ratio (FAR), dwelling units per hectare (du/ha), building height, building mass, transportation and open space networks are consistent with the applicable Plan 2030 and/or Development Code and/or Area Plan.

### ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

## Requirement Achievement

This is a requirement. There are no Credit Points awarded.

## Credit Submission: Design Rating

- A letter from the QP stating and providing justification that the proposed development is:
  - Located within an established Urban Growth Boundary; and
  - Did not require significant variance or special relief from Plan 2030, Development Code and/or Area Plan for approval.

## Credit Submission: Construction Rating

There is no required submission at this stage.

## Calculations and Methodology

Development Code relationship to other Plans, Policies and Regulations:

- The Development Code will generally conform to Plan 2030. In cases where there is a conflict between the Code and Plan 2030 or Plan Districts, the Code governs.
- Outside of Plan Districts, when there are two Code regulations or guidelines on the same subject, the more restrictive governs, except were a less restrictive provision is clearly intended (e.g. greater height around transit stations).
- When a Plan District regulation or guideline and a Code regulation or guidelines address the same topic, the Plan District guidelines govern.
- When there is no regulation or guideline in a Plan District to address an issue but there is an appropriate regulation or guideline in the general Code, the Code provisions apply.
- In case of conflict on any subject with any other plan, policy, regulation or guideline, including affection plans imposed or issued by other agencies in the Emirate of Abu Dhabi, the Code provisions govern.

The Code may refer to plans, policies and guidelines, created by the UPC, the Municipality or external agencies that supplement regulations and guidelines in this Code.

## References

- Plan 2030 relevant to the site
- Development Codes relevant to the site.
- Area Plans relevant to the site.

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
### LC-R2: Urban Systems Assessment

**Intent**
To ensure that, before the design process begins, a thorough understanding of the urban systems influencing the site are considered and assessed.

**Credit Requirements**

**GENERAL**

Demonstrate that, before the start of the design process and site clearance, an urban systems assessment has been carried out for the project site and at the following scales:
- Local,
- Sub-regional, and
- Regional scale.

Based on the urban systems analysis, identify opportunities and constraints associated with the development and present them in an Urban Systems Assessment Report.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Requirement Achievement**
This is a requirement. There are no Credit Points awarded.

**Credit Submission: Design Rating**

- Urban Systems Assessment report including:
  - Narrative;
  - Maps; and
  - Site photographs.

  Maps, diagrams and site photographs must clearly identify the existing site conditions.

- CV of the appointed suitably qualified professional.

**Credit Submission: Construction Rating**
There is no required submission at this stage.

**Calculations and Methodology**
Information contained in the following documents may provide the foundation for this credit:
- Plan 2030;
- Surface Transport Master Plan;
- UPC community facility requirements;
- Census Data;
- ADACH - Preliminary Cultural Review;
- Estidama Integrative Development Process as part of the requirements for the Development Review Process.

The urban systems analysis must include a detailed assessment of the following elements, as applicable to the various scales:
- Location,
- Site Access
- Population,
- Transport,
- Economy and Employment,
- Land Use,
- Densities,
- Built Form,
- Access and Mobility,
- Culturally significant resources, as identified by Abu Dhabi Authority for Culture and Heritage (ADACH),
- Open Space,
- Community Facilities,
- Infrastructure including Utilities and Services,
- Easements and Rights of Ways,
- Visual and Landscape, and
- Micro-climate.

Site Scale refers to the project itself, defined by the specific site project boundaries. Local Scale/ Sub-Regional Scale and Regional Scale are to be determined, based on the project size, by the suitably qualified professional.

The Urban Systems Assessment is to be undertaken in combination with NS-R1 Natural Systems Assessment.

The Urban Systems Assessment must be documented as a consolidated assessment report and include the following:

- Narrative- the written component of the report which highlights the key elements, key issues and the opportunities and constraints at the project site, local, sub-regional and regional scale. Additionally, this should include a section which summaries how this information is reflected in the final master plan solution, supported by graphics.
- Maps and Diagrams- the graphic component should highlight the existing situation and opportunities and constraints relating to the elements explored.

A suitably qualified professional is an individual with:
- a degree in a relevant subject (e.g. Architecture, Town Planning and/or Landscape Architecture),
- a minimum of five years relevant work experience,
- a proven track record on working on similar projects in the region.

**References**

- Abu Dhabi Authority for Culture and Heritage (ADACH) [www.adach.gov.ae](http://www.adach.gov.ae)
- Department of Transport, Surface Transport Master Plan [www.dot.gov.ae](http://www.dot.gov.ae)

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
## LC-R3: Provision of Amenities and Facilities

**Intent**
To ensure that a neighborhood’s cultural amenities and community facilities are accessible to the greater population, affording social connectivity, interaction and shared public benefit of community resources.

### Credit Requirements

**GENERAL**
Demonstrate that the development has met minimum standards on the provision of community facilities as set out in the UPC community facility requirements and prepare a community facilities implementation plan.

Demonstrate that the location of amenities and facilities encourages pedestrian and cycle access through the provision of a network of primary pedestrian walkways and cycle paths. All primary pedestrian walkways and cycle tracks within a 350m radius of all amenities and facilities are to be clearly identified. Demonstrate that through the co-location of amenities and facilities linked trips are encouraged.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

### Requirement Achievement

This is a requirement. There are no Credit Points awarded.

### Credit Submission: Design Rating

- **Community facility statement that contains:**
  - Demand Analysis, identifying the need for additional community facilities based on land uses, demographics and facility deficits identified in LC-R2; and
  - Proposed Facilities, summarizing proposed Community Facilities program including a description of each facility, proposed size, capacity and users for each.

- **Community Facilities Implementation Plan that outlines:**
  - Responsible party who owns and builds the community facilities;
  - Responsible party for operation and management of community facilities; and
  - Life-cycle management strategy for community facilities, including projected costs of maintenance.

- **Site Plan that clearly identifies:**
  - The location of any existing community facilities and cultural sites and amenities to be retained;
  - The location of supporting community facilities in the sub-region;
  - The location of any proposed amenities and facilities;
  - Points of public access (including access from transit stops) and clear lines of connection for easy walking or cycling to amenities;
  - The Primary Pedestrian Walkways and cycle tracks within 350m of amenities and facilities;
  - Car parking location and number of spaces; and
  - Public transit options within 350m of amenities and facilities.

### Credit Submission: Construction Rating

- An aerial photograph illustrating the location of community facilities and points of interest, together with the access routes, car parking and public transit if applicable.

### Calculations and Methodology

Primary pedestrian walkways are those located along boulevards, avenues, streets or access lanes as defined in the Abu Dhabi Urban Street Design Manual (Chapter 5).
References

- Community facility requirements, UPC
- Abu Dhabi Urban Street Design Manual, UPC

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-R4: Outdoor Thermal Comfort Strategy

Intent
To increase outdoor thermal comfort during transition months and reduce thermal discomfort during summer months in public spaces and walkways.

Credit Requirements

GENERAL

Demonstrate an outdoor thermal comfort strategy has been employed to identify priority areas for shading and improve the outdoor microclimate for the community. The strategy is to consider the following as appropriate within the project’s specific context:
- Orientation;
- Shading;
- Selection of high-albedo surfaces;
- Ventilation;
- Evaporative cooling;
- Radiative cooling; and
- Thermal mass.

Identify public realm spaces as priority areas for shading, including all:
- Primary and secondary pedestrian walkways;
- Surface car parking; and
- Applicable public open spaces including the following:
  - Plazas;
  - Playgrounds;
  - Pocket parks;
  - Barahas; and
  - Other public open spaces.

Identify shade provided by buildings and / or structures on these areas.

Identify types of cover or shade measures to be implemented in the project to achieve the following minimum % shading of applicable public realm spaces.

Table LC-R4a: Minimum shading requirements

<table>
<thead>
<tr>
<th>Public Realm Space</th>
<th>Minimum % shading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Surface Car Parking with more than 10 spaces</td>
<td>40%</td>
</tr>
<tr>
<td>(including parking on roof surfaces)</td>
<td></td>
</tr>
<tr>
<td>Public Open Spaces</td>
<td>60%</td>
</tr>
<tr>
<td>Primary Pedestrian Walkways (based on 1.8m width within the</td>
<td>75%</td>
</tr>
<tr>
<td>through zone).</td>
<td></td>
</tr>
<tr>
<td>Secondary Pedestrian Walkways (based on 1.8m width)</td>
<td>75%</td>
</tr>
<tr>
<td>within the through zone).</td>
<td></td>
</tr>
<tr>
<td>Cycle Tracks</td>
<td>50%</td>
</tr>
<tr>
<td>Playgrounds</td>
<td>90%</td>
</tr>
</tbody>
</table>

ADDITIONAL REQUIREMENT/CLARIFICATIONS

- Where cover is provided by structures such as canopies or other architectural elements, the outer surface of the shading element must have a minimum Solar Reflectance Index (SRI) of 29.
- Shade from trees is to be measured at 3 years growth.
- Public realm spaces shade requirements excludes active recreational areas such as
playing fields and ball courts.

<table>
<thead>
<tr>
<th>Requirement Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a requirement. There are no Credit Points awarded.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Design Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Outdoor thermal comfort strategy including narrative on opportunities for shade provision and priority areas for shade;</td>
</tr>
<tr>
<td>□ Plan to show public realm spaces and priority areas for shading;</td>
</tr>
<tr>
<td>□ Plan to show shade provision by buildings, structures, cover and / or shade measures on priority areas of public realm, calculated at 1:00 pm clock time on the Equinox and Summer Solstice;</td>
</tr>
<tr>
<td>□ Summary results showing achievement of minimum % of shading of public realm spaces and priority areas for shading at 1:00pm clock time on the Equinox and Summer Solstice; and</td>
</tr>
<tr>
<td>□ Extracts from specifications relating to the SRI of all cover elements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Updated Outdoor Thermal Comfort Strategy report including narrative supported by as-built drawings and photographs of the public realm spaces and priority shade areas, highlighting all measures contributing to improving the exterior microclimate, including planned or existing features; and</td>
</tr>
<tr>
<td>□ Evidence that all purchased and installed covers have compliant outer surface SRIs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Primary pedestrian walkways are those located along boulevards, avenues, streets or access lanes as defined in the Abu Dhabi Urban Street Design Manual (Chapter 5).</td>
</tr>
<tr>
<td>▪ Secondary pedestrian walkways are all other walkways, including sikkas.</td>
</tr>
<tr>
<td>▪ Through zones are defined in the UPC Urban Street Design Manual.</td>
</tr>
<tr>
<td>▪ For both primary and secondary walkways, the minimum required shaded area must first prioritize a 1.8m wide zone.</td>
</tr>
<tr>
<td>▪ Shade calculations must be undertaken on the equinox (March 21st) and the summer solstice (June 21st) at 1:00pm clock time. The compliant shaded area must be in shade at both the equinox and summer solstice.</td>
</tr>
<tr>
<td>▪ In all calculations, shade from adjacent buildings and / or structures is to be included.</td>
</tr>
<tr>
<td>▪ Dappled shade of more than 60%, such as that created by a grid or lattice, may be considered fully shaded. Dappled shade less than 60% must be calculated based on the actual shaded portion.</td>
</tr>
<tr>
<td>▪ SRI values for the outer surface of cover elements can be calculated based on solar reflectance and emittance numbers as defined in the American Society of Testing and Materials Standard E1980-01. Alternatively, manufacturer’s evidence can be supplied where the testing is in accordance with the referenced standards below.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Abu Dhabi Urban Street Design Manual, UPC</td>
</tr>
<tr>
<td>▪ Community facility requirements, UPC</td>
</tr>
</tbody>
</table>

Please refer to the UPC and/or Estidama Website for the latest relevant UPC.
documents or contact the UPC directly.
LC-R5: Minimum Pearl Rated Buildings Within Communities

**Intent**

To reward development that has a high proportion of buildings achieving minimum pearl building ratings.

**Credit Requirements**

**GENERAL**

Demonstrate attainment of an average building rating of at least 1 for Pearl Building Ratings across the community development.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

For communities consisting of existing and new buildings, this only applies to new buildings and existing buildings undergoing major renovation and forming a part of the development scope.

**Requirement Achievement**

This is a requirement. There are no Credit Points awarded.

**Credit Submission: Design Rating**

- High Performance Building Strategy that includes:
  - Table outlining each building in the proposed development and corresponding GFA and pearl rating;
  - Calculation of average Pearl Building rating for community; and
  - Extracts from design guidelines and mechanism for compliance.

**Credit Submission: Construction Rating**

- Updated High Performance Building Strategy that includes:
  - Table outlining each building in the development and corresponding built GFA, noting which have achieved a Pearl Building Rating and the level of rating achieved;
  - Pearl Rating Certificates verifying the Pearl level achieved for each nominated building and GFA; and
  - Calculation of average Pearl Building Rating for community.

**Calculations and Methodology**

Pearl Rated Building Certificate is acceptable for compliance with submission requirement for this credit.

Formula for calculating Average Building Rating:

\[
\text{Average Building Rating} = \sum_{n=1}^{5} \left( \frac{\text{GFA}_n}{\text{Total GFA}} \times n \right)
\]

where \( n \) is the building pearl rating from 1 to 5; \( \text{GFA}_n \) is the combined gross floor area of all buildings achieving \( n \) pearls; and Total GFA is the gross floor area of all new / major refurbished buildings within the community.

For example a community with 20% GFA of 2 pearl buildings and 25% of GFA 3 pearls buildings would achieve a community average pearl rating of 1.15.

A calculation tool for calculating the average Pearl Building Rating for the community is available.

**References**

- UPC LCr-5 Pearl Building Rating Calculator
- The Pearl Building Rating System, UPC, 2010

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-1: Transit Supportive Practices

**Intent**
To optimize public transportation investment through development practices that facilitate higher use of transit facilities.

**Credit Requirements**

**GENERAL**
- Demonstrate that development within an established transit-shed meets the following criteria:

<table>
<thead>
<tr>
<th>Transit-shed</th>
<th>Transportation mode</th>
<th>Residential (du/ha gross)</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 meters</td>
<td>Transit stations within the CBD</td>
<td>120-200</td>
</tr>
<tr>
<td>350 meters</td>
<td>Transit stations within Centers</td>
<td>60-120</td>
</tr>
<tr>
<td>350 meters</td>
<td>Transit stations within suburban and neighborhood areas</td>
<td>35-60</td>
</tr>
</tbody>
</table>

- Demonstrate that at least one primary pedestrian walkway (with minimum 75% shade as defined in LC-R4 Outdoor Thermal Comfort Strategy) has been provided, connecting each transit station in the transit-shed to an identified center of transit users.

**ADDITIONAL REQUIREMENT / CLARIFICATIONS**
None

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2</strong> (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate appropriate densities as defined in Table LC-1a and at least 1 primary pedestrian walkway with 75% shade as defined in LC-R4.</td>
</tr>
<tr>
<td><strong>2</strong> (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>2</td>
<td>Confirm required densities as defined by Table LC-1a and show proof of primary pedestrian walkway with 75% shade as defined in LC-R4.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

- Transit Supportive Strategy that includes:
  - Transit Capture Plan illustrating the limits of the development’s proposed transit-shed(s) and the proposed mode of transit;
  - Transit Supportive Density Summary Table summarizing the station type (Light Rapid Transit (LRT) / Bus Rapid Transit (BRT) / Metro), total area within the transit-shed, total number of dwellings and dwelling units per hectare; and
  - Site Plan defining primary pedestrian walkway.

**Credit Submission: Construction Rating**

- Updated Transit Supportive Strategy that includes:
  - Updated Transit Capture Plan comparing the initially proposed transit-shed(s) and actual area at build out, as well as the proposed and actual result post construction;
  - Transit Supportive Density Summary Table highlighting the proposed total
number of dwellings and du/ha and the actual result post construction;
  - As built drawings and photos documenting the actual primary pedestrian walkway; and
  - Shading analysis and as-built drawings to illustrate 75% shade to the primary pedestrian access walkway as per the requirements under LC-R4.

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
<th>Transit stations relates to Metro and / or LRT and / or BRT.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transit-shed is the 350m capture radius from the relevant transit station.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>References</th>
<th>None</th>
</tr>
</thead>
</table>
### LC-2: Neighborhood Connectivity

**Intent**

To achieve a high level of pedestrian/cycle and vehicular connections within the neighborhood and with existing and potential future surrounding developments.

**Credit Requirements**

**GENERAL**

Demonstrate that the proposed development achieves a high level of vehicular and pedestrian/cycle connectivity at the neighborhood level through the design of street networks and intersections. Additional credit points are awarded for better connectivity and, where applicable, enhancing the existing situation.

1 Credit Point:

**Connectivity**

Achieve a minimum average Connectivity Index of 1.5, as outlined in the Abu Dhabi Urban Street Design Manual.


**Adjacency**

For Infill Sites (Applies to sites with at least 50% adjacency to existing development):

- Demonstrate that 80% of the development’s perimeter streets provide full movement intersections with existing development, unless by doing so it would result in the new development exceeding the minimum Through Street Spacing Criteria;

For New Sites (Applies to sites with at least 50% adjacency to future development areas):

- Demonstrate that the development will establish a street and pedestrian network that adjacent parcels can adopt for connectivity in future years. The only exception to this is where extensions and connections are prevented by topographical, cultural resource or environmental conditions, as defined in LC-R2 or NS-R1.

1 Credit Point: Achieve the Average Through Street Spacing Criteria standard on 75% of intersections as defined in Table LC-2a.

1 Credit Point: Through revitalization of existing areas, enhance existing Connectivity Index by 50% against baseline position.

**ADDITIONAL REQUIREMENT / CLARIFICATIONS**

None
Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (maximum)</td>
<td><strong>Design Rating</strong></td>
</tr>
<tr>
<td>1</td>
<td>Illustrate minimum average Connectivity Index of 1.5 and Adjacency Standards</td>
</tr>
<tr>
<td>1</td>
<td>Illustrate at least 75% of the intersections meet the Average standard as set out in Table LC-2a</td>
</tr>
<tr>
<td>1</td>
<td>Illustrate revitalization of neighborhood through increased connectivity by 50% for existing areas</td>
</tr>
<tr>
<td>3 (maximum)</td>
<td><strong>Construction Rating</strong></td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate minimum average Connectivity Index of 1.5 and achievement of Adjacency Standards.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that at least 75% of the intersections meet the Average standard as set out in Table LC-2a.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate revitalization of neighborhood has increased connectivity by 50%</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Connectivity Index calculation, demonstrating attainment of a minimum average index of 1.5;
- Plan illustrating adjacency calculation;
- Connectivity Plan at a legible scale illustrating:
  - The proposed street network for the development, including avenues, boulevards, streets and lanes;
  - Through streets that meet the maximum spacing;
  - All adjacent development street networks, illustrating inter-development connections;
  - All pedestrian connections along the perimeter of the development;
  - Full and restricted movement vehicular intersections highlighting bicycle, pedestrian and other multi-modal transportation networks; and
  - Intersections to be removed from connectivity calculation due to restrictions in the form of topography, cultural resources or environmentally sensitive areas that prohibit through streets.
- Connectivity plan demonstrating at least 75% of the intersections meet the Average standard as set out in Table LC-2a.
- For revitalization projects, provide a Connectivity Index for the area as existing, and illustrate 50% enhancement has been achieved.

Credit Submission: Construction Rating

- Aerial photograph, overlain on the original Connectivity Plan that illustrates attainment of the intersections identified in the Design Rating submission.
- Aerial photograph and as-built drawings demonstrating at least 75% of the intersections meet the Average standard as set out in Table LC-2a.
- For revitalization projects, aerial photographs and as-built drawings demonstrating the Connectivity Index for the area as existing, and 50% enhancement.
Connectivity Index and Through Street Spacing are described in the Abu Dhabi Urban Street Design Manual, 2009 (Chapter 7 page 9 and Table 5.6 respectively).

Average street spacing standards as based on Table 5.7 of the Abu Dhabi Urban Street Design Manual are:

<table>
<thead>
<tr>
<th>Table LC-2a Average Through Street Spacing Criteria (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
</tr>
<tr>
<td>City</td>
</tr>
<tr>
<td>Town</td>
</tr>
<tr>
<td>Commercial</td>
</tr>
<tr>
<td>Residential</td>
</tr>
<tr>
<td>Industrial</td>
</tr>
</tbody>
</table>

Street types and context are as set out in the Urban Street Design Manual. All measurements on junction spacing will be centerline to centerline.

Adjacency refers to the amount of existing development at the project’s site’s perimeter. To calculate percentage of adjacency:

Step 1: Measure entire perimeter of property.

Step 2: On an aerial photograph note those areas adjoining the development site that are currently developed; containing commercial, residential and/or developed recreational uses.

Step 3: Measure the frontage of adjoining developed areas.

Step 4: Sum adjoining frontage that is developed and divide total by total development perimeter.

References

- Abu Dhabi Urban Street Design Manual, UPC

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-3: Open Space Network

Intent
To create an interconnected network of parks and open space, differing in size, character and purpose to support a variety of human activities and natural systems.

Credit Requirements

GENERAL

1 Credit Point: Demonstrate provision of an open space and management strategy that illustrates the following:
- Compliance with UPC open space standards;
- The open space program based on type, hierarchy, character and standards; and
- Management strategy.

1 Credit Point: Demonstrate an accessible interconnected system of open space through the use of greenways and trails, with at least 70% of residents within 350m walking distance of a linear open space over 1 ha.

1 Credit Point: Demonstrate the multiple use of open space, with all open spaces serving a minimum of 1 different function, in addition to recreation.

ADDITIONAL REQUIREMENT / CLARIFICATIONS
None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Provide an Open Space and management strategy that meets the standards set out in the UPC community facility requirements.</td>
</tr>
<tr>
<td>1</td>
<td>Illustrate the provision of an interconnected system of open space as detailed above.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate all open spaces serve a minimum of 1 function in addition to recreation.</td>
</tr>
<tr>
<td>3 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Provide an Open Space strategy and management plan that meets the standards set out in the UPC community facility requirements.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate the provision of an interconnected system of open space as detailed above.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate multiple use of open space as planned.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Open space and management strategy, including:
  - Open space program that includes a breakdown of open space provision by types and hierarchy, defining the character, purpose, potential uses and users for each;
  - A written summary of standards for each open space area that describes size in hectares, intended population catchment and representative imagery of each typology;
  - A management strategy for the ongoing management of the space; and
- A scaled plan that identifies the location, boundaries, use and accessibility routes to the linear open spaces with a written summary of resident number assumptions.
<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Updated open space and management strategy.</td>
</tr>
<tr>
<td>□ As-built plan identifying the location, boundaries, use and accessibility routes to linear open spaces.</td>
</tr>
<tr>
<td>□ Aerial photograph, overlain on the original open space plan and as-built drawings illustrating attainment of the spaces and open spaces identified in the Design Rating submission.</td>
</tr>
<tr>
<td>□ As-built drawings illustrating multi-functional uses for each open space.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open space requirements are set out in the UPC community facility requirements.</td>
</tr>
</tbody>
</table>

**Applicable functions, in addition to recreation may include:**
- habitat provision;
- stormwater treatment;
- microclimate enhancement and amelioration;
- market place provision;
- social and/or cultural function.

<table>
<thead>
<tr>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Abu Dhabi Development Code, UPC, 2009</td>
</tr>
<tr>
<td>▪ Community facility requirements, UPC</td>
</tr>
</tbody>
</table>

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-4: Accessible Community Facilities

Intent
To promote clustering and sharing of community facilities to enable easy access to be achieved.

Credit Requirements

GENERAL

1 Credit Point: Demonstrate walking distance standards to applicable facilities are reduced by 25% against the UPC standards.

1 Credit Point: Demonstrate a 25% reduction in building footprint or site area is achieved through the sharing of facilities (including car parking).

ADDITIONAL REQUIREMENT / CLARIFICATIONS
None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that walking distances to all applicable facilities are reduced by 25% against the published standards.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate a 25% reduction in building footprint or site size is achieved through the sharing of facilities</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Confirm that walking distances to all applicable facilities are reduced by 25% against the published standards</td>
</tr>
<tr>
<td>1</td>
<td>Confirm a 25% reduction in building footprint or site size is achieved through the sharing of facilities</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Community Facilities Diagram showing the location of all proposed and existing facilities, indicating walking catchments for each applicable facility.
- Space Efficiency Strategy defining multiple-use options for each facility to reduce building footprint or site size by 25%.

Credit Submission: Construction Rating

- Developed Community Facilities Plan showing the location of completed facilities and walking catchments for each facility.
- Details of built community facilities indicating where multi-use of sites has been achieved.

Calculations and Methodology
Applicable facilities are those that have a maximum walking distance defined in the UPC community facility requirements. It also defines community facility site size and building footprint standards and walking distance standards. As of November 2009 the applicable facilities were:
- mosques;
- schools (all types); and
- parks (Pocket & Neighborhood).

Applicable facilities and distances may be subject to change and developers must ensure that they apply the standards outlined in the latest available release from UPC.

References
- Community facility requirements, UPC
- Abu Dhabi Department of Municipal Affairs, General Conditions of Mosque Design,
www.abudhabi.ae

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-5: Housing Diversity

**Intent**
To encourage a diverse mix of residential properties in neighborhoods.

**Credit Requirements**

**GENERAL**
Demonstrate that the development’s proposed housing program results in a minimum housing diversity of at least 0.6.

- 1 Credit Point: Demonstrate achievement of Housing Diversity Index of 0.6 to 0.7
- 2 Credit Points: Demonstrate achievement of Housing Diversity Index of >0.7

**ADDITIONAL REQUIREMENT / CLARIFICATIONS**
None

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate achievement of Housing Diversity Index of 0.6 to 0.7.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate achievement of Housing Diversity Index of &gt;0.7</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Confirm achievement of Housing Diversity Index of 0.6 to 0.7.</td>
</tr>
<tr>
<td>2</td>
<td>Confirm achievement of Housing Diversity Index of &gt;0.7</td>
</tr>
</tbody>
</table>

- **Credit Submission: Design Rating**
  - Housing product summary that includes:
    - Housing Program Table identifying each product by name, form and total occupied space or number of bedrooms.
    - Housing Diversity calculation for the development or each neighborhood, whichever is the smallest.

- **Credit Submission: Construction Rating**
  - Updated Housing product summary that includes:
    - Housing Program Table identifying each product by name, form and total occupied space or number of bedrooms.
    - Housing Diversity calculation for the development or each neighborhood, whichever is the smallest.

**Calculations and Methodology**
Product options that support housing diversity are:

- Small Apartment (studio, 1bed, 2bed)
- Larger Apartment (3+bed)
- Small Villa House (2bed, 3bed)
- Larger Villa House (4+bed)
- Small Townhouse (2bed, 3 bed)
- Large Townhouse (4+ bed)

The formula for the Housing Diversity Indicator is based on the Simpson Diversity Index and is as follows:

\[ 1 - \Sigma (n/N)^2 \]
Where:
\( n \) = the total number of dwellings in a particular house type
\( N \) = the total number of dwellings in all categories

A housing diversity indicator calculator is available from UPC.

References

- LC-5 Housing Diversity Indicator Calculator, UPC
LC-6: Community Walkability

**Intent**
To improve public health, enhance mobility, reduce reliance on automobiles and improve the vitality of the community through an enhanced pedestrian environment.

**Credit Requirements**

**GENERAL**
Demonstrate achievement of all the following:
- Fully connected network of pedestrian routes with a Direct Route Index of less than 1.5, as defined in the UPC Urban Street Design Manual;
- Compliance with the minimum Urban Heat Reduction Credit RE-2 requirements;
- Full compliance with Abu Dhabi Urban Braille Guidelines for all pedestrian routes and community facilities;
- Meet the Universal Design Guidelines contained in the Abu Dhabi Urban Street Design Manual (6.2 and 6.3); and
- Provide a resting place at least every 350m along all primary pedestrian walkways that is 100% shaded.

**ADDITIONAL REQUIREMENT / CLARIFICATIONS**
None

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Rating</strong></td>
<td><img src="image" alt="CREDIT POINTS" /></td>
</tr>
</tbody>
</table>
| 4 (maximum) | Demonstrate compliance with the following;  
- Direct Route Index of less than 1.5;  
- Compliance with the minimum Urban Heat Reduction Credit RE-2 requirements;  
- Full compliance with Abu Dhabi Urban Braille Guidelines;  
- Meet the Universal Design Guidelines contained in the Abu Dhabi Urban Street Design Manual (6.2 and 6.3); and  
- Provide a shaded resting place at least every 350m along all primary pedestrian walkways. |
| **Construction Rating** | ![CREDIT POINTS](image) |
| 4 (maximum) | Confirm compliance with the following;  
- Direct Route Index of less than 1.5;  
- Compliance with the minimum Urban Heat Reduction Credit RE-2 requirements;  
- Full compliance with Abu Dhabi Urban Braille Guidelines;  
- Meet the Universal Design Guidelines contained in the Abu Dhabi Urban Street Design Manual (6.2 and 6.3); and  
- Provide a shaded resting place at least every 350m along all primary pedestrian walkways. |
Credit Submission: Design Rating

- Community Walkability report that includes:
  - Network Diagram, spatially documenting community facilities and features of interest, and the primary pedestrian walkways as identified in LC-R3 Provision of Amenities and Facilities;
  - Direct Route Index from a point 350m from any center for the four points of the compass;
  - Shading Strategies, including submission for meeting minimum requirements of RE-2 Urban Heat Reduction. In addition, provide locations and details of 100% shaded resting areas, with shading measured at 1:00 pm clock time at the Equinox and Summer Solstice;
  - Urban Braille Compliance summarizing features, elements and Design Standards to be employed consistent with UPC Urban Braille policy; and
  - Compliance with sections 6.2 and 6.3 of the Urban Street Design Manual.

Credit Submission: Construction Rating

- Aerial photos and as-built network diagrams with shaded resting areas shown;
- Photos identifying Urban Braille compliance and shaded resting areas; and
- Photos of crossing points and material product sheets for surface materials in compliance with 6.3 of the Urban Street Design Manual.

Calculations and Methodology

Calculation of minimum 350m must be based on actual walking distances.

Direct Route Index is calculated by the following equation:

\[ DRI = \frac{d}{a} \]

where:
- \( d \) = direct path i.e. as the crow flies
- \( a \) = actual path distance
- \( DRI \) = Direct Route Index

Direct Route Index is illustrated in the Abu Dhabi Urban Street Design Manual, Chapter 7 page 9.

References

- Abu Dhabi Urban Street Design Manual, UPC

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-7: Active Urban Environments

Intent
To encourage active lifestyles by providing building occupants and users with recreational public open spaces.

Credit Requirements

**GENERAL**
Demonstrate that outdoor spaces have been provided and programmed to encourage activity, including sport and recreation. The spaces must be specifically developed for any of, or any combination of, the following:
- Landscaped areas for recreation;
- Playground areas; and/or
- Sports field areas.

Develop and implement an Active Urban Environment Program which details the programming of spaces for the following types of uses:
- Communal;
- Women and children only; and
- Men only.

If sports field areas are provided, also demonstrate that accessible showers and change rooms are located within 350 meters walking distance.

Funding arrangements must be in place for maintenance.

**ADDITIONAL REQUIREMENT / CLARIFICATIONS**
None

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate provision of outdoor spaces compliant with the Credit Requirements</td>
</tr>
<tr>
<td>1 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate provision of outdoor spaces compliant with the Credit Requirements</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Brief narrative describing how the project meets the Credit Requirements including planned uses for the area, accessibility and maintenance arrangements; and
- Site plans, marked up to clearly demonstrate how the area meets the requirements highlighting the planned uses for the area, including highlighting communal areas, areas for woman and children only, men only, and accessible shower locations.

Credit Submission: Construction Rating

- As-built site plans marked up to clearly demonstrate how the area meets the use requirements highlighting the uses for the areas; and
- Photographs of the areas.

Calculations and Methodology
None

References
None
LC-8: Travel Plan

Intent
To reduce single occupancy vehicle use by managing the demand for travel and by maximizing the availability of alternatives to traveling by car.

Credit Requirements

**GENERAL**
Demonstrate the development of a Travel Plan. The Travel Plan must include:

- details of the type of measures proposed to manage the demand for travel by car;
- targets for reducing car travel;
- means of monitoring the effectiveness of the Plan; and
- remedial measures that will be implemented in the event that the stated targets are not delivered.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Develop a Travel Plan for the project.</td>
</tr>
<tr>
<td>(maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Update and implement the Travel Plan for the project.</td>
</tr>
</tbody>
</table>

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>Credit Submission: Design Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Plan, including details of the following:</td>
</tr>
<tr>
<td>☐ Proposed targets for the reduction in single occupancy car journeys;</td>
</tr>
<tr>
<td>☐ The type of measure likely to form part of the plan for delivering the stated target;</td>
</tr>
<tr>
<td>☐ The program of monitoring and review to record the effectiveness of the plan; and</td>
</tr>
<tr>
<td>☐ Details of mitigating measures to be initiated in the event that the stated plan targets are not achieved.</td>
</tr>
</tbody>
</table>

**Credit Submission: Construction Rating**

|☐| Updated Travel Plan, as set out in Design Submission requirements above; and
|☐| Evidence that the Travel Plan has been implemented.

**Calculations and Methodology**
Successful plans will be expected to secure reductions in single-occupancy car use by between 5% and 10% in the first three years of operation.

**References**

- Abu Dhabi Department of Transport, Surface Transport Master Plan 2009, [www.dot.abudhabi.ae](http://www.dot.abudhabi.ae)
LC-9: Improved Outdoor Thermal Comfort

Intent
To improve outdoor thermal comfort during transition months and further reduce thermal discomfort during summer months in public spaces and walkways.

Credit Requirements

GENERAL
1-3 Credit Points: Demonstrate that outdoor thermal comfort has been improved in priority public realm spaces beyond the minimum established under credit LC-R4 Outdoor Thermal Comfort Strategy by increasing the shade measures or adding heat purge strategies as follows:

<table>
<thead>
<tr>
<th>Public Realm space</th>
<th>Percentage shading threshold</th>
<th>1 credit point</th>
<th>2 credit points</th>
<th>3 credit points</th>
<th>1 credit point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Surface car parking with more than 10 spaces (including parking on roof surfaces)</td>
<td>50% 55% 60%</td>
<td></td>
<td></td>
<td></td>
<td>Two heat purge strategies</td>
</tr>
<tr>
<td>Public Open Space</td>
<td>65% 70% 75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Pedestrian Walkway (based on 1.8m width within the through zone)</td>
<td>80% 85% 90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Pedestrian Walkway (based on 1.8m width within the through zone)</td>
<td>80% 85% 90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle tracks</td>
<td>55% 65% 75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Credit Point: Demonstrate two strategies for the promotion of beneficial air movement as a heat purging mechanism. For inland areas that may experience hotter winds from certain directions, care must be taken as to the selection of such strategies. Strategies may include the following:

- Suitably sized and positioned openings on opposite sides of courtyards;
- Wind towers that direct wind to street level;
- Open vegetated walls that allow air movement and block solar heat;
- Building downwashing;
- Other passive means to encourage wind ventilation into public realm areas such as green fingers / channels aligned to prevailing wind directions.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

- Where cover is provided by structures such as canopies or other architectural elements, the outer surface of the shading element must have a minimum Solar Reflectance Index (SRI) of 29.
- Shade from trees should be measured at 3 years growth.
- Public open spaces shade requirements excludes active recreational areas such as playing fields and ball courts.
### Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4</strong> (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td></td>
<td>Demonstrate varying levels of cover or shade to car parking, public open space, primary and secondary pedestrian walkways and cycle tracks.</td>
</tr>
<tr>
<td><strong>1-3</strong></td>
<td>Construction Rating</td>
</tr>
<tr>
<td></td>
<td>Demonstrate varying levels of cover or shade to car parking, public open space, primary pedestrian walkways and cycle tracks.</td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>Two heat purging strategies</td>
</tr>
</tbody>
</table>

#### Credit Submission: Design Rating

- Updated outdoor thermal comfort strategy from LC-R4 with additional sections that compares and demonstrates shading improvements.
- Plan to show public realm spaces and priority areas for shading.
- Plan and tabulated results showing achievement of % of shading of public realm spaces at 1:00pm clock time on the Equinox and Summer Solstice.
- Extracts from specifications relating to the SRI of all cover elements.
- Narrative and drawings of the two additional heat purging strategies, where this option is pursued.

#### Credit Submission: Construction Rating

- Updated outdoor thermal comfort strategy including narrative supported by as-built drawings and photographs of the public realm spaces and priority shade areas, highlighting all measures contributing to improving the exterior microclimate, including planned or existing features.
- Evidence that all purchased and installed covers have compliant outer surface SRIs.
- Narrative and As-Built drawings of the two additional heat purging strategies, where this option is pursued.

### Calculations and Methodology

- Primary pedestrian walkways are those pedestrian networks located along boulevards, avenues, streets or access lanes as defined in the Abu Dhabi Urban Street Design Manual (Chapter 5).
- Secondary pedestrian walkways are all other walkways, including sikkas.
- Through zones are defined in the UPC Urban Street Design Manual.
- Shade calculations must be undertaken on the equinox (March 21st) and the summer solstice (June 21st) at 1:00pm clock time. The compliant shaded area must be in shade at both the equinox and summer solstice.
- In all calculations, shade from adjacent buildings is to be included.
- Dappled shade of more than 60%, such as that created by a grid or lattice, may be considered fully shaded. Dappled shade less than 60% must be calculated based on the actual shaded surface.
- SRI values for the outer surface of cover elements can be calculated based on solar reflectance and emittance numbers as defined in the American Society of Testing and Materials Standard E1980-01. Alternatively manufacturer’s evidence can be supplied where the testing is in accordance with the referenced standards in LC-R4.

### References

- Refer to LC-R4 Outdoor Thermal Comfort Strategy
## LC-10: Regionally Responsive Planning

### Intent

To reflect the unique climatic, social and historical influences of the site and region in the community plan.

### Credit Requirements

**GENERAL**

Demonstrate that the master plan and detailed design standards have evolved in response to the region’s climatic, landscape and historic urban design traditions through the following:

- Illustrate use of climate analysis undertaken in RE-R1 Community Energy Strategy, applying it to the design of streets, sikkak (pathways), barahaat (communal spaces) and open spaces to take advantage of prevailing breezes and shade.
- Demonstrate the design is based on a fareej form (housing cluster) surrounding a meydaan (central plaza) associated with a community use.
- Provide barahaat which are designed to:
  - accommodate passive cooling design principles (utilizing prevailing breezes and shading) as determined in RE-R1;
  - provide a minimum 60% area shaded either by adjacent buildings or shading structures; and
  - serve a function, determined by the connecting sikka destination.
- Provide connectivity to barahaat and meydeen using a network of vehicular traffic free sikkak that relate to key pedestrian routes. Illustrate wayfinding mechanism (including signage paving and built form treatments) used to denote key pedestrian routes and destinations.
- Describe the functionality and program for barahaat, in accordance with destinations provided by sikkak.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

### Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td></td>
<td>Provide a Regionally Responsive Plan that is informed by climate and incorporates a fareej form, surrounding a meydaan, with barahaat and connecting sikkak.</td>
</tr>
<tr>
<td>2</td>
<td>Construction Rating</td>
</tr>
<tr>
<td></td>
<td>Confirm fulfillment of the Regionally Responsive Plan.</td>
</tr>
</tbody>
</table>

### Credit Submission: Design Rating

- Regionally Responsive Planning Strategy that includes:
  - Narrative describing climatic analysis from RE-R1 Community Energy Strategy and influence of passive design principles on streets, barahaat, sikkak and open space design;
  - Illustrations on fareej form, including layout with barahaat, meydeen associated with community uses and locations of sikkak, including walking distance to barahaat;
  - Illustrations of wayfinding mechanism used to denote key pedestrian routes and destinations and description of functionality and program of barahaat, in
accordance with destinations of sikkak; and
- Modeling images demonstrating the shaded area in each baraha measured at 1:00pm clock time on the Summer Solstice and Equinox.

Credit Submission: Construction Rating

☐ Updated Regionally Responsive Planning Strategy that includes:
- Narrative illustrating how climatic analysis influenced layout of streets, barahaat, sikkak and open spaces;
- As-built plan drawings illustrating the fareej form with layout of barahaat, meydeen and sikkak;
- As-built drawings and photos illustrating program and function of barahaat and wayfinding mechanism used for sikkak to denote key pedestrian routes and destinations.

Calculations and Methodology

A Fareej (plural Firjan) is an urban system, based on a social structure resulting from the interaction between families, through which the community, particularly women and children can safely roam. Associated with a fareej are sikkak, barahaat and meydeen.

A Sikka (plural Sikkak) is a pathway which is the smallest denomination of street that permeates a fareej. They are narrow, irregular and shaded, taking residents to and from community facility destinations. Sikkak correspond to key pedestrian routes.

A Baraha (plural Barahaat) is an informal communal space strategically distributed throughout the fareej to encourage interaction between the residents. They are small, contained, intimate, shaded and cool spaces, contained by strong edge conditions. Their functionality is determined by the connected sikka destination and may include an adult baraha, a children’s baraha or a Mosque–Haram baraha. Distances to barahaat are informed by UPC community facility requirements for distances to pocket parks.

A Meydaan (plural Meydeen) is a plaza area used for community use and activity such as for religious, cultural, commercial and / or recreational purposes.

Modeling of shade is to be undertaken in accordance with LC-R4 Outdoor Thermal Comfort Strategy.

References

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
LC-11: Pearl Rated Buildings Within Communities

Intent
To reward development that has a significant proportion of buildings achieving high pearl building ratings.

Credit Requirements
**GENERAL**
Demonstrate attainment of an average building rating beyond the minimum established in credit LC-R5 Minimum Pearl Rated Buildings within Communities, as follows:

- **2 Credit Points**: Achieve a minimum average building rating of 2
- **3 Credit Points**: Achieve a minimum average building rating of 3
- **6 Credit Points**: Achieve a minimum average building rating of 4
- **10 Credit Points**: Achieve an average building rating of 5

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
For communities consisting of existing and new buildings, this only applies to new buildings and existing buildings undergoing major renovation and forming a part of the development scope.

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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<tbody>
<tr>
<td>10 (maximum)</td>
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</tr>
<tr>
<td>2</td>
<td>Demonstrate an average building rating of at least 2</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate an average building rating of at least 3</td>
</tr>
<tr>
<td>6</td>
<td>Demonstrate an average building rating of at least 4</td>
</tr>
<tr>
<td>10</td>
<td>Demonstrate an average building rating of 5</td>
</tr>
<tr>
<td>10 (maximum)</td>
<td>Construction Rating</td>
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<tr>
<td>2</td>
<td>Demonstrate an average building rating of at least 2</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate an average building rating of at least 3</td>
</tr>
<tr>
<td>6</td>
<td>Demonstrate an average building rating of at least 4</td>
</tr>
<tr>
<td>10</td>
<td>Demonstrate an average building rating of 5</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**
- High Performance Building Strategy that includes:
  - Table outlining each building in the proposed development and corresponding GFA and pearl rating;
  - Calculation of average Pearl Building rating for community; and
  - Extracts from design guidelines and mechanism for compliance.

**Credit Submission: Construction Rating**
- High Performance Building Strategy that includes:
  - Table outlining each building in the development and corresponding built GFA, noting which have achieved a Pearl Building Rating and the level of rating achieved;
  - Pearls Rating Certificates verifying the Pearl level achieved for each nominated building and GFA; and
  - Calculation of average Pearl Building rating for community.

**Calculations and Methodology**
Pearl Rated Building Certificate is acceptable for compliance with submission requirement for this credit.

Formula for calculating Average Building Rating:
Average Building Rating = \sum_{n=1}^{5} \left( \frac{GFA_n}{\text{Total GFA}} \times n \right)

where \( n \) is the building pearl rating from 1 to 5; \( GFA_n \) is the combined gross floor area of all buildings achieving \( n \) pearls; and \( \text{Total GFA} \) is the gross floor area of all new / major refurbished buildings within the community.

For example a community with 40% GFA of 1 pearl buildings, 25% GFA of 2 pearls buildings, 20% GFA of 3 pearl buildings, 10% GFA of 4 pearl buildings and 2% GFA of 5 pearl buildings would achieve a community average pearl rating of 2.

A calculation tool for calculating the average Pearl Building Rating for the community is available.

References

- UPC LC-R5 Pearl Building Rating Calculator
- The Pearl Building Rating System, UPC, 2010

Please refer to the UPC and/or Estidama Website for the latest relevant UPC documents or contact the UPC directly.
# LC-12: Safe & Secure Community

## Intent
To provide a safe and secure environment for the community’s occupants and visitors.

## Credit Requirements

### GENERAL

Demonstrate appropriate safety & security risk mitigation for the development, through one of the following two approaches:

- Implementation of risk mitigation measures, agreed in consultation with the UPC Safety & Security Team as part of the UPC Development Review Process; or
- Where consultation with the UPC Safety & Security Team is not mandated as part of the UPC Development Review Process, develop the following documents to demonstrate that safety & security have been incorporated into the development’s planning and design stages:
  - Safety & Security Risk Assessment;
  - Safety & Security Strategy; and
  - Safety & Security Layout Plan.

### ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

## Awarding Credit Points

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</thead>
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<tr>
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<tr>
<td>1</td>
<td>Develop a safety and security strategy</td>
</tr>
<tr>
<td>1 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Implement a safety and security strategy</td>
</tr>
</tbody>
</table>

## Credit Submission: Design Rating

- UPC Safety & Security Team Development Approval Confirmation.  
  Or
- Safety & Security Risk Assessment;
- Safety & Security Strategy;
- Safety and Security Layout plan(s); and
- Safety and security system drawings and extracts from specifications.

## Credit Submission: Construction Rating

- UPC Safety & Security Team Development Approval Confirmation.  
  Or
- Safety & Security Risk Assessment;
- Safety & Security Strategy;
- Safety and Security Layout plan(s); and
- As-built and certified safety and security system drawings and photographs of system installation(s).

## Calculations and Methodology

**Safety & Security Risk Assessment**  
The risk assessment forms the basis for determining the extent of safety & security measures implemented for a specific development. The scope of the risk assessment, assumptions and relevant stakeholders must be identified.

**Safety & Security Strategy**
The strategy outlines the safety and security approach to mitigate the risks identified by the risk assessment. Measures must be designed to mitigate risk in accordance with international best practice and relevant guidelines issued by the Urban Planning Council and Abu Dhabi Safety & Security Agencies. The strategy must address the four CPTED design principles discussed below.

Safety & Security Layout Plan
The Safety & Security Layout Plan identifies the location of inherent and built-in safety & security measures (building site, building design and technologies) and must detail the implementation of CPTED design principles. The plan must be drawn at a suitable scale to allow detailed review and include the following information:

- Proposed buildings and structure locations, indicating:
  - land Use;
  - setback distances from boundaries, vehicle parking and transportation;
  - infrastructure i.e. roads, metro, railways;
  - locations of loading bays;
  - building heights / number of storeys; and
  - peak occupancy.

- Site spot elevations at 0.5m vertical intervals;
- Transportation infrastructure (roads, rail, metro), highlighting details such as tunnels, bridges, underpasses and podium structures;
- Emergency services vehicular access routes, marine approach or helipads;
- Any critical infrastructure (utilities) and exclusion zones;
- Building emergency exit locations, external evacuation routes and emergency refuge areas;
- Location of Safety & Security Community Facilities (if relevant) including,
  - hospitals,
  - health clinics,
  - Critical National Infrastructure Authority (CNIA) facilities,
  - police stations,
  - Civil Defense stations,
  - command & control centers e.g. Integrated Situational Awareness Centers (ISACs),
  - traffic management.

- Location of physical security measures such as hardened facades, boundary treatments, and vehicle barriers; and
- Areas and access points benefiting from security lighting, CCTV coverage and access control.

Crime Prevention Through Environmental Design (CPTED)
Crime Prevention Through Environmental Design (CPTED) is a tested approach to reducing opportunities for crime and improving community perceptions of safety. The four CPTED principles are discussed by the author Randall Atlas in 21st Century Security and CPTED as follows:

- Territoriality;
- Natural Surveillance;
- Access control; and
- Activity Support.

Territoriality
The concept of creating and fostering places that are adopted by legitimate users of the space. These users make it difficult for people who do not belong to engage in criminal or nuisance behavior. Principles include reinforcing existing natural surveillance and natural access control strategies with additional symbolic or social ones; space design to allow for continued use and intended purpose; and the use of design features such as sidewalk treatments, landscaping, art, signage, screening and fences to define and outline ownership of space.
Natural Surveillance
The concept of enabling people engaged in their normal behavior to observe the space around them, making a place unattractive for potential illegitimate behavior. Street design, landscaping, lighting, site and neighborhood design all influence the potential for natural surveillance. Principles include the design and placement of physical features to maximize visibility; placement of persons or activities to maximize surveillance possibilities; provision of sufficient and maintained night-time lighting levels.

Access Control
The concept of controlling passage into or out of a neighborhood, park or building through limits on the number of openings. Principles include limiting the number of access points; sidewalk, gate, lighting and landscaping that clearly guides entrance and exit; the use of gates, fences, walls, landscaping and lighting to prevent or discourage public access to or from dark or unmonitored areas.

Activity Support
The concept of planning and placing activities to encourage natural surveillance. The principles are placement of safe activity areas to foster perception of safety for legitimate users and increasing perception of risk to would-be offenders; placement of high risk activities in safe locations to overcome vulnerability of such activities; locating gathering areas in locations that provide for natural surveillance and access control or in locations away from the view of would-be offenders; and improving the scheduling of space to allow effective use and appropriate intensity of accepted behaviors.

References
Because of Abu Dhabi’s limited annual rainfall, hot climate, and the significant energy embodied in potable water due to desalinization, water conservation is a priority for Estidama. As discussed in the April 2006 UAE Initial National Communication to the United Nations on climate change, it is a distinct possibility that the UAE will become even drier due to the effects of global warming. Coupled with projected population increases, the importance of accelerating water conservation and reuse efforts is clear.

“One of the most important challenges for the Emirate is to balance water supply and demand as efficiently as possible given that the per capita consumption of fresh water is among the highest in the world and new water supplies are expensive.”

— Abu Dhabi Water Resources Master Plan, EAD 2009

The Precious Water section of the Pearl Community Rating System: Design & Construction includes the Community Water Calculator that should be used throughout the entire design process. This calculator will help the development team to assess inputs and flows of water to and from the project with a holistic perspective, and assist in identifying how and where reductions in the use of potable water may be made.

![Diagram of water conservation strategies: Alternative Sources, Efficient Distribution, Reduce Demand]
## Precious Water

<table>
<thead>
<tr>
<th>Credit Code</th>
<th>Credit Title</th>
<th>Maximum Credit Points</th>
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<tbody>
<tr>
<td>PW-R1</td>
<td>Community Water Strategy</td>
<td>R</td>
</tr>
<tr>
<td>PW-R2</td>
<td>Building Water Guidelines</td>
<td>R</td>
</tr>
<tr>
<td>PW-R3</td>
<td>Water Monitoring &amp; Leak Detection</td>
<td>R</td>
</tr>
<tr>
<td>PW-1.1</td>
<td>Community Water Use Reduction: Landscaping</td>
<td>14</td>
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<tr>
<td>PW-1.2</td>
<td>Community Water Use Reduction: Heat Rejection</td>
<td>5</td>
</tr>
<tr>
<td>PW-1.3</td>
<td>Community Water Use Reduction: Water Features</td>
<td>4</td>
</tr>
<tr>
<td>PW-2</td>
<td>Stormwater Management</td>
<td>6</td>
</tr>
<tr>
<td>PW-3</td>
<td>Water Efficient Buildings</td>
<td>8</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>
## PW-R1: Community Water Strategy

### Intent
To develop and integrate a comprehensive water strategy during the early stages of design with the goal of minimizing the overall water consumption and establishing a project water balance.

### Credit Requirements

**GENERAL**

**Overall Strategy**
Demonstrate that a water strategy has been developed for the community which covers each of the following public realm items:

- Irrigation;
- Water features;
- District cooling; and
- Stormwater.

**Community Water Balance**
Using the Community, Building and Villa Water Calculators, establish the community’s overall water demand and determine the community-wide water balance between the available building wastewater and public realm irrigation, heat rejection and water feature demands.

**Minimum Prescriptive Irrigation Requirements**
Demonstrate that the average landscape irrigation requirement for all public realm areas achieve the following:

- All public park landscaping in aggregate does not require more than 10 l/m²/day;
- All streetscape landscaping in aggregate does not require more than 7 l/m²/day; and
- All remaining landscaping in aggregate does not exceed 4 l/m²/day.

### ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

### Requirement Achievement
This is a requirement. There are no Credit Points awarded.

### Credit Submission: Design Rating

**Overall Strategy**
- Narrative detailing the analysis for reducing water consumption and the proposed strategies for each of the items outlined in the requirements.

**Community Water Balance**
- Completed Community Water Calculator detailing the output of the community water balance; and
- Completed Building and / or Villa Water Calculator for each representative building within the community.

**Minimum Prescriptive Irrigation Requirements**
- Completed Community Water Calculator confirming the landscape requirements will be achieved;
- Site plan illustrating landscaped areas, highlighting areas of hardscape and softscape, as well as water feature/swimming pool areas;
- Calculations detailing how the total annual average irrigation demand of external areas...
softscape areas (liters/day) is determined; and

- Plant schedules for the development’s landscape program that includes the following key data:
  - Plant names (common and botanic); and
  - Annual water demand at third year of growth.

**Overall Strategy**
- Updated narrative detailing the analysis for reducing water consumption and the proposed strategies for each of the items outlined in the requirements.

**Community Water Balance**
- Updated Community Water Calculator detailing the output of the community water balance; and
- Updated Building and / or Villa Water Calculator for each representative building within a community.

**Minimum Prescriptive Irrigation Requirements**
- Updated Community Water Calculator confirming the landscape requirements will be achieved;
- As-built site plan illustrating landscaped areas, highlighting areas of hardscape and softscape, as well as water feature/swimming pool areas;
- Updated calculations detailing how the total annual average irrigation demand of external softscape areas (liters/day) is determined; and
- Plant schedules for the development’s landscape program that includes the following key data:
  - Plant names (common and botanic); and
  - Annual water demand at third year of growth.

**Calculations and Methodology**

**Community Water Balance**
- The aim is to ensure that the non-recoverable community water demand associated with irrigation, heat rejection and water features does not overburden the available building wastewater.
- The community water balance is calculated using the Community Water Calculator and is determined based on the difference between the available building wastewater and the exterior water demand for irrigation, heat rejection and water features.
- The interior water use of buildings within the community must be determined using the Pearl Rating System Building and / or Villa Water Calculators. Each building type within the community must be modelled and the baseline and proposed interior water consumptions input into the Community Water Calculator to determine the community water balance. Where PW-3 Water Efficient Buildings is not being pursued, the proposed building interior water consumption must be set equal to the baseline interior water consumption.
- The Community Water Balance, CWB, is determined as follows:

\[
\text{CWB} = \sum B_w x E_m - L_w - DC_w - WF_w
\]

*BW = Building Water Consumption (determined using Building/Villa Water Calculator)*

*EM = Municipal Recycled Water Efficiency*

*LW = Irrigation Demand of all community landscaping*

*DCW = Water make-up requirements of all community district cooling schemes*

*WFW = Water make-up requirements of all community based water features*

**Minimum Prescriptive Irrigation Requirements**
- Landscaping refers to the entire site excluding the building plots and any water feature areas, and is made up of all hardscape and softscape areas.
- The methodology for determining the average landscape irrigation requirement is
outlined within PW-1.1 Community Water Use Reduction: Landscaping.

References

- Pearl Rating System Community Water Calculator
- Pearl Rating System Building Water Calculator
- Pearl Rating System Villa Water Calculator
**PW-R2: Building Water Guidelines**

**Intent**
To focus the design and development team on promoting water conservation in buildings within the community.

**Credit Requirements**

**GENERAL**
Demonstrate that Building Guidelines have been developed, based on analysis, which identifies the most efficient measures for reducing the water consumption of buildings within the community. At a minimum the analysis must cover the following:

- **Fixtures and fittings**
  - Kitchen taps;
  - Bathroom taps;
  - Toilets;
  - Urinals;
  - Bidets;
  - Showers; and
  - Ablution facilities.

- **Appliances**
  - Dishwashers; and
  - Clothes washing machines.

- **Landscaping**
  - Plant Selection;
  - Irrigation; and
  - Water Features.

- **Heat Rejection**
  - District cooling; and
  - Onsite heat rejection.

Demonstrate that the Building Guidelines have been incorporated into development plot controls and that a mechanism for ensuring compliance is developed.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Requirement Achievement**
This is a requirement. There are no Credit Points awarded.

**Credit Submission: Design Rating**

- Narrative detailing the analysis undertaken for each of the items outlined in the requirements including the results of any calculations;
- Draft Building Guidelines; and
- Demonstrate the mechanism for ensuring compliance with building guidelines.

**Credit Submission: Construction Rating**

- Updated narrative detailing the analysis undertaken for each of the items outlined in the requirements including the results of any calculations;
- Completed Building Guidelines; and
- Confirm mechanism for ensuring compliance with building guidelines.

**Calculations and Methodology**

- The analysis is to highlight the various design options available to buildings and show the iterative process which was conducted to determine the most efficient
measures for reducing water consumption.

- The Building Guidelines are to emphasize effective solutions to reducing water consumption, but also demonstrate the consequences that various design decisions may have on the building water consumption.

References

- Pearl Rating System Community Water Calculator
- Pearl Rating System Building Water Calculator
- Pearl Rating System Villa Water Calculator
**PW-R3: Water Monitoring & Leak Detection**

**Intent**
To reduce loss of water associated with leaks, system degradation, or failure.

**Credit Requirements**

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monitoring</strong></td>
</tr>
<tr>
<td>Demonstrate that easily accessible and clearly labelled water meters are provided and capable of monitoring the water consumption of, at a minimum, the following major uses (where present):</td>
</tr>
<tr>
<td>▪ Building plots, divided into occupancy type (office, retail, residential, school etc);</td>
</tr>
<tr>
<td>▪ Irrigation (public realm);</td>
</tr>
<tr>
<td>▪ District cooling plants;</td>
</tr>
<tr>
<td>▪ Water Features (public realm); and</td>
</tr>
<tr>
<td>▪ Any other major community water requirements (e.g. water parks etc).</td>
</tr>
</tbody>
</table>

**Leak Detection**
Demonstrate that water transmission and distribution facilities are designed and installed with water meters in order to monitor the water network and be capable of detecting major system-wide leaks.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Requirement Achievement**
This is a requirement. There are no Credit Points awarded.

**Credit Submission: Design Rating**
- □ Narrative detailing the community water monitoring strategy;
- □ Extracts from specifications clearly indicating the type and extent of all metering;
- □ Design utility plans identifying the location of all meters and monitoring equipment; and
- □ Design system specifications for central monitoring system and details of how the system is configured to identify major system leaks.

**Credit Submission: Construction Rating**
- □ Updated narrative detailing the community water monitoring strategy;
- □ Manufacturer’s information detailing the installed water meters;
- □ As-built utility plans identifying the location of all meters and monitoring equipment; and
- □ Manufacturer’s information for central monitoring system and details of how the system is configured to identify major system leaks.
- □ Photographic evidence confirming the installation of water meters and central monitoring system.

**Calculations and Methodology**
- ▪ All meters shall have data logging capability and be connected to a central community-wide monitoring system so that information on the water network performance can be recorded. The monitoring system shall have, at a minimum, the following capability:
  - ▪ Provide hourly, daily, weekly, monthly and annual water consumption by each major use;
  - ▪ Compare consumption to previous days, weeks, months and years for trend analysis;
- Detect leaks by determining ‘out-of-range’ values and alert facility operators to unusually high consumption; and
- Record peak water consumption for each major use.

- The developer/system operator must provide a written commitment to supply water monitoring data to Estidama (if requested). All reported information will be treated as confidential.

- The leak detection system must be capable of:
  - Sounding an alarm when a leak is detected;
  - Identifying varying leakage rates; and
  - Being programmed to fit the project’s water consumption requirements.

**References**

None
**PW-1.1: Community Water Use Reduction: Landscaping**

**Intent**

To encourage water efficient public realm landscape design through plant selection, irrigation technologies and management, and the use of recycled water.

**Credit Requirements**

**GENERAL**

**Plant Selection**

Demonstrate that the average irrigation requirement for all public realm areas achieve the following:

All public park landscaping in aggregate does not require more than:
- 1 Credit Point: 8 l/m²/day;
- 2 Credit Points: 6 l/m²/day;
- 3 Credit Points: 4 l/m²/day;

All streetscape landscaping in aggregate does not require more than:
- 1 Credit Point: 5 l/m²/day;
- 2 Credit Points: 3 l/m²/day;

All remaining landscaping in aggregate does not require more than:
- 1 Credit Point: 2 l/m²/day
- 2 Credit Points: 0 l/m²/day

**Irrigation System**

- 2 Credit Points: Demonstrate that a Water Efficient Irrigation System has been incorporated into all public realm landscaping.

**Irrigation System Management**

- 2 Credit Points: Demonstrate that an Irrigation Operation and Maintenance Plan has been developed.

**Recycled Water**

- Achieve at least three credit points related to Plant Selection and demonstrate that:
  - 2 Credit Points: A minimum of 75% of the community’s irrigation demand can be served using the Exterior Water Allowance (as outlined in the Calculations and Methodology section).
  - 3 Credit Points: 100% of the community’s irrigation demand can be served using the Exterior Water Allowance.
  - Where recycled water is not immediately available to meet all irrigation demands, demonstrate that a recycled water mainline loop has been installed which allows for the future switch from potable to recycled water for exterior irrigation demands when it becomes available; and
  - All pipes containing recycled water must be color coded in order to easily distinguish them from potable water pipes.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

- This credit only applies to water demand in the public realm and does not include irrigation associated with building plots.
### Awarding Credit

#### Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
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<tbody>
<tr>
<td>14 (maximum)</td>
<td>Design Rating</td>
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<tr>
<td>7</td>
<td>Demonstrate that the average irrigation requirement of all landscape areas is minimized.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that a Water Efficient Irrigation System has been incorporated into all public realm landscape design.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that an Irrigation Operation and Maintenance Plan has been developed.</td>
</tr>
<tr>
<td>2-3</td>
<td>Demonstrate that a proportion of the community irrigation demand can be served using the Exterior Water Allowance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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<tr>
<td>14 (maximum)</td>
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<td>7</td>
<td>Demonstrate that the average irrigation requirement of all landscape areas is minimized.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that a Water Efficient Irrigation System has been incorporated into all public realm landscaping.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that an Irrigation Operation and Maintenance Plan has been updated.</td>
</tr>
<tr>
<td>2-3</td>
<td>Demonstrate that a proportion of the community irrigation demand can be served using the Exterior Water Allowance.</td>
</tr>
</tbody>
</table>

### Credit Submission: Design Rating

#### Plant Selection
- □ Low Water Use Landscaping Strategy including:
  - Completed Community Water Calculator;
  - Site plan illustrating landscape areas, highlighting areas of hardscape and softscape as well as water feature/swimming pool areas;
  - Calculations detailing how the total annual average irrigation demand of external softscape areas (liters/day) is determined; and
  - Plant schedules for the development’s landscape program that includes the following key data:
    - Plant names (common and botanic); and
    - Annual water demand at third year of growth.

#### Irrigation System
- □ Irrigation Strategy including:
  - Narrative describing the community’s irrigation approach, technology to be used, and anticipated irrigation efficiency;
  - System schematic indicating mainline routing, laterals, irrigation controller and meter locations as well as proposed landscape/hydrozones; and
  - System specifications including cut sheets and/or manufacturer’s specifications for master controller(s), valves and monitoring equipment including moisture sensors, wind sensors etc.

- □ Soil Amendment Strategy including:
  - Narrative describing moisture retention approach for soil amendments including type, location, extent of application, and frequency of reapplication (if needed) to maintain effectiveness.

#### Irrigation System Management
- □ Operation and Maintenance plan including:
  - Brief narrative describing the monitoring strategy and how it is integrated into
the overall landscaping plan;
- System specifications including cut sheets and/or manufacturer’s specifications for override sensors, backflow valves and separate meters.
- Drawings showing the location of each device on a site plan.

Recycled Water
- Completed Community Water Calculator confirming the percentage of the irrigation demand that can be served using the Exterior Water Allowance.
- A composite utility schematic illustrating routing of recycled water mainline and laterals.

Credit Submission: Construction Rating
- Revised as-built documentation as per Design Rating; and
- Photographic evidence confirming the installation of irrigation systems, landscaping, water recycling systems (where installed) and routing of recycled water mainline and laterals indicating their color code.

Calculations and Methodology

Plant Selection
- Public realm landscaped area refers to the entire site excluding all water features, swimming pool areas and building plots, and is made up of all hardscape and softscape areas.

The average irrigation requirement of landscaped areas is determined as follows:

\[
\text{Average Irrigation Demand} = \frac{I_s}{A_L}
\]

Where:
- \( I_s \) = Total annual average irrigation demand of softscape area (liters/day)
- \( A_L \) = Landscaped area referring to public parks, streetscape and/or remaining landscape.

Irrigation System
A water efficient irrigation system must:
- Eliminate all surface spray components (except in public parks or playing fields);
- Irrigate only during non-daylight hours (except if sub-surface);
- Include moisture sensors that control the irrigation system to irrigate only when required;
- Provide irrigation zones, with independently controlled valves, segregated by plant water needs; and
- Utilize mulch and/or soil amendment techniques to reduce evapotranspiration.

Irrigation System Management
An Irrigation Operation and Maintenance Plan should include:
- Regular maintenance and operation efficiency performance monitoring;
- Procedures for alerting operator and shutting system down when flows exceed design range due to mainline, lateral, valve or emitter failure or there is a leak detected; and
- Irrigation systems must demonstrate that they incorporate sensors and valves connected to a central system by:
  - Providing override sensors tied to a centralized computer controller with a feedback loop to shut down zones that are malfunctioning; and
  - Including separate meters and backflow prevention at point of mainline connection.
Recycled Water

- The Exterior Water Allowance, $E_{WA}$, that is available to serve the community’s exterior water demand is determined based on the values used within PW-R1 Community Water Strategy as follows:

$$E_{WA} = \sum B_W \times E_M$$

$B_W$ = Building Water Consumption  
$E_M$ = Municipal Recycled Water Efficiency

$E_{WA}$ must not be ‘double counted’ towards other uses such as heat rejection and/or water features. The design team must decide upon the most appropriate use of the $E_{WA}$ in order to balance the available wastewater volume with their exterior water demand.

References
- Pearl Rating System Community Water Calculator
PW-1.2: Community Water Use Reduction: Heat Rejection

Intent

To reduce potable water use for heat rejection by promoting the use of recycled water and/or alternatives to water based heat rejection.

Credit Requirements

**GENERAL**

Demonstrate the community includes a Water Cooled District Cooling (DC) network that is connected to at least 35% of the community’s buildings based on Gross Floor Area (GFA); AND

Demonstrate that the following percentage of the aggregate water make-up requirements of all District Cooling (DC) systems within the community can be served using the Exterior Water Allowance (as outlined in the Calculations and Methodology section):

- 2 Credit Points: > 25%
- 3 Credit Points: >50%
- 4 Credit Points: >75%
- 5 Credit Points: 100%

OR

- 2 Credit Points: No water cooled district cooling is present.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

- Where recycled water is not immediately available to all DC plants, demonstrate that a recycled water mainline loop has been installed which allows for the future switch from potable to recycled water in DC plants when it becomes available. All pipes containing recycled water must be color coded in order to easily distinguish them from potable water pipes.

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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</thead>
<tbody>
<tr>
<td>5 (maximum)</td>
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</tr>
<tr>
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<td>Demonstrate that a percentage of the community’s DC plant water make-up requirements can be served using the Exterior Water Allowance.</td>
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<td>No water cooled district cooling is present.</td>
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<td>5 (maximum)</td>
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<tr>
<td>2-5</td>
<td>Demonstrate that a percentage of the community’s DC plant water make-up requirements can be served using the Exterior Water Allowance.</td>
</tr>
<tr>
<td>2</td>
<td>No water cooled district cooling is present.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

- Calculations demonstrating that at least 35% of the community GFA is connected to a Water Cooled District Cooling network;
- Completed Community Water Calculator confirming the percentage of the DC plant water make-up requirements that can be served using the Exterior Water Allowance;
- DC plant design specifications including system efficiencies, percentage of drift loss, condenser water temperatures and the cycles of concentration for cooling tower water blowdown; and
- Narrative describing the recycled water distribution strategy for the cooling towers.
OR
☐ Confirmation that no water cooled district cooling will be present.

Credit Submission: Construction Rating

☐ Updated calculations demonstrating that at least 35% of the community GFA is connected to a Water Cooled District Cooling network;
☐ Updated Community Water Calculator confirming the percentage of the DC plant water make-up requirements that can be served using the Exterior Water Allowance;
☐ DC plant manufacturer information including system efficiencies, percentage of drift loss, condenser water temperatures and the cycles of concentration for cooling tower water blowdown; and
☐ Updated narrative describing the recycled water distribution strategy for the cooling towers.

OR
☐ Confirmation that no water cooled district cooling is present.

Calculations and Methodology

- The percentage of the community’s buildings (based on GFA) connected to a DC network is determined as follows:

\[
35\% \leq \frac{\text{Total Building GFA connected to a DC network (m}^3\text{)}}{\text{Total Building GFA (m}^2\text{)}}
\]

- The project’s district cooling water make-up requirements shall be determined using the Community Water Calculator based on the Gross Floor Area (GFA) of buildings connected to the DC network and the cooling demand determined within RE-R1 Community Energy Strategy.

- The Exterior Water Allowance, \(E_{WA}\), that is available to serve the community’s exterior water demand is determined based on the values used within PW-R1 Community Water Strategy:

\[
E_{WA} = \sum B_w x E_M
\]

- \(B_w\) = Building Water Consumption
- \(E_M\) = Municipal Recycled Water Efficiency

- \(E_{WA}\) must not be ‘double counted’ towards other uses such as irrigation and/or water features. The design team must decide upon the most appropriate use of the \(E_{WA}\) in order to balance the available wastewater volume with their exterior water demand.

References

None
PW-1.3: Community Water Use Reduction: Water Features

**Intent**
To reduce potable water use in exterior water features by minimizing evaporative loss and through the use of recycled water.

**Credit Requirements**

**GENERAL**
- **2 Credit Points:** Demonstrate that the water make-up requirements for all exterior water features in the public realm can be served using the Exterior Water Allowance.

- **1 Credit Points:** Demonstrate that all external swimming pools are supplied with permanently installed retractable pool blankets.

**Or**
- **4 Credit Points:** Demonstrate that there are no exterior water features or swimming pools within the public realm.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
- Where recycled water is not immediately available to all water features, demonstrate that a recycled water mainline loop has been installed which allows for the future switch from potable to recycled water for exterior water feature demands when it becomes available. All pipes containing recycled water must be color coded in order to easily distinguish them from potable water pipes.

**Awarding Credit Points**

<table>
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<tr>
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<tr>
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<td>Demonstrate that the water make-up requirements for all water features can be served using the Exterior Water Allowance.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that all swimming pools are provided with permanently installed pool blankets.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate that there are no exterior water features or swimming pools within the public realm.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
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<td>4 (maximum)</td>
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<td>2</td>
<td>Demonstrate that the water make-up requirements for all water features can be served using the Exterior Water Allowance.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that all swimming pools are provided with permanently installed pool blankets.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate that there are no exterior water features or swimming pools within the public realm.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**
- Site plans highlighting locations of all water features and their associated areas;
- Community Water Calculator confirming that the water make-up requirements for all water features can be served using the Exterior Water Allowance;
- A composite utility schematic illustrating routing of recycled water mainline and...
latterals; and
□ Specification for proposed pool blankets.
Or
□ Site plans confirmation that there will be no exterior water features or swimming pools.

Credit Submission: Construction Rating

□ As-built site plans highlighting locations of all water features and their associated areas;
□ Updated Community Water Calculator confirming that the water make-up requirements for all water features can be served using the Exterior Water Allowance;
□ As-built composite utility schematic illustrating routing of recycled water mainline and laterals; and
□ Photographs illustrating the routing of recycled water mainline and laterals indicating their color code, water recycling systems (where installed) and pool blankets.
Or
□ As-built site plans confirming that there are no exterior water features or swimming pools.

Calculations and Methodology

- Exterior water features: Include any open surface water associated with fountains, ponds, lakes, streams etc (excluding swimming pools).
- The water loss from all exterior water features is determined using the Community Water Calculator and based on the total surface area of water features and catchment area of fountains; and the evaporation loss of surface water, EL, as follows:

\[
\text{Total Water Feature Loss} = \sum (A_{WF} + F_L \times A_{FC}) \times E_L
\]

- \( A_{WF} \) = Water Feature Area
- \( A_{FC} \) = Fountain Catchment Area
- \( F_L \) = Fountain loss factor
- \( E_L \) = Evaporative Loss of surface water = 2,200 litres/m²/yr

- The Exterior Water Allowance, \( E_{WA} \), that is available to serve the community’s exterior water demand is determined based on the values used within PW-R1 Community Water Strategy:

\[
E_{WA} = \sum B_W \times E_M
\]

- \( B_W \) = Building Water Consumption
- \( E_M \) = Municipal Recycled Water Efficiency

- \( E_{WA} \) must not be ‘double counted’ towards other uses such as irrigation and/or heat rejection. The design team must decide upon the most appropriate use of the \( E_{WA} \) in order to balance the available wastewater volume with their exterior water demand.

References

None
PW-2: Stormwater Management

**Intent**

To minimise peak stormwater discharge and protect the stormwater drainage system and receiving water bodies from pollutant loading during and after storm events.

**Credit Requirements**

**GENERAL**

**Quantity Control**

- Demonstrate that the project has developed a stormwater management system that prioritizes infiltration, sustainable urban drainage systems, and utilizes structural solutions when necessary.
- 2 Credit Points: Demonstrate that the post-development peak runoff rate and quantity from the 2-year 24-hour design storm does not exceed the pre-development peak runoff rate and quantity through structural methods, or a combination of both structural and non-structural methods.
- 4 Credit Points: Demonstrate that the post-development peak runoff rate and quantity from the 2-year 24-hour design storm does not exceed the pre-development peak runoff rate and quantity through the use of non-structural methods only.

**Quality Control**

- 1 Credit Point: The proposed stormwater management system is capable of collecting and treating a minimum of 90% of stormwater and that the treatment process is capable of achieving the following minimum standards for quality control:
  - 80% removal of Total Suspended Solids (TSS);
  - Minimum 95% removal of litter (gross pollutants, >1mm);
  - Minimum 90% removal of hydrocarbons; and
  - Use of petrol interceptors or suitable permeable paving for car parks of more than 4 bays

**Operation & Maintenance Plan**

- 1 Credit Point: Achieve either a minimum of 2 credit points related to Quantity Control or 1 credit point related to Quality Control and demonstrate that an Operation & Maintenance Plan (OMP) is in place that shows how all systems will be maintained throughout the life of the development. The plan should include at a minimum:
  - Protocol for maintaining regular system checks and maintenance
  - Methods for ensuring neighboring developments will not be adversely affected by the project’s stormwater strategy
  - Strategies to prevent onsite erosion

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None
### Awarding Credit Points

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<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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<td>2-4</td>
<td>Stormwater management system is designed to meet Quantity Control criteria as per Credit Requirements.</td>
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<tr>
<td>1</td>
<td>Stormwater management system is designed to meet Quality Control criteria as per Credit Requirements.</td>
</tr>
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<td>1</td>
<td>An OMP has been developed.</td>
</tr>
<tr>
<td><strong>6</strong> (Maximum)</td>
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</tr>
<tr>
<td>2-4</td>
<td>Stormwater management system components are constructed to meet Quantity Control criteria as per Credit Requirements.</td>
</tr>
<tr>
<td>1</td>
<td>Stormwater management system components are constructed to meet Quality Control criteria as per Credit Requirements.</td>
</tr>
<tr>
<td>1</td>
<td>An OMP has been updated.</td>
</tr>
</tbody>
</table>

### Credit Submission: Design Rating

- Narrative describing the stormwater management system developed for the community including:
  - Drawings showing locations of components of the stormwater management system;
  - Civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-development peak runoff rate and quantity; and
  - Extracts from specifications and product data sheets describing the components specified, confirming that the system is capable of collecting 90% of stormwater and is able to treat to the required quality standards.
- OMP for ongoing site best management practices to uphold system integrity. The plan shall include:
  - An inspection schedule for the stormwater management system to assure its continued operation as designed;
  - The proposed person(s), organization, or entity responsible for the continued operation and maintenance of the stormwater management system;
  - Operating budgets and funding mechanism for the continued maintenance of the stormwater management system, where not managed by the municipality;
  - Methods for ensuring neighboring developments will not be adversely affected by the project’s stormwater strategy; and
  - Erosion plan to prevent excessive onsite erosion and to any receiving water courses.
- CV of qualified Civil Engineer.

### Credit Submission: Construction Rating

- As built drawings showing locations of the applied components of the stormwater management system;
- Updated civil engineering calculations describing and quantifying the stormwater management strategies, specifically addressing the pre-development and post-development peak runoff rate and quantity;
- Manufacturers information for the purchased components, confirming that the system is capable of collecting 90% of stormwater and is able to treat to the required quality standards;
- Updated OMP; and
- Photographic evidence confirming the installation of the stormwater management strategy.
Calculations and Methodology

- Non-structural stormwater management solutions include sustainable urban drainage systems (SUDS) such as ponds, vegetated swales, wetlands etc.
- Structural stormwater management solutions include engineered structures such as pipes, concrete channels etc.
- All water infiltrated through SUDS is considered to be 100% treated, achieving all the required quality control standards
- Calculations must be signed off by a qualified civil engineer.

A qualified Civil Engineer is an individual with:
- A degree in a relevant subject, and
- A minimum of five years relevant work experience and a proven track record on working on similar projects in the region.

References

- Environment Agency Abu Dhabi, [www.ead.gov.ae](http://www.ead.gov.ae)
PW-3: Water Efficient Buildings & Plots

**Intent**
To promote reductions in the water consumption of buildings and associated plots within the community as well as limit the size and burden on the community infrastructure.

**Credit Requirements**

**GENERAL**
Set water reduction targets for the interior water use of all buildings within the community using the Pearl Rating System Building and Villa Water Calculator. Demonstrate that the average Water Reduction Target (as defined within the Calculations and Methodology section), $W_{\text{bl}}$, achieves the following improvement compared to the baseline building performance, from efficiency measures only:

- **1 Credit Point:** $W_{\text{bl}} \geq 16\%$ improvement compared to the baseline building
- **2 Credit Points:** $W_{\text{bl}} \geq 22\%$ improvement compared to the baseline building
- **3 Credit Points:** $W_{\text{bl}} \geq 28\%$ improvement compared to the baseline building
- **4 Credit Points:** $W_{\text{bl}} \geq 34\%$ improvement compared to the baseline building
- **5 Credit Points:** $W_{\text{bl}} \geq 40\%$ improvement compared to the baseline building

And

- Develop extended guidelines for representative buildings within the community demonstrating how the proposed target may be achieved. The targets must be based on the results of the Building and Villa Water Calculator and incorporated into the Building Guidelines developed in PW-R2.

Set targets for the average landscape irrigation demand, $I_{\text{BL}}$, of all building plots within the community as follows:

- **2 Credit Point:** $I_{\text{BL}} < 4$ liters/m$^2$/day
- **3 Credit Point:** $I_{\text{BL}} < 2$ liters/m$^2$/day

And

- The targets must be incorporated into the Building Guidelines developed in PW-R2.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Awarding Credit Points**

<table>
<thead>
<tr>
<th>CREDIT POINTS (maximum)</th>
<th>REQUIREMENTS</th>
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</thead>
<tbody>
<tr>
<td><strong>8</strong></td>
<td><strong>Design Rating</strong></td>
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<tr>
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<td>Demonstrate that the average water reduction target, $W_{\text{bl}}$, achieves a percentage improvement over the baseline building performance.</td>
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<td><strong>Construction Rating</strong></td>
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<td>Demonstrate that the building plot average landscape irrigation demand, $I_{\text{BL}}$, has been minimized.</td>
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<td><strong>2-3</strong></td>
<td><strong>Construction Rating</strong></td>
</tr>
<tr>
<td></td>
<td>Demonstrate that the building plot average landscape irrigation demand, $I_{\text{BL}}$, has been minimized.</td>
</tr>
</tbody>
</table>
Credit Submission: Design Rating

- Average performance targets, $W_{bldg}$ and $I_{BL}$, and color coded site plans to illustrate how the target will be achieved across the community;
- Completed Community Water Calculator;
- Completed Building and Villa Water Calculator for each building type demonstrating the prescribed fixture / appliance requirements and associated reductions in water consumption; and
- Draft of Building Guidelines, integrated into PW-R2.

Credit Submission: Construction Rating

- Average performance targets, $W_{bldg}$ and $I_{BL}$, and color coded site plans to illustrate how the target has been achieved across the community;
- Updated Community Water Calculator;
- Updated Building and Villa Water Calculator for each building type demonstrating the prescribed fixture / appliance requirements and associated reductions in water consumption; and
- Completed Building Guidelines, integrated into PW-R2.

Calculations and Methodology

- The weighted average water reduction target, $W_{bldg}$, is determined as follows:

$$ W_{bldg} = \frac{\sum GFA \times Performance\ Improvement_1 + GFA \times Performance\ Improvement_2 + \ldots + GFA \times Performance\ Improvement_n}{Total\ Building\ GFA} $$

- In order to demonstrate the reductions identified will be achieved, results from the Building and Villa Water Calculator will need to be submitted for each building type within the community.
- Water reduction targets for each building / villa type can only be set based on the results from the building and villa water calculators.
- Various strategies for reducing the water consumption of buildings will need to be modelled and the results included in the building guidelines in order to illustrate how the proposed percentage reductions may be achieved.

- The weighted average landscape irrigation demand for all building plots, $I_{BL}$, determined as follows:

$$ I_{BL} = \frac{\sum A_{BL1} \times I_{BL1} + A_{BL2} \times I_{BL2} + \ldots + A_{BLn} \times I_{BLn}}{\sum A_{BL1} + A_{BL2} + \ldots + A_{BLn}} $$

$A_{BL} = $ Building/Villa Plot Landscape Area = $A_P - A_B$

$A_P = $ Building/Villa Plot Area

$A_B = $ Building/Villa Footprint Area

$I_{BL} = $ Building/Villa Plot Average Landscape Irrigation Demand

References

- Pearl Rating System Community Water Calculator
- Pearl Rating System Building Water Calculator
- Pearl Rating System Villa Water Calculator
- Pearl Building Rating System, PW-R1.
- Pearl Villa Rating System, PW-R1.
Abu Dhabi’s ambitious growth targets translate into increased energy consumption. Energy conservation and portfolio diversification are imperative to sustain a competitive economy. Through the Pearl Rating System, Estidama seeks to target energy conservation through technological transitions in the community sector.

“The UAE has almost the highest rate of energy consumption per person in the world. If we continue at the current rate, the demand for energy will simply exceed the supply. At the same time, our consumption of energy adds to the worldwide problem of global warming. Clearly, we need to do something to prevent this”

— Heroes of the UAE, EAD

Techniques to conserve energy at the community design and construction stage can have significant impacts on reducing overall energy consumption during operation. The Resourceful Energy section requires an energy calculation and assessment process to be undertaken. This assessment will facilitate careful consideration of energy issues during the design of communities, resulting in better informed decision making. Emphasis is on reducing the demand for energy through passive environmental design, appropriate selection of highly efficient mechanical and electrical equipment, and the facilitation of renewable energy installations.
## CREDITS COVERED IN THIS SECTION

The table below outlines the credits covered in this section of the Pearl Community Rating System.

<table>
<thead>
<tr>
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<th>Credit Title</th>
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<td>RE-R2</td>
<td>RE-R2</td>
<td>Building Energy Guidelines</td>
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<td>RE-R3</td>
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</table>
## RE-R1: Community Energy Strategy

### Intent
To focus the design and development team on energy conservation through demand reduction and efficient generation and distribution, while making informed decisions about the implications of renewable energy strategies.

### Credit Requirements

#### GENERAL

Demonstrate that an energy strategy has been developed for the community which includes analysis of the following at a minimum:

- Climate analysis and response;
- Street orientation;
- Building orientation, massing and layout;
- Shading strategies;
- District energy systems; and
- Renewable energy generation.

Demonstrate that calculations have been undertaken to evaluate the community’s energy consumption. At a minimum this should include:

- Total annual energy consumption (MWh) of the entire community as well as each major use category;
- Peak power demand (MW) of the entire community as well as each major use category; and
- Total energy supplied by onsite renewable technologies, expressed as both annual generation (MWh) and peak generation (MW)

#### ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

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<tr>
<th>Requirement Achievement</th>
<th>This is a requirement. There are no Credit Points awarded.</th>
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<tbody>
<tr>
<td>Credit Submission: Design Rating</td>
<td>□ Narrative detailing the analysis undertaken for each of the strategies outlined in the requirements, including design drawings illustrating how the recommendations of the study have been incorporated into the design; and</td>
</tr>
<tr>
<td></td>
<td>□ Energy report containing the following:</td>
</tr>
<tr>
<td></td>
<td>    □ Calculations for the entire community energy consumption and peak power demand as well as each major use category;</td>
</tr>
<tr>
<td></td>
<td>    □ Calculations for the energy generated from any onsite renewable technologies;</td>
</tr>
<tr>
<td></td>
<td>    □ Input assumptions and variables;</td>
</tr>
<tr>
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<td>    □ Calculation methodologies;</td>
</tr>
<tr>
<td></td>
<td>    □ Graphs and output results; and</td>
</tr>
<tr>
<td></td>
<td>    □ Referenced standards (if applicable).</td>
</tr>
</tbody>
</table>

| Credit Submission: Construction Rating | □ Updated narrative detailing the analysis undertaken for each of the strategies outlined in the requirements, including as-built drawings illustrating the incorporation of study recommendations into the design; |
| | □ Updated energy report containing the following: |
| |     □ Calculations for the entire community energy consumption and peak power demand as well as broken down into the major use categories; |
| |     □ Calculations for the energy generated from any onsite renewable technologies; |
• Input assumptions and variables;
• Calculation methodologies;
• Graphs and output results; and
• Referenced standards (if applicable).

### Calculations and Methodology

- **Major energy use categories include, but are not limited to, the following:**
  - Buildings, divided into different occupancy types and further separated into cooling, electricity and any other fuel types that are present;
  - Infrastructure lighting (road, public, traffic lights, signage etc);
  - District energy systems;
  - Water system pumping, treatment and wastewater processing; and
  - Any other major infrastructure energy requirements such as transport systems (metro) etc.

- The energy consumption of buildings are estimated using methodologies developed by the design teams. All inputs, calculation methodologies, outputs, references and assumptions must be submitted. Where energy models are developed as part of RE-5 Energy Efficient Buildings, these may be used for those building types that have been modeled. Alternatively benchmarks for energy consumption given below may be used for the building types listed.

- All other energy uses described within the requirement must be calculated by the design team. All inputs, calculation methodologies, outputs and any references/assumptions must be submitted.

#### Table RE-R1a: Benchmark energy consumption data for typical buildings in Abu Dhabi:

<table>
<thead>
<tr>
<th>Occupancy Type</th>
<th>Energy Consumption (kWh/m²/annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>333</td>
</tr>
<tr>
<td>Retail</td>
<td>424</td>
</tr>
<tr>
<td>Multi-Residential</td>
<td>247</td>
</tr>
</tbody>
</table>

### References

RE-R2: Building Energy Guidelines

Intent
To focus the design and development team on promoting energy conservation in buildings within the community.

Credit Requirements

GENERAL
Demonstrate building guidelines have been developed based on analysis which identifies the most efficient measures for reducing the energy consumption of buildings within the community. The analysis should cover the following at a minimum:

- Passive design strategies
  - Building orientation;
  - Building glazing ratio;
  - Building envelope parameters; and
  - Shading strategies.
- Mechanical and electrical systems
  - HVAC system design options;
  - Lighting systems;
  - Heat rejection options; and
  - Metering strategies.
- Integrated renewable energy generation options

Demonstrate that the building guidelines have been incorporated into development plot controls and that a mechanism for ensuring compliance is developed.

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Requirement Achievement
This is a requirement. There are no Credit Points awarded.

Credit Submission: Design Rating
☐ Narrative detailing the analysis undertaken for each of the items outlined in the requirements including the results of calculations and/or simulations;
☐ Draft Building Guidelines; and
☐ Demonstrate the mechanism for ensuring compliance with building guidelines.

Credit Submission: Construction Rating
☐ Updated narrative detailing the analysis undertaken for each of the items outlined in the requirements including the results of calculations and/or simulations;
☐ Completed Building Guidelines; and
☐ Confirm mechanism for ensuring compliance with building guidelines.

Calculations and Methodology
- The analysis is to highlight the various design options available to buildings and show the iterative process which was conducted to determine the most efficient measures for reducing energy consumption.
- The Building Guidelines are to emphasize effective solutions to reducing energy consumption, but also demonstrate the consequences that various design decisions may have on the building energy consumption.

References
None
### RE-R3: Energy Monitoring & Reporting

#### Intent
To ensure the provision of metering facilities to monitor the performance of infrastructure systems, enabling future improvements and understanding of energy use within the community.

#### Credit Requirements

**GENERAL**
Demonstrate that easily accessible and clearly labelled energy sub-meters are provided and capable of monitoring the energy consumption of, at a minimum, the following major uses (where present):

- Buildings, divided into occupancy type (office, retail, residential, school etc);
- District energy systems;
- Infrastructure lighting (road, public, traffic lights, signage);
- Water pumping;
- Water treatment systems; and
- Any other major infrastructure energy requirements such as transport systems (metro) etc.

In addition, any onsite energy generating systems must be separately metered.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

<table>
<thead>
<tr>
<th>Requirement Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is a requirement. There are no Credit Points awarded.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Design Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Brief narrative describing how the requirements of the credit will be achieved;</td>
</tr>
<tr>
<td>□ Schematics illustrating the metering strategy confirming that the required level of metering will be achieved; and</td>
</tr>
<tr>
<td>□ Extracts from specifications and design drawings clearly indicating the type, extent and locations of all metering, and central monitoring system.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Updated narrative describing how the requirements of the credit have been achieved;</td>
</tr>
<tr>
<td>□ Schematics illustrating the metering strategy confirming that the required level of metering has been achieved;</td>
</tr>
<tr>
<td>□ Manufacturer’s data and as-built drawings clearly indicating the type, extent and locations of all metering, and central monitoring system;</td>
</tr>
<tr>
<td>□ Photographic evidence confirming installation of specified meters and central monitoring system; and</td>
</tr>
<tr>
<td>□ Written commitment from the developer/system operator to submit all energy monitoring data to Estidama (if requested).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Calculations and Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sub-meters shall have data logging capability and be connected to a central community-wide monitoring system so that information on the community’s energy consumption can be recorded. The monitoring system shall have, at a minimum, the following capability:</td>
</tr>
<tr>
<td>□ Provide hourly, daily, weekly, monthly and annual energy totals for each major use;</td>
</tr>
<tr>
<td>□ Compare consumption to previous days, weeks, months and years for trend</td>
</tr>
</tbody>
</table>
• Analysis;
  o Determine ‘out-of-range’ values and alert facility operator to unusually high consumption; and
  o Record peak energy consumption for each major use.

• The developer/system operator must provide a written commitment to supply energy monitoring data to Estidama (if requested). All reported information will be treated as confidential.

References

None
RE-1: Community Strategies for Passive Cooling

**Intent**
To improve outdoor microclimates through early community design and land use decisions.

**Credit Requirements**

**GENERAL**
Demonstrate that the development has considered, evaluated and incorporated passive cooling strategies to improve the outdoor microclimate and building energy performance.

**Conceptual Analysis**
Undertake a conceptual solar and wind analysis to determine street orientation, block size and shape, building massing and landscaping to promote shading and appropriate wind flows for passive cooling and improved pedestrian comfort; and demonstrate that:

- 2 Credit Points: Two of the following strategies have been incorporated into the community design
- 3 Credit Points: Three of the following strategies have been incorporated into the community design
  - Orientate streets so that more than 65% of the total street length is aligned within 15 degrees of true East-West orientation;
  - Arrangement of building mass, height and frontage in a staggered fashion to prevent wind flow becoming stagnant;
  - Align streets within 15 degrees of the appropriate prevailing wind direction;
  - Provision of linear parks or vegetated corridors parallel to the prevailing wind direction to ventilate urban areas;
  - Provision of shelter belts that protect the community from drifting sand;
  - Wind towers that direct appropriate winds to street level;
  - For sites with waterfront edges: conservation or provision of a green or landscaped edge along 90% of the development’s waterfront to cool incoming breezes, along with stepping of building heights away from the waterfront edge to ensure breezes are not obstructed;

**OR**
  - For sites with no waterfront edges: provision of a green or landscaped edge along 90% of the development’s prevailing wind boundary to cool incoming breezes.

**Advanced Analysis Techniques**
- 3 Credit Points: Demonstrate use of advanced solar and wind analysis techniques (e.g. solar exposure analysis, computational fluid dynamic (CFD) modeling, wind tunnel testing etc) to optimize the performance of the selected strategies. The analysis must consider the effects of solar radiation, wind, air temperature, surface radiant temperature and humidity.

**ADDITIONAL REQUIREMENT/CLEARIFICATIONS**
Where equivalent or improved performance is demonstrated via alternative strategies or via alternative criteria within the chosen strategies from the list above, credit points are still awarded.
<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 (maximum)</strong></td>
<td><strong>Design Rating</strong></td>
</tr>
<tr>
<td>2-3</td>
<td>Undertake a conceptual solar and wind analysis and incorporate passive cooling strategies into the community design.</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate that advanced solar and wind analysis techniques have been used to optimise pedestrian comfort and verify the performance of the selected strategies.</td>
</tr>
<tr>
<td><strong>6 (maximum)</strong></td>
<td><strong>Construction Rating</strong></td>
</tr>
<tr>
<td>2-3</td>
<td>Undertake a conceptual solar and wind analysis and incorporate passive cooling strategies into the community design.</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate that advanced solar and wind analysis techniques have been used to optimise pedestrian comfort and verify the performance of the selected strategies.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

**Conceptual Solar and Wind Analysis**

- Annual weather conditions for the site including solar azimuth and altitude, solar radiation, prevailing wind direction, wind speeds, wind temperatures and humidity;
- Site map illustrating the annual onsite wind conditions;
- Conceptual solar and wind analysis report including studies for all adopted strategies and evidence of how the community design promotes shading and wind flows for passive cooling and improved pedestrian comfort; and
- Site plan illustrating how the adopted strategies will be implemented.

**Advanced Analysis Techniques:**

- Narrative of the advanced solar and wind analysis describing how the results informed the final community design;
- Technical report containing outputs from the advanced solar and wind modeling analysis for all adopted strategies, demonstrating an improved level of performance; and
- Site plan indicating how the strategies will be implemented.

**Credit Submission: Construction Rating**

**Conceptual Solar and Wind Analysis**

- Revised documentation as per design rating including as-built site plans illustrating how the adopted strategies were integrated into the design;
- Photographic evidence of linear parks or vegetated corridors, shelter belts and wind towers where applicable.

**Advanced Analysis Techniques:**

- Revised documentation as per design rating including as-built site plans illustrating how the adopted strategies were integrated into the design;
- Photographic evidence of alternative passive cooling strategies where applicable.

**Calculations and Methodology**

**Conceptual Solar and Wind Analysis**

The analysis should include analysis of how the following vary over an entire year:

- Solar altitude and azimuth
- Solar radiation
- Prevailing wind direction
- Wind speed
- Wind temperature
- Wind humidity

Communities can be subject to hot and dry and/or hot and humid environments and these require different techniques to be applied to aid cooling and/or protect the site from heat.

Where possible wind data should be based on at least 10 years’ worth of records.

Advanced Analysis Techniques:
- Each adopted strategy should be analysed in the context of the community, and optimized based on the advanced analysis techniques.
- If alternative strategies are used to those outlined within the credit requirements, advanced analysis needs to be used to demonstrate they will achieve an equivalent or improved level of performance.

References
None
RE-2: Urban Heat Reduction

Intent
To improve outdoor microclimates through the reduction of urban heat build up.

Credit Requirements

**GENERAL**

Demonstrate that a combination of the following has been applied to all community hardscape areas excluding roads:

- Provide shade such as that from canopies, solar panels, vegetation, building form etc measured at 12pm solar time on the summer solstice; and
- Use materials with a minimum Solar Reflective Index (SRI) of 29.

Points are awarded where a combination of the above has been applied to a minimum of:

- 1 Credit Points: 70% of all community hardscape
- 2 Credit Points: 90% of all community hardscape

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

- Where shading is provided by structures such as canopies or other architectural elements (excluding solar panels), the outer surface of the shading element must have a minimum Solar Reflective Index (SRI) of 29.
- Any shading from trees should be measured at 3 years estimated growth.

### Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1-2</td>
<td>Demonstrate that community hardscape areas have utilised strategies to reduce the build up of heat.</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1-2</td>
<td>Demonstrate that community hardscape areas have utilised strategies to reduce the build up of heat.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

- Summary report demonstrating how the credit requirements have been met, including calculations for the percentage of compliant hardscape;
- Plan drawings highlighting the extent of all hardscape surfaces, overlaid with clearly identifiable ‘hashed’ areas denoting the coverage of the various measures;
- Typical street sections illustrating urban heat reduction strategies; and
- Extracts from the specification for surface finishes demonstrating that the minimum required SRI has been specified.

**Credit Submission: Construction Rating**

- Updated summary report demonstrating how the credit requirements have been met, including calculations for the percentage of compliant hardscape;
- As-built plan drawings highlighting the extent of all hardscape surfaces, overlaid with clearly identifiable ‘hashed’ areas denoting the coverage of the various measures;
- As-built street sections illustrating urban heat reduction strategies; and
- Manufacturers information for surface finishes demonstrating that the minimum required SRI has been achieved.
Calculations and Methodology

- The following methodology shall be used to determine the percentage of compliant hardscape:

\[
\text{Percentage of Compliant Hardscape} = 100 \times \frac{A_s + A_p (m^2)}{A_T (m^2)}
\]

- \(A_s\) = Area provided with shade must be measured at 12pm solar time on the summer solstice (June 21st).
- \(A_p\) = Area of materials with a minimum Solar Reflective Index (SRI) of 29.
- \(A_T\) = Total area of community hardscape areas excluding roads.

- Whilst the areas \(A_s\) and \(A_p\) may overlap in practice, for the purposes of this credit the calculated areas must not include overlapping areas.
- Community hardscape areas do not include any area within building plot boundaries.
- SRI of a material shall be calculated based on solar reflectance and emittance numbers as defined in the American Society of Testing and Materials Standard E1980-01. Alternatively manufacturer’s evidence can be supplied where the testing is in accordance with the referenced standards below.

References

- ASTM E1980 - 01 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
- ASTM E1918-06, Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
RE-3.1: Efficient Infrastructure: Lighting

Intent
To reduce the energy consumption and carbon emissions associated with infrastructure lighting including, road, public, traffic and signage.

Credit Requirements

**GENERAL**
Demonstrate that energy efficient lighting strategies have been incorporated into the community’s infrastructure lighting design.

All roadway, pathway and amenity lighting shall be designed in accordance with the following standards:
- IESNA RP 33 99 Lighting for Exterior Environments
- IESNA RP 8 Roadway Lighting

A maximum of 6 points are awarded for achieving the following:

**Energy Consumption**
- 4 Credit Points: The power density of all roadway, pathway and amenity lighting shall not exceed 80% of the figure specified for exterior areas and 50% of the figure specified for landscape features in the IECC 2009, Section 505.6.2 Exterior Lighting. Illuminated signage should be considered as “street frontage” for the purposes of power density.

**Controls**
- 2 Credit Points: Demonstrate that all of the following have been achieved:
  - All lighting not designated for dusk-to-dawn operation shall be controlled by either a combination of a photocell and a time switch, or an astronomical time switch
  - All lighting designated for dusk-to-dawn operation shall be controlled by an astronomical time switch or photocell
  - All time switches, including astronomical types, shall be capable of retaining programming and time settings during loss of power for a minimum period of 72 hours
  - All lighting shall be turned off at 24:00hrs, unless required for safety reasons. If needed for safety, lighting levels shall be lowered to those recommended in IESNA RP-33-99 and IES RP-8
  - All security lighting shall be activated using motion sensors so that luminaires are only on when someone is in the immediate area.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None
Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td></td>
<td>Demonstrate that the power density of all Roadway, Pathway and Amenity lighting shall not exceed 80% of the figure specified for exterior areas and 50% of the figure specified for landscape features in the IECC 2009.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate that the power density of all Roadway, Pathway and Amenity lighting shall not exceed 80% of the figure specified for exterior areas and 50% of the figure specified for landscape features in the IECC 2009.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that suitable controls have been installed to limit the use of lighting during unnecessary periods.</td>
</tr>
<tr>
<td>6 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrate that the power density of all Roadway, Pathway and Amenity lighting shall not exceed 80% of the figure specified for exterior areas and 50% of the figure specified for landscape features in the IECC 2009.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that suitable controls have been installed to limit the use of lighting during unnecessary periods.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

**Energy Consumption:**
- External lighting drawings, specifications and calculations confirming the lighting power densities of all roadway, pathway and amenity lighting.

**Controls:**
- Lighting control strategy confirming that all external lighting shall be controlled as required;
- Specifications of all control measures: photocell, time switch or astronomical time switch as required; and
- Method for retaining programming for 72 hours during periods of loss of power.

Credit Submission: Construction Rating

**Energy Consumption:**
- As-built external lighting drawings, specifications and calculations confirming the lighting power densities of all roadway, pathway and amenity lighting.

**Controls:**
- Lighting control strategy confirming that all external lighting shall be controlled as per the credit requirements;
- Specifications of all control measures: photocell, time switch or astronomical time switch as required; and
- Method for retaining programming for 72 hours during periods of loss of power.

Calculations and Methodology

Infrastructure lighting refers to all artificial lighting sources located in the public realm, including but not limited to:
- Roadway lighting
- Pathway lighting
- Public amenity lighting (parks, corniches, boardwalks etc)
- Traffic lights
- Directional signage lighting
- Advertising display lighting

References

- IESNA RP 33 99 Lighting for exterior environments
- IESNA RP 8 Roadway Lighting
- International Energy Conservation Code 2009
RE-3.2: Efficient Infrastructure: District Cooling

**Intent**
To promote the use of high efficiency district cooling systems.

**Credit Requirements**

**GENERAL**
Demonstrate the community includes a District Cooling (DC) network that achieves a Coefficient of Performance (COP) weighted average according to the following, and is connected to at least 35% of the community's buildings based on Gross Floor Area (GFA):

- 2 Credit Points: COP weighted average > 4.5
- 4 Credit Points: COP weighted average > 5.5

- 1 Credit Point: Demonstrate that the peak DC system cooling demand has been reduced by 25% through the use of thermal energy storage systems

- 1 Credit Point: Demonstrate that refrigerants used in the DC plant have a Global Warming Potential (GWP) of 10 or less.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
All refrigerants within the DC plant must have an Ozone Depletion Potential (ODP) of zero to obtain points within this credit.

### Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>2-4</td>
<td>Demonstrate use of DC which achieves a minimum level of efficiency.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that the peak DC system cooling demand has been reduced by 25% through the use of thermal energy storage.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that all refrigerants used in the DC system have a GWP of 10 or less.</td>
</tr>
<tr>
<td>6 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>2-4</td>
<td>Demonstrate use of DC which achieves a minimum level of efficiency.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that the peak DC system cooling demand has been reduced by 25% through the use of thermal energy storage.</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that all refrigerants used in the DC system have a GWP of 10 or less.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**

- Calculations demonstrating that at least 35% of the community is connected to a DC network;
- Calculations confirming the COP weighted average;
- Extracts from the DC plant specifications, or, details from the DC plant operator/designer confirming the seasonal average delivered COP;
- Extracts from the DC plant specifications confirming that all refrigerants used in the DC system will have an ODP of zero;
- Calculations demonstrating that the peak DC system cooling demand has been reduced by 25% through the use of thermal energy storage systems.
reduced by 25% through the use of thermal energy storage systems;

□ Refrigerant specifications from the DC provider confirming that all refrigerants to be used in the DC system have a GWP of 10 or less; and

□ Extracts from specifications and/or design drawings confirming the design and location of the DC plant and thermal energy storage system (where applicable).

Credit Submission: Construction Rating

□ Calculations demonstrating that at least 35% of the community is connected to a district cooling network;

□ Calculations confirming the COP weighted average;

□ Confirmation from the district cooling plant operator/designer specifying the seasonal average delivered COP of the DC system;

□ Manufacturer’s information confirming that all refrigerants used in the DC system have an ODP of zero;

□ Calculations demonstrating that the peak DC system cooling demand has been reduced by 25% through the use of thermal energy storage systems;

□ Manufacturer’s information confirming that all refrigerants used in the DC system have a GWP of 10 or less; and

□ Extracts from the utility as-built drawings confirming the design and location of the DC plant and thermal energy storage system (where applicable).

Calculations and Methodology

▪ The percentage of the community’s buildings (based on GFA) connected to a DC network is determined as follows:

\[
35\% = \frac{\text{Total Building GFA connected to a DC network (m}^2\text{)}}{\text{Total Building GFA (m}^2\text{)}}
\]

▪ Calculations of the COP weighted average are based on the seasonal average COP of district cooling systems used within the community as follows:

\[
\text{COP Weighted Average} = \frac{100 \times \sum \text{GFA}_i \text{COP}_i + \text{GFA}_2 \text{COP}_2 + \ldots + \text{GFA}_n \text{COP}_n}{\text{Total GFA served via DC}}
\]

▪ \text{GFA}_n = \text{Building GFA served via a DC network with seasonal average delivered efficiency of COP}_n

▪ \text{COP}_n = \text{Seasonal average delivered COP}

▪ COP is defined as the net annual cooling energy exported from the DC network divided by the total energy consumption of the DC plant.

▪ Calculation of the seasonal average delivered COP must include cooling tower and primary pumping energy, as well as account of thermal losses within the network in both directions.

References

None
RE-3.3: Efficient Infrastructure: Smart Grid Technology

Intent
To reduce peak electricity demand and increase efficiency of electric energy delivery through intelligent design of the community’s electric supply and demand systems.

Credit Requirements

**GENERAL**
Demonstrate that smart meters will be installed within all buildings at all points of connection to the primary utility networks to establish a two-way data connection between the building and community power provider.

**AND**
Demonstrate that end users have employed supporting smart grid strategies:

2 Credit Points: At least two of the strategies listed below have been adopted in a minimum of 50% of the project Gross Floor Area (GFA)

4 Credit Points: At least two of the strategies listed below have been adopted in a minimum of 75% of the project Gross Floor Area (GFA)

- Consumer dashboard thermostats and energy monitors (connected to data aggregation centre where applicable);
- Home automation software;
- Plug load reduction controls;
- Control systems for dynamic demand response.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
- Smart meters must be capable of tracking electricity use in real-time and transmit information back to the power distribution provider.

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td></td>
<td>Demonstrate that smart meters are proposed and that two smart grid strategies have been adopted in 50% of the building GFA.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate that smart meters are proposed and that two smart grid strategies have been adopted in 75% of the building GFA.</td>
</tr>
<tr>
<td>4</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>4 (maximum)</td>
<td>Demonstrate that smart meters have been installed and that two smart grid strategies have been adopted in 75% of the building GFA.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrated that smart meters have been installed and that two smart grid strategies have been adopted in 50% of the building GFA.</td>
</tr>
<tr>
<td>4</td>
<td>Demonstrated that smart meters have been installed and that two smart grid strategies have been adopted in 75% of the building GFA.</td>
</tr>
</tbody>
</table>
Credit Submission: Design Rating

- Confirmation that smart meters will be installed in all buildings, at all points of connection to the primary utility networks;
- Narrative describing the proposed smart grid strategies to be employed in the development, how they comply with relevant standards and the impact they have on consumer behaviour;
- Integration Manual/Standards (or similar document) for all buildings, defining how end users connect to, and interact with, the smart grid infrastructure; and
- Design standards and specifications demonstrating how smart grid infrastructure and operating criteria will be implemented into the development.

Credit Submission: Construction Rating

- Confirmation that smart meters are installed in all buildings, at all points of connection to the primary utility networks;
- Narrative describing the proposed smart grid strategies employed in the development, how they comply with relevant standards and the impact they have on consumer behaviour;
- Integration documentation for all buildings, defining how end users have connected to, and interact with, the smart grid infrastructure; and
- Design standards, specifications and record drawings demonstrating how smart grid infrastructure and operating criteria were incorporated and implemented into the development.

Calculations and Methodology

- The Percentage of GFA that have adopted smart grid strategies shall be calculated by dividing the total building GFA by the GFA of all buildings where at least two Smart Grid strategies have been installed and are in active use.

\[
\text{Smart Grid Percentage} = \frac{100 \times \sum \text{GFA of buildings incorporating at least 2 smart grid strategies (m}^2\text{)}}{\text{Total Building GFA (m}^2\text{)}}
\]

References

- None
RE-4.1: Renewable Energy: Onsite

**Intent**
To promote the use of onsite renewable energy to reduce transmission losses, curb peak power demand, and reduce reliance on fossil fuel based power generation.

**Credit Requirements**

**GENERAL**
Demonstrate that a percentage of the community’s total energy consumption is supplied through renewable energy generated within the community site boundary. Renewable energy may be supplied by developer-funded and owned systems or through third-party onsite renewable energy hosting and purchase agreements (with a purchase agreement of at least 5 years).

- Demonstrate that an onsite renewable energy feasibility study has been undertaken, and that one or more appropriate technologies have been selected from the study; and
- 1-8 Credit Points: Demonstrate that a percentage of the community’s energy consumption is supplied through onsite renewable energy. Points are awarded as follows:

<table>
<thead>
<tr>
<th>Points Achieved</th>
<th>Required Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>2</td>
<td>3%</td>
</tr>
<tr>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>7%</td>
</tr>
<tr>
<td>5</td>
<td>10%</td>
</tr>
<tr>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>7</td>
<td>20%</td>
</tr>
<tr>
<td>8</td>
<td>25%</td>
</tr>
</tbody>
</table>

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1-8</td>
<td>Demonstrate that a percentage of the community’s energy consumption is to be supplied by on-site renewable energy.</td>
</tr>
<tr>
<td>8 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1-8</td>
<td>Demonstrate that a percentage of the community’s energy consumption is supplied by on-site renewable energy.</td>
</tr>
</tbody>
</table>

- Onsite renewable energy feasibility study including recommendations on the most appropriate technology/technologies for the community.

**Developer Funded Systems**
- Calculations of the annual energy generation capability of each proposed renewable energy technology, both in terms of annual energy produced as well as a percentage of the community’s annual energy consumption.

**Hosting & Purchase Agreements**
- Narrative describing the proposed hosting agreement, including the company that will be purchasing and operating the equipment, the size and capacity of the equipment, the negotiated purchase price and the terms of the contract; and
Details of estimated annual energy purchases as well as a percentage of the community’s annual energy consumption.

Confirmation that the recommended renewable energy technology/technologies based on the design stage feasibility study has been incorporated into the community.

Developer Funded Systems

Calculations of the annual energy generation capability of each installed renewable energy technology, both in terms of annual energy produced as well as a percentage of the community’s annual energy consumption.

Hosting & Purchase Agreements

Signed contract for the hosting agreement, with details on the length of contract, amount of annual energy purchased and the percentage of the community’s annual energy consumption it will provide.

Eligible renewable technologies include:

- Wind energy systems;
- Solar energy, including solar electricity and solar thermal systems;
- Landfill gas;
- Deep-heat geothermal, providing either electrical power or thermal energy (does not include ground source heat pumps);
- Wave/Tidal/Hydro electric energy systems; and
- Organic/agricultural and animal waste to energy systems.

Any other form of renewable technology may be proposed and will be subject to approval from Estidama.

The renewable energy feasibility study must cover a minimum of three renewable technologies and cover the following:

- Annual energy generated by each renewable technology;
- Percentage of the community’s total annual energy consumption that would be supplied by each onsite renewable technology;
- Payback;
- Water use;
- Land use;
- Visual issues;
- Noise;
- Maintenance; and
- How the renewable technology is used (e.g. car park lighting systems etc).

The study must include a summary matrix detailing the relative merits of each renewable technology in reference to the above issues with the selected technology/technologies highlighted.

The percentage of energy supplied through onsite renewable technologies is determined by calculating the annual energy production of each onsite renewable technology, and dividing their sum by the total annual energy consumption of the community (as determined in credit RE-R1 Community Energy Strategy):

\[
\text{Percentage Renewable Energy} = \frac{100 \times \sum \text{Annual Energy Generated from Renewable Technologies (MWh)}}{\text{Annual Community Energy Consumption (MWh)}}
\]

None
RE-4.2: Renewable Energy: Offsite

Intent To create demand for large-scale renewable energy generation facilities, reducing reliance on fossil fuel based power generation.

Credit Requirements

GENERAL

- 3 Credit Points: Demonstrate that the total energy consumption of all community infrastructure (as defined within Calculations and Methodology) is supplied by offsite renewable generation through direct purchase and/or certified Renewable Energy Certificates (RECs); and that contract(s) are signed for a minimum of 5 years.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate that the total energy consumption of all community infrastructure will be provided by offsite renewable generation and contracts are signed for 5 years.</td>
</tr>
<tr>
<td>3 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>3</td>
<td>Demonstrate that the total energy consumption of all community infrastructure is provided by offsite renewable generation and contracts are signed for 5 years.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Calculations from RE-R1 Community Energy Strategy confirming the total annual energy consumption of all community infrastructure; and
- Narrative describing the proposed strategy (direct purchase and/or RECs).

Credit Submission: Construction Rating

Direct Purchase

- Offsite renewable energy direct purchase scheme, including the following information:
  - Name of the renewable energy provider;
  - Annual quantity of renewable energy purchases;
  - Renewable energy technology (e.g. solar photovoltaics etc);
  - Confirmation that the annual purchases are equal to or greater than the total community infrastructure energy consumption; and
  - Contract verifying the annual purchase amount and length of contract.

Renewable Energy Credits/Certificates (RECs)

- Renewable energy REC scheme, including the following information:
  - Narrative describing the proposed purchase plan for RECs;
  - Annual quantity of renewable energy purchases;
  - RECs technology (e.g. solar photovoltaics etc);
  - Confirmation that the annual purchases are equal to or greater than the total community infrastructure energy consumption;
  - Copy of the contract verifying the annual purchase amount and length of contract.
contract; and
- Approved certification (e.g. Green-e certified).

Combination of Direct Purchase and RECs
- Documentation required as above for both Direct Purchase and RECs; and
- Confirmation that the combined annual purchase is equal to or greater than the total community infrastructure energy consumption.

**Calculations and Methodology**

<table>
<thead>
<tr>
<th>Eligible renewable technologies include:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind energy systems;</td>
</tr>
<tr>
<td>Solar energy, including solar electricity and solar thermal systems;</td>
</tr>
<tr>
<td>Landfill gas;</td>
</tr>
<tr>
<td>Deep-heat geothermal, providing either electrical power or thermal energy (does not include ground source heat pumps);</td>
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<tr>
<td>Wave/Tidal/Hydro electric energy systems; and</td>
</tr>
<tr>
<td>Organic/agricultural and animal waste to energy systems.</td>
</tr>
</tbody>
</table>

Any other form of renewable technology may be proposed and will be subject to approval from Estidama.

- Offsite systems are defined as renewable energy generated outside of the project site boundary
- The total community infrastructure energy consumptions is defined as the energy consumption of all major use categories outlined in RE-R1 Community Energy Strategy except energy consumed by buildings or within building plot boundaries.

**References**

- Centre for Resource Solutions, Green-e Product Certification Requirements
  http://www.green-e.org/
**RE-5: Energy Efficient Buildings**

**Intent**
To promote the reduction of energy consumption of buildings within the community to help decrease the carbon emissions associated with the development as well as limit the size and burden on the community infrastructure.

**Credit Requirements**

**GENERAL**

**Buildings (except Villas)**
Set energy performance targets for all buildings (except villas) within the community as per the methodology outlined in credit RE-R1 Minimum Energy Performance of the Pearl Building Rating System. Demonstrate that the average energy performance target (as defined within the Calculations and Methodology section), \( C_{\text{bldg}} \), achieves the following:

- 1 Credit Points: \( C_{\text{bldg}} \geq 15\% \) improvement compared to the baseline building energy consumption.
- 2 Credit Points: \( C_{\text{bldg}} \geq 20\% \) improvement compared to the baseline building energy consumption.
- 3 Credit Points: \( C_{\text{bldg}} \geq 25\% \) improvement compared to the baseline building energy consumption.
- 4 Credit Points: \( C_{\text{bldg}} \geq 30\% \) improvement compared to the baseline building energy consumption.

AND

- Develop extended guidelines for representative buildings within the community demonstrating how the proposed target may be achieved. The targets must be based on the results of energy modeling carried out in accordance with RE-R1 Minimum Energy Performance of the Pearl Building Rating System and incorporated into RE-R2 Building Energy Guidelines.

**Villas**
Set energy performance targets for all low-rise residential buildings within the community as per the methodology outlined in credit RE-R1 Minimum Energy Performance of the Pearl Villa Rating System. Demonstrate that the average performance target (as defined within the Calculations and Methodology section), \( V_{\text{bldg}} \), achieves the following:

- 1 Credit Points: \( V_{\text{bldg}} \geq 10\% \) improvement compared to the baseline building energy consumption.
- 2 Credit Points: \( V_{\text{bldg}} \geq 20\% \) improvement compared to the baseline building energy consumption.
- 3 Credit Points: \( V_{\text{bldg}} \geq 30\% \) improvement compared to the baseline building energy consumption.

AND

- Develop extended guidelines for representative buildings within the community demonstrating how the proposed target may be achieved. The targets must be based on the results of energy modeling carried out in accordance with RE-R1 Minimum Energy Performance of the Pearl Villa Rating System and incorporated into RE-R2 Building Energy Guidelines.
### ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong> (maximum)</td>
<td><strong>Design Rating</strong></td>
</tr>
<tr>
<td>1-4</td>
<td>Demonstrate that the weighted average performance target (by GFA), C_{bldg}, achieve a percentage improvement compared to the baseline building</td>
</tr>
<tr>
<td>1-3</td>
<td>Demonstrate that the weighted average performance target (by GFA), V_{bldg}, achieve a percentage improvement compared to the baseline building</td>
</tr>
<tr>
<td><strong>7</strong> (maximum)</td>
<td><strong>Construction Rating</strong></td>
</tr>
<tr>
<td>1-4</td>
<td>Demonstrate that the weighted average performance target (by GFA), C_{bldg}, achieve a percentage improvement compared to the baseline building</td>
</tr>
<tr>
<td>1-3</td>
<td>Demonstrate that the weighted average performance target (by GFA), V_{bldg}, achieve a percentage improvement compared to the baseline building</td>
</tr>
</tbody>
</table>

#### Credit Submission: Design Rating
- Average performance targets, C_{bldg} and V_{bldg}, as well as calculations and color coded site plans to illustrate how the target is achieved across the community.
- Draft of building guidelines, integrated into RE-R2, highlighting energy model outputs and iterative steps in optimising the designs in order to achieve the targeted reductions. At a minimum this should include:
  - Design drawings and model screenshots illustrating representative buildings;
  - Details on the baseline and proposed building elements including: building envelope, lighting, HVAC, service water heating and receptacle and process loads;
  - Summary table highlighting the most effective strategies; and
  - Energy consumption of proposed and baseline buildings confirming the percentage reduction.

#### Credit Submission: Construction Rating
- Average performance targets, C_{bldg} and V_{bldg}, as well as calculations and color coded site plans to illustrate how the target is achieved across the community.
- Completed building guidelines, integrated into RE-R2, highlighting energy model outputs and iterative steps in optimising the designs in order to achieve the targeted reductions. At a minimum this should include:
  - Design drawings and model screenshots illustrating representative buildings;
  - Details on the baseline and proposed building elements including: building envelope, lighting, HVAC, service water heating and receptacle and process loads;
  - Summary table highlighting the most effective strategies; and
  - Energy consumption of proposed and baseline buildings confirming the percentage reduction.

#### Calculations and Methodology: Buildings (except Villas)
- The weighted average energy performance target for buildings (except Villas), C_{bldg}, is determined as follows:

\[
C_{bldg} = \frac{\sum GFA \times Performance\ Improvement_1 + GFA \times Performance\ Improvement_2 + \ldots + GFA \times Performance\ Improvement_n}{Total\ Commercial\ and\ Multi\ -\ Residential\ Building\ GFA}
\]
In order to demonstrate the reductions identified will be achieved, energy models will need to be created for representative buildings. Energy reduction targets for each building type can only be set based on the results of energy modelling.

Representative buildings are those which make up the majority of the GFA of a building type within the community. For example, if the majority of the GFA of commercial office buildings will be high-rise offices, a corresponding high-rise office building will need to be modelled to reflect this.

Various strategies for reducing the energy consumption of buildings will need to be modelled and the results included in the building guidelines in order to illustrate how the proposed percentage reductions may be achieved.

The methodology for determining the energy reductions will be in line with the methodology outlined in credit RE-R1 Minimum Energy Performance of the Pearl Building Rating System.

**Villas**

The weighted average energy performance target for low-rise residential buildings, \( V_{\text{Vldg}} \), is determined as follows:

\[
V_{\text{Vldg}} = \frac{\sum \text{GFA} \times \text{Performance Improvement}_1 + \text{GFA} \times \text{Performance Improvement}_2 + \ldots + \text{GFA} \times \text{Performance Improvement}_n}{\text{Total Low-Rise Residential Building GFA}}
\]

In order to demonstrate the reductions identified will be achieved, energy models will need to be created for representative villas within the community. Energy reduction targets for each villa type can only be set based on the results of the energy modeling.

Various strategies for reducing the energy consumption of the buildings will need to be modelled and the results of such strategies included in the building guidelines in order to illustrate how the percentage reductions identified can be achieved.

The methodology for determining the energy reductions will be in line with the methodology outlined in credit RE-R1 Minimum Energy Performance of the Pearl Villa Rating System.

**References**

None
The act of using materials such as timber, concrete and asphalt generates a number of direct and indirect consequences, beginning with the way raw content is extracted, through to how that material is prepared and installed. The consequences can be far-reaching including:

- The loss of biodiversity in a tropical rainforest half a world away;
- Consumption of energy required to ship materials to the UAE by boat, plane or truck;
- Substantial energy and water inputs required for the manufacturing process; and
- Impacts as the material ages, degrades and finally must be disposed of or recycled back into useful life.

In a sustainable development, the materials chosen and the process by which associated waste is disposed should be viewed as a complete cycle, not two disconnected constructs. Transportation of waste uses large amounts of fossil fuel and decaying landfill trash generates methane, a major greenhouse gas.

“The fact that people produce waste cannot change. However, by changing our behavior and our attitudes to waste, we can tackle this problem in a way that meets the needs of the present without affecting future generations. Optimizing recycling and re-use, as well as limiting production, forms a core part of protecting the environment.” Abu Dhabi Water Resources Master Plan, EAD 2009

The Stewarding Materials section of the Pearl Community Rating System encourages design and development teams to consider this entire continuum - or ‘whole-of-life’ cycle- when selecting and specifying materials, with an overall objective to improve the social and environmental outcomes associated with their manufacture, transport, installation and disposal.
## CREDITS COVERED IN THIS SECTION

<table>
<thead>
<tr>
<th>SM</th>
<th>Credit Code</th>
<th>Credit Title</th>
<th>Maximum Credit Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-R1</td>
<td>CCA Treated Timber Elimination</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>SM-R2</td>
<td>Basic Construction Waste Management</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>SM-R3</td>
<td>Basic Operational Waste Management</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>SM-1</td>
<td>Modular Pavement and Hardscape Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SM-2</td>
<td>Regional Materials</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>SM-3</td>
<td>Recycled Materials</td>
<td>5</td>
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<tr>
<td>SM-4</td>
<td>Reused or Certified Timber</td>
<td>3</td>
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<tr>
<td>SM-5</td>
<td>Improved Construction Waste Management</td>
<td>2</td>
<td></td>
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<tr>
<td>SM-6</td>
<td>Improved Operational Waste Management</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>SM-7</td>
<td>Organic Waste Management</td>
<td>2</td>
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</tr>
<tr>
<td>SM-8</td>
<td>Hazardous Waste Management</td>
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<tr>
<td></td>
<td>TOTAL</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
## SM-R1: CCA Treated Timber Elimination

<table>
<thead>
<tr>
<th>Intent</th>
<th>To minimize toxic effects of chromated copper arsenate (CCA) treated timber on people and the environment.</th>
</tr>
</thead>
</table>
| **Credit Requirements** | **GENERAL**
Demonstrate that where timber is specified to treat external structures used as part of the community’s public realm, where there is frequent and intimate contact, such as - but not limited to- shading devices and playground equipment that no chromated copper arsenate (CCA)-treated timber is used on the project. |
| **ADDITIONAL REQUIREMENT/CLARIFICATIONS** | None |
| **Requirement Achievement** | This is a requirement. There are no Credit Points awarded. |
| **Credit Submission: Design Rating** | ☐ Extracts from specifications indicating that no CCA-treated timber is to be used in the project as per the Credit Requirements. |
| **Credit Submission: Construction Rating** | ☐ Evidence of products purchased, indicating that no CCA-treated timber was used in the project as per the Credit Requirements. |
| **Calculations and Methodology** | None |
| **References** | None |
# SM-R2: Basic Construction Waste Management

**Intent**
To reduce the long-term environmental impacts associated with construction waste collection, transport and disposal.

**Credit Requirements**

**GENERAL**
Demonstrate that the General contractor, working collaboratively with all subcontractors and specialty contractors (e.g. demolition) on the community’s infrastructure and public realm works, developed a Construction and Demolition Waste Management Plan (CDWMP) prior to the start of construction and demolition activities. The Plan must identify the materials to be diverted from landfill and indicate whether the materials will be segregated on-site or co-mingled. If materials are planned for salvage, the plan must indicate their planned use.

Demonstrate that the Contractor implemented monthly monitoring of the CDWMP, and achieved a minimum final recycling/salvage rate of 50% of construction and demolition waste (by weight or volume). This figure excludes all hazardous waste that must undergo specialized treatment.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Requirement Achievement**
This is a requirement. There are no Credit Points awarded.

<table>
<thead>
<tr>
<th>Credit Submission: Design Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ CDWMP conforming to the Credit Requirements; and</td>
</tr>
<tr>
<td>□ Schedule of items to be recycled/salvaged, their source within the project, their total estimated weight or volume and the name and location of potential reclaim/recycling haulers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Calculations, supported with detailed receipts, summarizing final results of the CDWMP activities listing items recycled/salvaged, their source within the project, their total weight or volume, the name and location of the reclaim/recycling haulers, and markets for the recyclable materials.</td>
</tr>
</tbody>
</table>

**Calculations and Methodology**
Calculations can be done by weight or volume but must be consistent throughout.

**References**
- Center of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
### SM-R3: Basic Operational Waste Management

**Intent**
To reduce the long-term environmental impacts associated with operational waste collection, transport and disposal.

**Credit Requirements**

**GENERAL**
Demonstrate that Operational Waste Management has been addressed from the concept stage. As a minimum, the following must be addressed by the design and development team:

- Annual estimates of Operational waste (in buildings and public realm);
- Summary review of existing and planned waste management infrastructure and programs available from the appropriate authority;
- Proposed options for diverting waste from landfills and incineration with a minimum targeted diversion rate of 40% by weight or volume of the total operational waste generated at full occupancy;
- Provision of adequately sized waste management facilities including:
  - Collection and storage facilities for recyclables, general waste and hazardous waste, and
  - Treatment facilities (e.g. composting, anaerobic digestion energy from waste) where appropriate; and
- Adequate vehicular access for waste handling vehicles.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

**Requirement Achievement**
This is a requirement. There are no Credit Points awarded.

<table>
<thead>
<tr>
<th>Credit Submission: Design Rating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Operational Waste Strategy, including:</td>
<td></td>
</tr>
<tr>
<td>- Narrative summarizing options researched and selected to meet the diversion targets, addressing waste minimization, storage, collection, and treatment and links to private or municipal and regional infrastructure and programs;</td>
<td></td>
</tr>
<tr>
<td>- Calculations documenting projected waste quantities for the development during operation on an annual basis;</td>
<td></td>
</tr>
<tr>
<td>- Plan(s) indicating location of the waste management facilities and vehicle access areas, designed to ensure adequate space for maneuvering delivery and waste removal vehicles; and</td>
<td></td>
</tr>
<tr>
<td>- A waste transfer inventory outlining the intended receiver of waste and indicating that the carrier, recycling and disposal facilities are licensed.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Credit Submission: Construction Rating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Updated calculations documenting projected waste quantities for the development during operation on an annual basis;</td>
<td></td>
</tr>
<tr>
<td>□ As-built plan(s) and photographs indicating location of the waste management facilities and vehicle access areas designed to ensure adequate space for maneuvering delivery and waste removal vehicles; and</td>
<td></td>
</tr>
<tr>
<td>□ Updated waste transfer inventory outlining the contracted receiver of waste and indicating that the carrier, recycling and disposal facilities are licensed.</td>
<td></td>
</tr>
</tbody>
</table>

**Calculations and Methodology**
- Calculations can be done by weight or volume but must be consistent throughout.
- Waste benchmarks may be obtained from the Center of Waste Management, waste audits of buildings or literature research. References must be clearly listed.

**References**
- Center of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
SM-1: Modular Pavement and Hardscape Cover

Intent
To minimize waste associated with upgrades or maintenance of public realm and right-of-way through the use of modular pavement and hardscape cover.

Credit Requirements

**GENERAL**

Demonstrate that at least 70% (by surface area) of hardscape public realm and right-of-way, excluding transit and motor vehicle travelled way, use modular pavement and/or hardscape cover.

Demonstrate the proposed modular or hardscape product has a minimum SRI of 29.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td></td>
<td>Demonstrate at least 70% (by surface area) of hardscape public realm and right-of-way, excluding transit and motor vehicle travelled way, are specified with modular materials with minimum SRI of 29.</td>
</tr>
<tr>
<td>1</td>
<td>Construction Rating</td>
</tr>
<tr>
<td></td>
<td>At least 70% (by surface area) of hardscaped public realm and right-of-way, excluding transit and motor vehicle travelled way, are constructed with modular materials with minimum SRI of 29.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Plans to illustrate location of public realm and right-of-way;
- Schedule of materials used for pavement and hardscape cover and their SRI;
- Calculations demonstrating the percentage hardscape public realm and right-of-way comprising modular pavement and hardscape cover; and
- Extracts from specifications showing that pavement and hardscape cover systems meet the SRI requirements.

Credit Submission: Construction Rating

- As-built plans identifying the location of public realm and right-of-way;
- Schedule of materials used for pavement and hardscape cover and their SRI;
- Updated calculations demonstrating the percentage hardscape public realm and right-of-way comprising modular pavement and hardscape cover; and
- Evidence of purchase and installation of these materials in the project in the form of invoices from suppliers and installers.

Calculations and Methodology

This credit applies to all hardscape public realm and right-of-way in the community, excluding transit and motor vehicle travelled way as defined in the Abu Dhabi Urban Street Design Manual, Chapter 5.

References

- Abu Dhabi Urban Street Design Manual, UPC
SM-2: Regional Materials

Intent

To encourage the selection of materials that have reduced transport impacts and promote regional economies.

Credit Requirements

GENERAL

Demonstrate that the transport distance traveled by materials, representing a proportion of the material cost, is not greater than 500 km from the furthest point of origin to the project site.

- 1 Credit Point: Cost of regional materials equivalent to 10% of Total Material Cost.
- 2 Credit Points: Cost of regional materials equivalent to 20% of Total Material Cost.

Any materials sent by airfreight at any point during their transport do not qualify for this credit.

This credit only applies to materials used in the construction of infrastructure and public realm (including urban furniture).

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Cost of regional materials specified equal to 10% of Total Material Cost</td>
</tr>
<tr>
<td>2</td>
<td>Cost of regional materials specified equal to 20% of Total Material Cost</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Cost of regional materials installed equal to 10% of Total Material Cost</td>
</tr>
<tr>
<td>2</td>
<td>Cost of regional materials installed equal to 20% of Total Material Cost</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Report listing all materials proposed to demonstrate compliance with the Credit Requirements, including:
  - their materials cost;
  - location(s) of extraction/harvest/recovery/manufacture; distance traveled and means of transport; and
  - calculations demonstrating the total amount of the qualifying materials as a percentage of the total material cost.

- For each nominated material, proof of manufacture detailing country of origin and port of entry, if applicable; and

- Extracts from specifications indicating the requirement for materials to meet this credit.
Credit Submission: Construction Rating

- Updated report listing all nominated materials demonstrating compliance with the Credit Requirements, including:
  - final cost;
  - location(s) of extract/harvest/recovery/manufacture; and
  - proof of manufacture detailing country of origin and port of entry, if applicable.

- For each nominated material, proof of manufacture detailing country of origin and port of entry, if applicable; and

- Evidence of purchase and installation of these materials in the project in the form of invoices from suppliers and installers.

Calculations and Methodology

- The ‘furthest point of origin’ is defined as the longest distance to the project site from (1) the point of extraction, harvest or recovery or (2) the point of manufacture.
- The distance traveled is calculated as (‘Distance traveled by road or rail’ + 0.1 x ‘Distance traveled by sea’)
- For composite materials, a weighted average by weight (mass) must be applied to the distance. This calculation is not necessary for materials where one major constituent represents at least 90% of the final material by weight.

\[
\text{Percentage Regional Materials} = \left( \frac{\text{Cost of the regional materials}}{\text{Total Cost of Materials}} \right) \times 100
\]

- Where materials or primary constituent elements are quarried, extracted, or harvested, the calculation begins at this point and includes the distance traveled to the manufacturing/processing facility.
- Where products are primarily comprised of recycled materials (i.e. 90% by weight or more), then the calculation begins at the point of manufacture.
- Calculations to include distance to site but not returns.
- Total Material Cost: exclude labor and equipment costs and include the following divisions from the Construction Specifications Institute (CSI) MasterFormat™ or equivalent: Division 03 Concrete, Division 04 Masonry, Division 05 Metals, Division 06 Wood, Plastics, and Composites, Division 07 Thermal and Moisture Protection, Division 10 Specialties, Division 31 Earthwork, Division 32 Exterior Improvements, 33 Utilities, 34 Transportation, 35 Waterway and Marine Construction.

References

None
SM-3: Recycled Materials

Intent
To increase the demand for recycled materials and therefore reduce the amount of waste going to disposal.

Credit Requirements

**GENERAL**

Demonstrate that recycled materials used in the development’s infrastructure and public realm (including urban furniture) are as follows.

**Recycled Aggregates**
- 1 Credit Point: Demonstrate that 15% (by volume) of all aggregate used is recycled.
- 2 Credit Points: Demonstrate that 30% (by volume) of all aggregate used is recycled.

**Cement Replacement**

Demonstrate through either the use of supplementary cementing materials (SCMs) (including fly ash, ground granulated blast furnace slag (GGBFS) and silica fumes) or the increased use of aggregates or admixtures, that the project has reduced the overall amount of Portland cement used and associated embodied greenhouse gas emissions as per as per table SM3.1.
- 1 Credit Point: Concrete mixes with an embodied GHG as per Table SM3.1, rows B1, C1 and D1.
- 2 Credit Points: Concrete mixes with an embodied GHG as per Table SM3.1, rows B2, C2 and D2.

**Table SM 3.1: Embodied Greenhouse Gas Emissions of Concrete**

<table>
<thead>
<tr>
<th>Row A</th>
<th>Strength Grade</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>Estidama Credits</th>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row B1</td>
<td>Cast in place</td>
<td>162</td>
<td>192</td>
<td>218</td>
<td>240</td>
<td>259</td>
<td>277</td>
<td>292</td>
<td>307</td>
<td>1 Credit</td>
</tr>
<tr>
<td>Row B2</td>
<td>Cast in place</td>
<td>121</td>
<td>144</td>
<td>163</td>
<td>179</td>
<td>194</td>
<td>206</td>
<td>218</td>
<td>229</td>
<td>2 Credits</td>
</tr>
<tr>
<td>Row C1</td>
<td>Precast</td>
<td>176</td>
<td>209</td>
<td>236</td>
<td>260</td>
<td>281</td>
<td>300</td>
<td>317</td>
<td>332</td>
<td>1 Credit</td>
</tr>
<tr>
<td>Row C2</td>
<td>Precast</td>
<td>149</td>
<td>176</td>
<td>199</td>
<td>220</td>
<td>237</td>
<td>253</td>
<td>268</td>
<td>281</td>
<td>2 Credits</td>
</tr>
<tr>
<td>Row D1</td>
<td>Stressed</td>
<td>183</td>
<td>217</td>
<td>245</td>
<td>270</td>
<td>292</td>
<td>312</td>
<td>329</td>
<td>345</td>
<td>1 Credit</td>
</tr>
<tr>
<td>Row D2</td>
<td>Stressed</td>
<td>162</td>
<td>192</td>
<td>218</td>
<td>240</td>
<td>259</td>
<td>277</td>
<td>292</td>
<td>307</td>
<td>2 Credits</td>
</tr>
</tbody>
</table>

**Other Materials**
1 Credit Point: Demonstrate that any combination of materials with the following characteristics constitute at least 10% of the Total Material Cost:
- Minimum 30% post-consumer recycled content;
- Minimum of 80% post-industrial content;
- 50% agricultural waste by-product.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None
## Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Rating</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 (maximum)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>At least 15% of all aggregates specified are recycled.</td>
</tr>
<tr>
<td>2</td>
<td>At least 30% of all aggregates specified are recycled.</td>
</tr>
<tr>
<td>1</td>
<td>Specified concrete mix and reduction in cement use will achieve an embodied GHG of concrete as per Table SM3.1, rows B1, C1 and D1</td>
</tr>
<tr>
<td>2</td>
<td>Specified concrete mix and reduction in cement use will achieve an embodied GHG of concrete as per Table SM3.1, rows B2, C2 and D2</td>
</tr>
<tr>
<td>1</td>
<td>Cost of specified recycled materials equal to at least 10% of Total Material Cost</td>
</tr>
<tr>
<td><strong>Construction Rating</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5 (maximum)</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>At least 15% of all aggregates used are recycled.</td>
</tr>
<tr>
<td>2</td>
<td>At least 30% of all aggregates used are recycled.</td>
</tr>
<tr>
<td>1</td>
<td>Installed concrete mix and reduction in cement use will achieve an embodied GHG of concrete as per Table SM3.1, rows B1, C1 and D1</td>
</tr>
<tr>
<td>2</td>
<td>Installed concrete mix and reduction in cement use will achieve an embodied GHG of concrete as per Table SM3.1, rows B2, C2 and D2</td>
</tr>
<tr>
<td>1</td>
<td>Cost of installed recycled materials equal to at least 10% of Total Material Cost</td>
</tr>
</tbody>
</table>

### Credit Submission: Design Rating

- Narrative listing all materials proposed for compliance with the Credit Requirements;
- Calculations by volume (Recycled Aggregates, embodied GHG emissions (Cement Replacement, using the Estidama Concrete GHG calculator) or cost (Other materials) demonstrating compliance with the Credit Requirements; and
- Extracts from specifications detailing the use of compliant nominated materials.

### Credit Submission: Construction Rating

- An updated narrative listing all materials used to meet the Credit Requirements;
- Updated calculations by volume (Recycled Aggregates, embodied GHG emissions (Cement Replacement, using the Estidama Concrete GHG calculator) or cost (Other materials) demonstrating compliance with the Credit Requirements; and
- Proof of manufacture for all nominated materials; and
- Proof of purchase for all nominated materials. For nominated ‘Other Materials’ the proof of purchase should indicate the material cost (excluding labor and equipment).

### Calculations and Methodology

#### Recycled Aggregates

\[
\text{Percentage Recycled Aggregates} = \frac{\text{Volume of recycled aggregates}}{\text{Total volume of aggregates}} \times 100
\]

#### Cement Replacement

The embodied greenhouse gas emissions in concrete are calculated using the Estidama Concrete GHG Calculator.

#### Other Materials
Percentage Recycled Materials = \frac{\text{Cost of recycled content materials}}{\text{Total Materials Cost}} \times 100

Total Material Cost: exclude labor and equipment costs and include the following divisions from the Construction Specifications Institute (CSI) MasterFormat™ or equivalent: Division 03 Concrete, Division 04 Masonry, Division 05 Metals, Division 06 Wood, Plastics, and Composites, Division 07 Thermal and Moisture Protection, Division 10 Specialties, Division 31 Earthwork, Division 32 Exterior Improvements, 33 Utilities, 34 Transportation, 35 Waterway and Marine Construction.

Potential materials with recycled content include steel, paving products, asphalt.

References
- Estidama Concrete Embodied GHG Calculator
SM-4: Reused or Certified Timber

Intent
To encourage the use of timber sourced from legal and sustainable sources.

Credit Requirements

GENERAL
Demonstrate that a proportion (by cost) of the timber and composite wood products used on the project in relation to public realm and right-of-way works, including temporary construction timber, is reused OR certified (with Chain of Custody Certification: CoC) under any one or any combination of the following certification schemes as per the Requirement Achievement table:

- Forest Stewardship Council (FSC), or
- Program for the Endorsement of Forest Certification scheme (PEFC) or the following national schemes endorsed by PEFC: the Canadian Standards Association, CSA, the Sustainable Forestry Initiative SFI and the Malaysian Timber Certification Scheme MTCS; And

Demonstrate that all timber is legally sourced and not on the CITES (Convention on International Trade in Endangered Species) list of endangered species (Appendix I, II and III).

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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</thead>
<tbody>
<tr>
<td>3 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>50% (by cost) of the timber specified for the project comply with the Credit Requirements</td>
</tr>
<tr>
<td>2</td>
<td>70% (by cost) of the timber specified for the project comply with the Credit Requirements</td>
</tr>
<tr>
<td>3</td>
<td>90% (by cost) of the timber specified for the project comply with the Credit Requirements</td>
</tr>
<tr>
<td>3 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>50% (by cost) of the timber used on the project comply with the Credit Requirements</td>
</tr>
<tr>
<td>2</td>
<td>70% (by cost) of the timber used on the project comply with the Credit Requirements</td>
</tr>
<tr>
<td>3</td>
<td>90% (by cost) of the timber used on the project comply with the Credit Requirements</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- List of specified timber products (including temporary construction timber) highlighting intended use, proposed certification schemes and/or if the timber product is reused; and
- Extracts from specifications highlighting which timber product will come from certified sources (clearly indicating intended certification scheme) and/or be reused. The specification (or equivalent legally binding document) must also confirm that all timber and timber products will not include species on the CITES list of endangered species.

Credit Submission: Construction Rating

- Updated list of installed timber products (including temporary construction timber) highlighting certification schemes used and/or if the timber product was reused;
- Chain of custody (CoC) certificates associated with each timber product; and
- Evidence of purchase and installation of the certified timber products from suppliers and installers.
Calculations and Methodology

\[
\text{Percentage Certified Timber} = \frac{\text{Cost of certified timber}}{\text{Total materials cost of timber products}} \times 100
\]

References

- Forest Stewardship Council (FSC): [www.pefc.org](http://www.pefc.org)
- Program for the Endorsement of Forest Certification scheme (PEFC): [www.fsc.org](http://www.fsc.org)
- Canadian Standards Association (CSA): [www.csa.ca](http://www.csa.ca)
- Sustainable Forestry Initiative (SFI): [www.sfiprogram.org](http://www.sfiprogram.org)
SM-5: Improved Construction Waste Management

Intent
To further reduce the long-term environmental impacts associated with construction waste collection, transport and disposal.

Credit Requirements

GENERAL
- 1 Credit Point: Demonstrate that the Contractor implemented monthly monitoring of the CDWMP and achieved a minimum final recycling/salvage rate of 60% of construction and demolition waste (by weight or volume). This figure excludes all hazardous waste that must undergo specialized treatment.
- 2 Credit Points: Demonstrate that the Contractor implemented monthly monitoring of the CDWMP and achieved a minimum final recycling/salvage rate of 70% of construction and demolition waste (by weight or volume). This figure excludes all hazardous waste that must undergo specialized treatment.

ADDITIONAL REQUIREMENT/CLARIFICATIONS
None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate CDWMP aims for a minimum of 60% demolition and construction waste (by weight or volume) to be recycled / salvaged.</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate CDWMP aims for a minimum of 70% demolition and construction waste (by weight or volume) to be recycled / salvaged.</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Confirm a minimum of 60% of demolition and construction waste (by weight or volume) was recycled / salvaged.</td>
</tr>
<tr>
<td>2</td>
<td>Confirm a minimum of 70% of demolition and construction waste (by weight or volume) was recycled / salvaged.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating
- CDWMP conforming to the Credit Requirements; and
- Schedule of items to be recycled/salvaged, their source within the project, their total estimated weight or volume and the name and location of potential reclaim/recycling haulers.

Credit Submission: Construction Rating
- Calculations, supported with detailed receipts, summarizing final results of the Construction and Demolition Waste Management activities listing items recycled/salvaged, their source within the project, their total weight or volume, the name and location of the reclaim/recycling haulers, and markets for the recyclable materials.

Calculations and Methodology
Calculations can be done by weight or volume but must be consistent throughout.

References
- Center of Waste Management, Abu Dhabi: www.cwm.ae
SM-6: Improved Operational Waste Management

Intent

To further reduce the long-term environmental impacts associated with operational waste collection, transport and disposal.

Credit Requirements

**GENERAL**

Develop and implement an Operational Waste Management Plan (OWMP) that includes measures for diverting waste from landfills and incineration to meet the following minimum targeted diversion rates:

- 1 Credit Point: 50% of the total operational waste generated at full occupancy (by weight or volume).
- 2 Credit Points: 60% of the total operational waste generated at full occupancy (by weight or volume).

These figures exclude all hazardous waste that must undergo specialized treatment.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**

None

Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>An OWMP is developed for a minimum targeted diversion rate of 50% (by weight or volume).</td>
</tr>
<tr>
<td>2</td>
<td>An OWMP is developed for a minimum targeted diversion rate of 60% (by weight or volume).</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Waste management facilities have been installed to meet a minimum targeted diversion rate of 50% (by weight or volume).</td>
</tr>
<tr>
<td>2</td>
<td>Waste management facilities have been installed to meet a minimum targeted diversion rate of 60% (by weight or volume).</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Operational Waste Strategy that includes:
  - Narrative summarizing options researched and chosen to meet the diversion targets, addressing waste minimization, storage, collection, and treatment and links to private or municipal and regional infrastructure and programs;
  - Calculations documenting projected waste quantities for the development during operation on an annual basis. Waste benchmarks may be obtained from the Center of Waste Management, waste audits of similar buildings or literature research. References must be clearly listed;
  - Drawing(s) indicating location of storage/disposal facilities and vehicle access areas designed to ensure adequate space for maneuvering delivery and waste removal vehicles; and
  - Waste transfer inventory outlining the intended receiver of waste, including confirmation that the carrier, recycling and disposal facilities are licensed.

Credit Submission: Construction Rating

- Updated calculations documenting projected waste quantities for the development during operation on an annual basis;
- As-built drawing(s) and photographs indicating location of the storage/disposal facilities and vehicle access areas designed to ensure adequate space for
manoeuvring delivery and waste removal vehicles; and

☐ Updated waste transfer inventory outlining the contracted receiver of waste, including confirmation that the carrier, recycling and disposal facilities are licensed.

**Calculations and Methodology**

Calculations can be done by weight or volume but must be consistent throughout.

**References**

- Center of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
SM-7: Organic Waste Management

Intent
To encourage the recovery and reuse of organic waste from the development’s operations including landscaping and food waste.

Credit Requirements

**GENERAL**
Demonstrate the provision of onsite location(s) for the collection and/or composting of organic waste generated onsite.

- 1 Credit Point: projects where only the collection and/or treatment of landscaping waste OR food waste is provided.
- 2 Credit Points: projects where the collection and/or treatment of both landscaping and food waste is provided.

Storage area(s) must be suitably sized for the projected amount of waste to be collected and located with ready access to adequate collection vehicle maneuvering areas.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

<table>
<thead>
<tr>
<th>POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Landscaping waste or food waste collection and/or treatment is proposed onsite.</td>
</tr>
<tr>
<td>2</td>
<td>Food and landscaping waste collection and/or treatment are proposed onsite.</td>
</tr>
<tr>
<td>2 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Landscaping waste or food waste collection and/or treatment is provided onsite.</td>
</tr>
<tr>
<td>2</td>
<td>Food and landscaping waste collection and/or treatment are provided onsite.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating
- A narrative describing how the project intends to meet the Credit Requirements, including details on the size and location of the storage area and the estimated amount of waste to be generated; and
- Drawings clearly indicating the proposed location and size of waste collection area(s).

Credit Submission: Construction Rating
- An updated narrative describing how the project meets the Credit Requirements, including details on the size and location of the storage area and the amount of waste to be generated; and
- As Built drawings clearly indicating the location and size of waste collection area(s).

Calculations and Methodology
None

References
- Center of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
SM-8: Hazardous Waste Management

Intent
To ensure the safe handling of hazardous waste in order to minimize pollution to the ground, water and air.

Credit Requirements

GENERAL

Demonstrate the provision of at least one location point for the safe collection of potentially hazardous consumer waste such as paints, batteries and oil.

ADDITIONAL REQUIREMENT/CLARIFICATIONS

None

Requirement Achievement

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Allocate a location on the development for the safe collection of potentially hazardous consumer waste.</td>
</tr>
<tr>
<td>1 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate adequate space on the development for the safe collection of potentially hazardous consumer waste.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

☐ Narrative describing how the project intends to meet the Credit Requirements, including details on the size and location of the storage area and the estimated amount of hazardous waste to be generated; and

☐ Drawings clearly indicating the proposed location and size of hazardous waste collection area(s).

Credit Submission: Construction Rating

☐ Updated narrative describing how the project meets the Credit Requirements, including details on the size and location of the storage area and the amount of hazardous waste to be generated; and

☐ As Built drawings clearly indicating the location and size of hazardous waste collection area(s).

Calculations and Methodology

None

References

- Center of Waste Management, Abu Dhabi: [www.cwm.ae](http://www.cwm.ae)
Innovative practice builds on the essential elements of Plan 2030 and the pillars of Estidama - environment, social, cultural and economic - to deliver developments that incorporate design outcomes that go beyond the established benchmarks and deliver genuinely innovative features to further the sustainability of the community. This requires a design process that embraces innovation and creativity whilst respecting and responding to the cultural identity of the region.

The Innovative Practice section is intended to encourage responsive design that achieves pioneering solutions which will enhance the development’s success and contribute to sustainability in the UAE through:

- addressing the pillars of sustainability through innovative design solutions which are able to be replicated;
- providing for cost benefit and feasibility analysis; and
- developing designs that showcase cultural and regional practices, while contributing to the environmental performance of the community.
<table>
<thead>
<tr>
<th>Credit Code</th>
<th>Credit Title</th>
<th>Credit Points</th>
</tr>
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<tbody>
<tr>
<td>IP-1</td>
<td>Innovative Cultural &amp; Regional Practices</td>
<td>1</td>
</tr>
<tr>
<td>IP-2</td>
<td>Innovating Practice</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>
IP-1: Innovative Cultural & Regional Practices

Intent
Develop designs that showcase cultural and regional practices, while contributing to the environmental performance of the community.

Credit Requirements

**GENERAL**
Develop a strategy for incorporating architectural and/or technical solutions that are inspired by cultural and regional precedents and demonstrate their contribution to energy efficiency, water conservation or improved outdoor comfort.

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>1</td>
<td>Develop a design strategy for incorporating solutions that showcase cultural and regional practices.</td>
</tr>
<tr>
<td>1 (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>1</td>
<td>Demonstrate that the proposed solutions are built as part of the development.</td>
</tr>
</tbody>
</table>

Credit Submission: Design Rating

- Narrative describing the proposed strategy, documenting:
  - Precedents for the proposed solutions;
  - Numerical or physical performance modeling/testing describing the performance of the proposed initiative(s) within the project setting; and
  - Rationale of how the proposed solutions will be incorporated into the project.

Credit Submission: Construction Rating

- Updated narrative describing the nominated solutions.
- Photographs illustrating the proposed built-in solutions.

Calculations and Methodology

Awarding innovative credit points are subject to Estidama approval.

References
None
IP-2: Innovating Practice

Intent
To promote designs that result in a significant positive impact in relation to any of the four pillars of Estidama.

Credit Requirements

**GENERAL**
- Develop, document and implement an innovative design and/or construction solution that addresses one or more of the four pillars of Estidama.
- AND
- Develop a guideline document that enables the innovative design solution to be repeated.

**ADDITIONAL REQUIREMENT/CLARIFICATIONS**
None

### Awarding Credit Points

<table>
<thead>
<tr>
<th>CREDIT POINTS</th>
<th>REQUIREMENTS</th>
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</thead>
<tbody>
<tr>
<td><strong>2</strong> (maximum)</td>
<td>Design Rating</td>
</tr>
<tr>
<td>2</td>
<td>Innovative solution report.</td>
</tr>
<tr>
<td><strong>2</strong> (maximum)</td>
<td>Construction Rating</td>
</tr>
<tr>
<td>2</td>
<td>Implement the innovative solution, update the innovative solution report and produce guideline documentation.</td>
</tr>
</tbody>
</table>

**Credit Submission: Design Rating**
- Evidence of IDP related to the innovative design and/or construction solution, developed through engaging all relevant team members; and
- Innovative solution report.

**Credit Submission: Construction Rating**
- Updated Innovative solution report; and
- Guideline document.

Calculations and Methodology

The four pillars that make up the Estidama concept are:

- Environmental
- Cultural
- Social
- Economic

The innovative solution must be developed in conjunction with the IDP-R1 Integrated Development Strategy and be developed into a workable final solution.

An Innovative Solution Report must be prepared that demonstrates the process by which the final innovative solution has evolved from early concepts and addresses the following subjects where relevant:

- Detailed narrative of final design solution that must:
  - fully describe the design innovation so that it may be repeated;
  - be fully supported by concept proofs from studies, experiments or other research;
  - document key parameters relied upon in the context of the project; and
- be fully supported by design drawings, photographs and specifications.

- Predicted impact in relation to the four pillars of Estidama: The final design solution should be contextualized in terms of tangible impacts against one or more of the four pillars;

- Feasibility studies: This must address documented design evolution decisions toward the final design solution and address any and all considerations that lead to the final solution;

- Cost Benefit Analysis: A detailed cost benefit analysis of the design measure(s) including, at a minimum, capital cost, operational and maintenance cost, cost as a percentage of total project cost and revenue where appropriate. The benefit analysis must include performance targets / levels attained or anticipated to be attained as a direct result of the measures;

- Risk: The risk analysis must detail the framework within which the design solution is intended to work and highlight any and all weaknesses that would impede performance. The analysis must anticipate the impact of such weaknesses on the performance of the design solution;

- Integration and Implementation: This section must clearly demonstrate how the design solution has been integrated with any and all related elements associated with the development as well as a detailed plan of how the design solution is implemented;

- Measurability: This section must address how the performance of the design solution will be measured in-use and include all metrics and associated technologies relied upon; and

- Maintainability and Durability: This section must address all maintenance and durability aspects related to the design solution.

Awarding innovative credit points are subject to Estidama approval.

References

None
### Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADACH</td>
<td>Abu Dhabi Authority for Culture and Heritage</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>BCIS</td>
<td>Building Cost Information Service</td>
</tr>
<tr>
<td>BRT</td>
<td>Bus Rapid Transit</td>
</tr>
<tr>
<td>BS</td>
<td>British Standard</td>
</tr>
<tr>
<td>BSI</td>
<td>British Standards Institute</td>
</tr>
<tr>
<td>CBD</td>
<td>Central Business District</td>
</tr>
<tr>
<td>CCA</td>
<td>Chromated Copper Arsenate</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed-circuit Television</td>
</tr>
<tr>
<td>CDWMP</td>
<td>Construction &amp; Demolition Waste Management Plan</td>
</tr>
<tr>
<td>CEMP</td>
<td>Construction Environmental Management Plan</td>
</tr>
<tr>
<td>CFD</td>
<td>Computational Fluid Dynamics</td>
</tr>
<tr>
<td>CITES</td>
<td>Convention on International Trade in Endangered Species</td>
</tr>
<tr>
<td>CNIA</td>
<td>Critical National Infrastructure Authority</td>
</tr>
<tr>
<td>CPTED</td>
<td>Crime Prevention Through Environmental Design</td>
</tr>
<tr>
<td>EAD</td>
<td>Environment Agency Abu Dhabi</td>
</tr>
<tr>
<td>EHSMS</td>
<td>Environmental Health and Safety Management System</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EIDP</td>
<td>Estidama Integrative Development Process</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency (US)</td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
</tr>
<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
</tr>
<tr>
<td>GFA</td>
<td>Gross Floor Area</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>HVAC</td>
<td>Heating, Ventilating and Air Conditioning</td>
</tr>
<tr>
<td>IDP</td>
<td>Integrated Development Process</td>
</tr>
<tr>
<td>IECC</td>
<td>International Energy Conservation Code</td>
</tr>
<tr>
<td>ISAC</td>
<td>Integrated Situational Awareness Center</td>
</tr>
<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
</tr>
<tr>
<td>LB</td>
<td>Livable Buildings</td>
</tr>
<tr>
<td>LRT</td>
<td>Light Rapid Transit</td>
</tr>
<tr>
<td>NS</td>
<td>Natural Systems</td>
</tr>
<tr>
<td>PAD</td>
<td>Plan Abu Dhabi</td>
</tr>
<tr>
<td>PEFC</td>
<td>Program for the Endorsement of Forest Certification</td>
</tr>
<tr>
<td>PER</td>
<td>Preliminary Environmental Review</td>
</tr>
<tr>
<td>PW</td>
<td>Precious Water</td>
</tr>
<tr>
<td>QP</td>
<td>Qualified Professional</td>
</tr>
<tr>
<td>REC</td>
<td>Renewable Energy Certificate</td>
</tr>
<tr>
<td>SCM</td>
<td>Supplementary Cementing Material</td>
</tr>
<tr>
<td>SFI</td>
<td>Sustainable Forestry Initiative</td>
</tr>
<tr>
<td>SM</td>
<td>Stewarding Materials</td>
</tr>
<tr>
<td>SRI</td>
<td>Solar Reflectance Index</td>
</tr>
<tr>
<td>SUDS</td>
<td>Sustainable Urban Drainage System</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solids</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>UPC</td>
<td>Abu Dhabi Urban Planning Council</td>
</tr>
</tbody>
</table>
Units

- du: dwelling units
- h: hour
- ha: hectares
- kW: kilowatt
- kWh: kilowatt hour
- l: liter
- m: meter
- MW: megawatt
- MWh: megawatt hour
- W: Watt
- yr: year
Glossary

The glossary for the Pearl Rating System is available on the Estidama website (www.upc.gov.ae).

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive species</td>
<td>A plant species which has adapted to the local climate that is drought and/or saline tolerant.</td>
</tr>
<tr>
<td>Admixture</td>
<td>A material other than water, aggregates, lime, or cement, used as an ingredient of concrete or mortar, and added immediately before or during the mixing process.</td>
</tr>
<tr>
<td>Aggregate</td>
<td>The particulate material used in construction including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates.</td>
</tr>
<tr>
<td>Albedo</td>
<td>The amount of solar energy reflected by a surface.</td>
</tr>
<tr>
<td>Area of probable impact</td>
<td>The extent of a physical area occupied by an environmental component that is likely to be impacted by at least one of the phases of the proposed project. The boundary of the area of probable impact is determined by measurements, previous studies, models or best professional judgment and may vary by environmental component. In simple terms the extent of the area outside of the project area that is likely to be directly or indirectly impacted by the proposed project.</td>
</tr>
<tr>
<td>Asbestos</td>
<td>A fibrous mineral formerly used for making incombustible or fireproof articles. The inhalation of asbestos fibres can cause serious illnesses, including malignant lung cancer, mesothelioma, asbestosis and gastro-intestinal cancer.</td>
</tr>
<tr>
<td>Audit</td>
<td>A systematic process of objectively obtaining and assessing evidence, including physical inspections and verification.</td>
</tr>
<tr>
<td>Baraha</td>
<td>A Baraha (plural Barahaat) is an informal communal space strategically distributed throughout the fareej to encourage interaction between the residents. They are small, contained, intimate, shaded and cool spaces, contained by strong edge conditions. Their functionality is determined by the connected sikka destination and may include an adult baraha, a children's baraha or a Mosque-Haram baraha. Distances to barahaat are informed by UPC community facility requirements for distances to pocket parks.</td>
</tr>
<tr>
<td>Baseline building performance</td>
<td>The annual energy consumption of a baseline building design as defined in ANSI/ASHRAE/IESNA Standard 90.1-2007.</td>
</tr>
<tr>
<td>Benchmark</td>
<td>A standard against which something can be measured or judged.</td>
</tr>
<tr>
<td>Building envelope</td>
<td>The elements of a building that separate conditioned spaces from the exterior.</td>
</tr>
<tr>
<td>Carbon emissions</td>
<td>The release of carbon (or carbon dioxide) into the atmosphere.</td>
</tr>
<tr>
<td>Carrying capacity</td>
<td>The maximum number of organisms or amount of biomass that can be supported in a given area.</td>
</tr>
<tr>
<td>Central monitoring system</td>
<td>A central point for the storage and monitoring of information.</td>
</tr>
<tr>
<td>Chromated Copper Arsenate (CCA)</td>
<td>A chemical wood preservative containing chromium, copper and arsenic.</td>
</tr>
<tr>
<td>Climate change</td>
<td>A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.</td>
</tr>
</tbody>
</table>
Clock time: The artificial time used in everyday life to standardize time measurements. It allows people in different locations to use the same time or to easily convert time from one location to another.

Coefficient of performance (COP) - cooling: The ratio of the net cooling energy exported from the system to the total electric power used by the system.

Commissioning: The process of ensuring that newly constructed/installed systems (HVAC, plumbing, electrical, fire/life safety, building security etc) operate as designed and meet the performance requirements of the building occupant.

Commissioning agent: An individual with responsibility for coordinating and monitoring the commissioning process.

Compensation: The measures taken to make up for the loss of, or permanent damage to, biological resources through the provision of replacement areas. Any replacement area should be similar to or, with appropriate management, have the ability to reproduce the ecological functions and conditions of those biological resources that have been lost or damaged.

Compost: A mixture of decomposed organic matter used to improve soil structure and provide nutrients.

Connectivity: A measure of the functional availability of the habitats needed for a particular species to move through a given area.

Construction waste: The unwanted material generated during construction, including demolition waste.

Desalinization: The removal of salt from water.


District cooling: The centralized production and distribution of cooling energy.

Environmental component: An attribute or constituent of the environment (i.e. air quality, marine waters, waste management, geology, seismicity, soil, groundwater, marine ecology, terrestrial ecology, noise, traffic, socio-economic) that may be impacted by the proposed project.

Environmental design: The process of addressing surrounding environmental parameters when devising plans, programmes, policies, buildings or products. Environmental design in the traditional sense develops physical environments to meet one or more aesthetic or day-to-day functional needs, or to create a specific sort of experience.

Environmental impact: The positive or negative impact that occurs to an environmental component as a result of the proposed project. This impact can be directly or indirectly caused by the project’s different phases (i.e. construction, operation and decommissioning).

Environmental Impact Assessment (EIA): The assessment of the possible impacts (both positive and negative) that a proposed development may have on the environment, covering natural, social and economic aspects.

Equinox: Either of the two times of the year when the sun crosses the plane of the earth’s equator and day and night are of equal length.

Evapotranspiration: The transport of water into the atmosphere from surfaces, including soil and vegetation.

Fareej: A Fareej (plural Firjan) is an urban system, based on a social structure resulting from the interaction between families, through which the community, particularly women and children can safely roam. Associated with a fareej are sikkak,
barahaat and meydeen.

**Fossil fuel**
A fuel manufactured from a hydrocarbon deposit such as petroleum, coal or natural gas derived from living matter of a previous geologic time.

**General contractor**
The contractor with the main responsibility for performing/supervising the construction of a project. The general contractor hires all the subcontractors and suppliers for the project.

**Geothermal**
The heating and/or cooling potential of the ground.

**Global Warming Potential (GWP)**
An indicator that reflects the relative effect of a greenhouse gas in terms of climate change considering a fixed time period, such as 100 years (GWP100). The GWPs for different emissions can then be added together to give one single indicator that expresses the overall contribution to climate change of these emissions.

**Green infrastructure**
A strategically planned and managed network of wilderness, parks, greenways, conservation easements and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for communities and people.

**Greenhouse gas (GHG)**
A gas which absorb infrared radiation (heat) and contributes to the greenhouse effect (examples include water vapour, carbon dioxide, methane etc).

**Gross Floor Area (GFA)**
The sum of the floor areas of the spaces within a building, including basements, mezzanines and intermediate floors, and penthouses with an internal height of 2.3m or greater. It is measured from the exterior faces of the exterior walls or from the centerline of walls separating buildings. It excludes covered walkways, porches, pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

**Groundwater**
The water that occurs below the surface of the earth where it occupies spaces in soils or geological strata.

**Habitat**
A place in which a particular plant or animal lives. Often used in the wider sense referring to major assemblages of plants and animals found together.

**Habitat creation**
The establishment of an ecosystem on land that did not previously support that ecosystem, or on severely altered sites.

**Heat rejection**
The removal of heat from a system, commonly water based.

**Key Performance Indicator (KPI)**
An indicator set in a key area to measure performance.

**Landscaping**
The planting, configuration and maintenance of trees, ground cover, shrubbery, decorative natural and structural features (walls, fences, hedges, trellises, fountains, sculptures), earth patterning and bedding materials, and other similar site improvements that serve an aesthetic or functional purpose.

**Life Cycle Cost (LCC) analysis**
An analysis of building impacts covering the consecutive and interlinked stages of a constructed building, from raw material acquisition to the final disposal.

**Living system**
An open self-organizing system that has the special characteristics of life and interacts with its environment. This takes place by means of information and material-energy exchanges.

**Meydaan**
A Meydaan (plural Meydeen) is a plaza area used for community use and activity such as for religious, cultural, commercial and / or recreational purposes.

**Microclimate**
The localised climate conditions within an urban area or neighbourhood.

**Mitigation**
The measures taken to avoid or reduce negative impacts.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native species</td>
<td>Indigenous species living naturally within a given area.</td>
</tr>
<tr>
<td>Non-renewable energy</td>
<td>The energy derived from a fossil fuel source.</td>
</tr>
<tr>
<td>Open area</td>
<td>The area of opening through which air exchange occurs between indoors and outdoors. It is not the same as the whole window area (glass and frame) and is typically much smaller and depends on the opening style of the window.</td>
</tr>
<tr>
<td>Operational waste</td>
<td>The waste produced as a result of operating/running a building e.g. office waste, landscaping waste, food waste.</td>
</tr>
<tr>
<td>Organic waste</td>
<td>The carbon-containing waste derived from animal and plant materials.</td>
</tr>
<tr>
<td>Ozone Depletion Potential (ODP)</td>
<td>The relative amount of degradation to the ozone layer a chemical compound can cause. The ODP of CFC-11 is 1 and the ODPs of other compounds are calculated relative to this.</td>
</tr>
<tr>
<td>Permeable paving</td>
<td>Paving designed to allow water to pass through its surface using porous asphalt or concrete or using interlocking concrete permeable pavers or open grid pavers.</td>
</tr>
<tr>
<td>Phase I habitat survey</td>
<td>A field survey technique which provides a relatively rapid method to record semi-natural and natural vegetation and other wildlife habitats, designed to cover large areas relatively rapidly.</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>Cells that produce a voltage when exposed to radiant energy (especially light). The main application is the conversion of solar radiation to usable energy.</td>
</tr>
<tr>
<td>Plan 2030</td>
<td>The plan which has been designed to help Abu Dhabi filter all planning decisions through environmental, social and economic development criteria. The full title is the Abu Dhabi 2030 Urban Structure Framework Plan.</td>
</tr>
<tr>
<td>Preliminary Environmental Review (PER)</td>
<td>A review to identify, at the earliest possible stage, the potential environmental consequences associated with a proposed development.</td>
</tr>
<tr>
<td>Previously developed land</td>
<td>Any land that is, or was, occupied by a permanent structure including the land up to the plot boundary of the permanent structure and any associated fixed surface infrastructure. It excludes any land occupied by agriculture or forestry and any parks or recreational grounds.</td>
</tr>
<tr>
<td>Priority habitats</td>
<td>The habitats identified in Abu Dhabi Emirate which are of exceptional value and are highly threatened, including Intertidal Mudflats, Mangroves, Vegetated Sandy Beaches, Marine (seagrass, coral), Wadis, Sand Sheets and Low Dunes, Interdunal Plains and High Dunes, Alluvial Plains and Jebels. Refer to Brown and Boer, 2004 for detailed habitat types.</td>
</tr>
<tr>
<td>Priority species</td>
<td>A protected species (flora or fauna) or species determined to be critically endangered, endangered, vulnerable, threatened, near threatened or sensitive (as defined by the International Union for Conservation of Nature, IUCN, UAE Red Data list and / or EHSMS).</td>
</tr>
<tr>
<td>Project site area</td>
<td>The physical area within which activities of the proposed project will take place (the boundary of the project area is defined by the titled property boundary).</td>
</tr>
<tr>
<td>Public Realm</td>
<td>Publicly used land or right of way.</td>
</tr>
<tr>
<td>Public Open Space</td>
<td>Parks, plazas and similar open space areas that are reserved and dedicated for public access and use. This includes publicly accessible open space that is located on privately owned land.</td>
</tr>
<tr>
<td>Receptacle and process loads</td>
<td>All miscellaneous and plug loads within a building e.g. office equipment, kitchen equipment, elevators etc.</td>
</tr>
</tbody>
</table>
Recyclable material  Any raw or processed material than can be recycled.

Recycled water  The water discharged from a wastewater treatment system, treated to reduce the concentration of any substance or organism that may be detrimental to public health or the environment and made suitable for reuse.

Recycling  The processing of previously used materials to create new products.

Remediation  In the context of contaminated land, remediation prevents contaminated land from harming the environment and restores the land to safe and usable conditions.

Renewable energy  The energy derived from a renewable source e.g. solar, wind, tidal.

Renewable Energy Certificate (REC)  A tradable energy commodity that represents proof that a unit of energy was generated from an eligible renewable source.

Restoration  The altering of an area in such a way as to re-establish an ecosystem's structure and function, usually bringing it back to its original (pre-disturbance) functioning.

Roof  The upper portion of the building envelope that is horizontal or tilted at an angle of less than 60° from horizontal.

Runoff  The water that is not absorbed by the soil or landscape to which it is applied and therefore flows from the area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or where there is a severe slope.

Salvage  To save discarded or damaged material for further use.

Security lighting  The lighting provided to deter intruders and protect property.

Service water heating  The heating of water for domestic or commercial purposes other than space heating and process requirements.

Significant asset  An asset which is of significant importance (internationally, nationally, regionally and/or locally), including:

- Priority Habitats;
- Any other habitat identified as significant through a Development Review Process, the Coastal Development Guidelines, an Environmental Impact Assessment, a Preliminary Environmental Review or a Strategic Environmental Assessment; and
- Priority species.

Sikka  A Sikka (plural Sikkak) is a pathway which is the smallest denomination of street that permeates a fareej. They are narrow, irregular and shaded, taking residents to and from community facility destinations. Sikkak correspond to key pedestrian routes.

Smart meter  An advanced meter that identifies consumption in more detail than a conventional meter. Smart metering is designed to provide utility customers with information on a real time basis about their domestic energy consumption. This may include data on how much gas and electricity they are consuming, the cost and the impact of their consumption on greenhouse gas emissions.

Solar radiation  The thermal energy from the sun, including the infrared, visible and ultraviolet wavelengths.

Solar Reflectance Index (SRI)  The measure of a material’s ability to reflect solar heat on a scale of 0 to 100. A standard black material has an SRI of 0 and a standard white material has an SRI of 100.

Solar time  The time according to the position of the sun in the sky relative to one specific
location on the ground. In solar time, the sun is always due south in Abu Dhabi at exactly noon. This means that someone a few miles east or west of you will realise a slightly different solar time than you, although clock time would be the same. Also known as local solar time.

<table>
<thead>
<tr>
<th>Stormwater</th>
<th>The excess water created during precipitation events.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td>A public or private right-of-way, other than a major or secondary highway or alley, whose function is to carry vehicular traffic or provide vehicular access to abutting property.</td>
</tr>
<tr>
<td>Sub-meter</td>
<td>A utility meter that allows for the monitoring of usage on a portion of a distribution system past a main meter.</td>
</tr>
<tr>
<td>Suitably qualified professional</td>
<td>An individual with:</td>
</tr>
<tr>
<td></td>
<td>▪ a degree in a relevant subject;</td>
</tr>
<tr>
<td></td>
<td>▪ a minimum of five years directly relevant work experience; and</td>
</tr>
<tr>
<td></td>
<td>▪ a proven track record on working on similar projects in the region.</td>
</tr>
<tr>
<td>The Environment Agency Abu Dhabi (<a href="http://www.ead.ae">www.ead.ae</a>) holds a list of consultants carrying out a range of environmental services within the Emirate of Abu Dhabi. For other consultants, appropriate evidence must be submitted to demonstrate meeting the criteria above.</td>
<td></td>
</tr>
<tr>
<td>Summer solstice</td>
<td>The time at which the sun is at its northernmost point in the sky (southernmost point in the southern hemisphere), appearing at noon at its highest altitude above the horizon. It occurs on 21st June (22nd December in the southern hemisphere).</td>
</tr>
<tr>
<td>Transit Shed</td>
<td>The 350 m catchment radius from the center of a transit station (light rapid transit, bus rapid transit or metro)</td>
</tr>
<tr>
<td>Transit station</td>
<td>A public transport station such as a railway station or metro station.</td>
</tr>
<tr>
<td>Transit stop</td>
<td>A dedicated public bus or tram stop.</td>
</tr>
<tr>
<td>Transition Months</td>
<td>The shoulder months to the summer period, which include March, April, October and November.</td>
</tr>
<tr>
<td>Valuable asset</td>
<td>A feature of ecological value, including healthy native trees or shrub.</td>
</tr>
<tr>
<td>Vegetated wall</td>
<td>A wall that is partially or completely covered with plants and a growing medium.</td>
</tr>
<tr>
<td>Walkway</td>
<td>A path/route intended for pedestrian use such as a concrete or asphalt surface or continuous blocks of pavers.</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Water that has been adversely affected in quality by human activity. Wastewater is a source of potentially valuable resources including biosolids, nutrients and water.</td>
</tr>
<tr>
<td>Water feature</td>
<td>An artificial body of water such as a pool or fountain.</td>
</tr>
<tr>
<td>Water model</td>
<td>An analytical tool for understanding how much potable water is used in a building and to determine volumes of all demands and sources including potable and other potential sources of water, including greywater, recycled water and stormwater harvesting.</td>
</tr>
</tbody>
</table>
Appendix A

Relationship Between Community, Building & Villa Rating Systems

The Pearl Rating Systems address common regionally relevant sustainability measures and challenges. The Community, Building and Villa Rating Systems have been developed concurrently to ensure a strong relationship between the three systems. As a result, work undertaken on a community scale will be also relevant to submissions when embarking on Building and Villa Ratings. The following table provides a summary of the commonality between the systems.

<table>
<thead>
<tr>
<th>Community</th>
<th>Building</th>
<th>Villa</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integrated Development Process</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDP-R1 Integrated Development Strategy</td>
<td>IDP-R1 Integrated Development Strategy</td>
<td>IDP-R1 Integrated Development Strategy</td>
</tr>
<tr>
<td>IDP-R3 Guest Worker Accommodation</td>
<td>IDP-R3 Guest Worker Accommodation</td>
<td>IDP-R2 Guest Worker Accommodation</td>
</tr>
<tr>
<td>IDP-R4 Community-Dedicated Infrastructure Basic Commissioning</td>
<td>IDP-R4 Basic Commissioning</td>
<td>IDP-R3 System &amp; Envelope Performance Verification</td>
</tr>
<tr>
<td>IDP-1 Life Cycle Costing</td>
<td>IDP-1 Life Cycle Costing</td>
<td>IDP-1 Life Cycle Costing</td>
</tr>
<tr>
<td>IDP-3 Sustainability Awareness</td>
<td>IDP-5 Sustainability Communication</td>
<td>IDP-3 Sustainability Communication</td>
</tr>
<tr>
<td><strong>Natural Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS-R1 Natural Systems Assessment</td>
<td>NS-R1 Natural Systems Assessment</td>
<td>NS-R1 Natural Systems Assessment &amp; Protection</td>
</tr>
<tr>
<td>NS-R2 Natural Systems Protection</td>
<td>NS-R2 Natural Systems Protection</td>
<td>NS-R1 Natural Systems Assessment &amp; Protection</td>
</tr>
<tr>
<td>NS-1 Reuse of Land</td>
<td>NS-1 Reuse of Land</td>
<td></td>
</tr>
<tr>
<td>NS-2 Remediation of Contaminated Land</td>
<td>NS-2 Remediation of Contaminated Land</td>
<td></td>
</tr>
<tr>
<td>NS-3 Ecological Enhancement</td>
<td>NS-3 Ecological Enhancement</td>
<td>NS-2 Landscape Enhancement</td>
</tr>
<tr>
<td>NS-4 Habitat Creation &amp; Restoration</td>
<td>NS-4 Habitat Creation &amp; Restoration</td>
<td></td>
</tr>
<tr>
<td><strong>Livable Communities, Livable Buildings and Livable Villas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC-R1 Plan 2030</td>
<td>LBo-R1 Plan 2030</td>
<td></td>
</tr>
<tr>
<td>LC-R2 Urban Systems Assessment</td>
<td>LBo-R2 Urban Systems Assessment</td>
<td>LV-R1 Urban Systems Assessment</td>
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<tr>
<td>--------------------------------</td>
<td>---------------------------------</td>
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</tr>
<tr>
<td>LC-R3 Provision of Amenities and Facilities</td>
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### Innovating Practice

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Acknowledgements

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