



Mostadam Rating System

Commercial Buildings D+C Manual

VERSION 2019



Building
Sustainability Assessment

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Contents

1	Introduction	6
1.1	Mostadam and Vision 2030	6
1.2	Mostadam and the SgBC	7
2	About Mostadam for Commercial Buildings	9
2.1	Applicability	9
2.2	Structure	13
2.3	Credit Categories	13
2.4	Rating Levels	14
2.5	Keystone Credits	16
2.6	Credit layout	17
3	Implementing Mostadam for Commercial Buildings D+C	22
3.1	Submission and approval process	22
3.1.1	Submission	22
3.1.2	Approval	23
3.2	Communication Protocol	23
3.3	Key roles and responsibilities	24
4	Site Sustainability	27
	SS-01 Sewage, Flood and Rainwater Management	28
	SS-02 Ecological Assessment and Protection	34
	SS-03 Construction Environmental Management	39
	SS-04 Ecological Enhancement	43
	SS-05 Heat Island Effect	47
	SS-06 Light Pollution	50
	SS-07 Previously Developed Land	57
5	Transportation and Connectivity	62
	TC-01 Sustainable Commuting	63
	TC-02 Access to Public Transportation	68
	TC-03 Access to Amenities	71
	TC-04 Individual Sustainable Transport	75
	TC-05 Sustainable Operations	80
6	Region and Culture	84
	RC-01 Thriving Economy	85
	RC-02 Heritage and Culture	88

RC-03 Embrace Locality.....	91
7 Energy	95
E-01 Energy Performance.....	97
E-02 Energy Metering.....	104
E-03 Envelope Commissioning	108
E-04 Renewable Energy.....	112
E-05 Energy Efficient Appliances.....	116
E-06 Efficient Vertical Transportation Systems.....	120
E-07 Ozone Impacts	124
8 Water	128
W-01 Indoor Water Performance	129
W-02 Outdoor Water Performance	132
W-03 Water Metering.....	135
W-04 Alternative Water Solutions	139
9 Health and Comfort	144
HC-01 Outdoor Thermal Comfort	145
HC-02 Indoor Thermal Comfort	149
HC-03 Ventilation	153
HC-04 Water Quality	158
HC-05 Smoke Control	162
HC-06 Outdoor Space.....	166
HC-07 Daylight and Views	168
HC-08 Indoor Lighting	173
HC-09 Acoustics.....	176
HC-10 Indoor Air Quality	179
HC-11 VOCs and Low-Emitting Materials.....	182
HC-12 Active Lifestyle.....	187
HC-13 Access for All	191
HC-14 Car Park Pollutant Control.....	195
HC-15 Safety and Security	198
HC-16 Indoor Vegetation	201
10 Materials and Waste.....	206
MW-01 Operational Waste Management	207
MW-02 Construction Waste Management.....	211
MW-03 On-site Organic Waste Management.....	215

MW-04 Non-Polluting Insulation Materials	218
MW-05 Sustainable Materials.....	221
MW-06 Life Cycle Assessment	225
MW-07 Space Flexibility.....	230
11 Education and Innovation.....	233
EI-01 Mostadam Guide.....	234
EI-02 Biodiversity.....	239
EI-03 Innovation	241
12 Policies, Management and Maintenance	247
PMM-01 Systems Commissioning	248
PMM-02 Sustainable Procurement.....	251
PMM-03 Fair Labor Practices	255
PMM-04 Building Performance Monitoring.....	258
13 Glossary of Terms	262

Tables

Table 1 Mostadam rating levels	15
Table 2 Rating Levels and Applicability of Points	15
Table 3 Keystone Credits	16
Table 4 Building applicability and points	22
Table 5 Mostadam roles and responsibilities	24

Figures

Figure 1 Relationship between Vision 2030 and Mostadam for Commercial Buildings	7
Figure 2 Relationship between SBC and Mostadam for Commercial Buildings	8
Figure 3 Inclusions of Shell only	10
Figure 4 Inclusions of Core and Shell	11
Figure 5 Inclusions of Fit-out space	12
Figure 6 Mostadam for Commercial Buildings D+C categories	14
Figure 7 Submission Process	23
Figure 8 Communication protocol	24
Figure 9 Site Sustainability credits	27
Figure 10 Transport and Connectivity credits	62
Figure 11 Region and Culture credits	84
Figure 12 Energy credits	96
Figure 13 Water credits	128
Figure 14 Health and Comfort credits	144
Figure 15 Materials and Waste credits	206
Figure 16 Education and Innovation credits	233
Figure 17 Policies, Management and Maintenance credits	247

Introduction

1 Introduction

Mostadam has been developed by *Sustainable Building* as a comprehensive sustainability rating and certification system to address the long-term sustainability of commercial buildings in the Kingdom of Saudi Arabia (KSA). Mostadam addresses a wide range of sustainability issues important to KSA and supports the aspirations of Vision 2030.

This manual introduces Mostadam for Commercial Buildings D+C and details its components, structure, applicability, methodology and credit requirements.

1.1 Mostadam and Vision 2030

Vision 2030 is KSA's roadmap for future economic and developmental action and expresses the country's long-term goals and objectives. Vision 2030 is built around three themes:

1. Vibrant Society
2. Thriving Economy
3. Ambitious Nation

The criteria for sustainable operation and maintenance that have been developed for Mostadam for Commercial Buildings have been informed by the performance indicators and objectives contained in Vision 2030.



Figure 1 Relationship between Vision 2030 and Mostadam for Commercial Buildings

1.2 Mostadam and the SgBC

The Saudi Green Building Code (SgBC 1001), also referred to as SBC 1001 - Green Construction Code, is part of a set of legal, administrative and technical regulations that specify the minimum standards for building design and construction in KSA. The SgBC has been developed to ensure that buildings that are designed and constructed according to the code's standards have a reduced impact on the environment.

Mostadam for Commercial Buildings is aligned with the SgBC and has been developed to go beyond the minimum SgBC requirements to ensure an even higher level of sustainability for commercial buildings. Furthermore, Mostadam D+C requires a set of specific performance parameters that have been benchmarked with the baseline parameters as defined in the SgBC for performance and further improvement in operation.

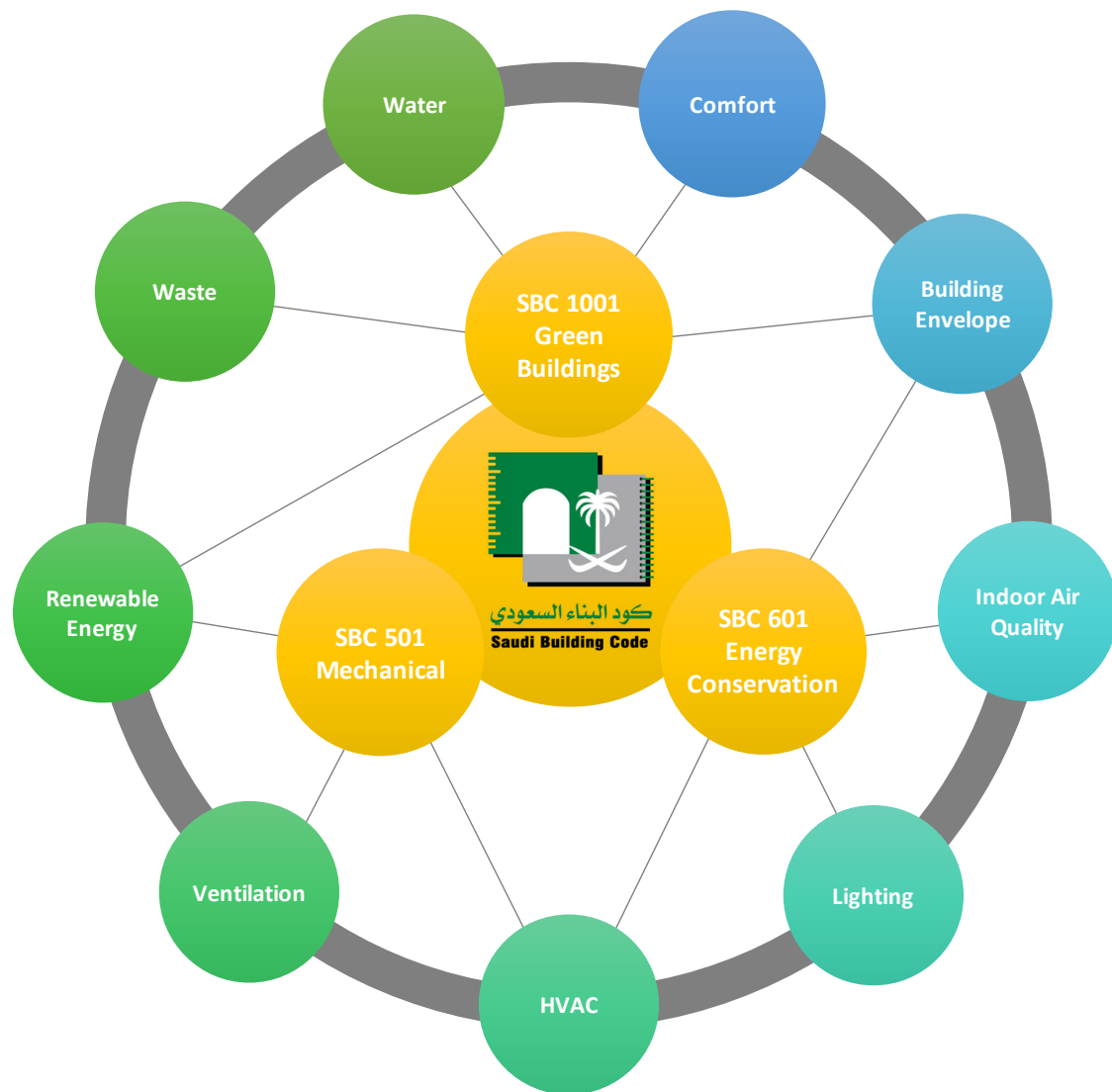


Figure 2 Relationship between SBC and Mostadam for Commercial Buildings

2 About Mostadam for Commercial Buildings

2.1 Applicability

Mostadam for Commercial Buildings (D+C) is applicable to all sizes of commercial developments and there is no minimum size required for certification. It is applicable to the following types of commercial projects at all different scopes for the development:

- **Shell only**: Shell may be defined as the “skeleton” of the building. It comprises of buildings and projects where the developer is responsible for construction of the shell of the building which includes the structure and envelope (roof, floor, walls, windows and doors). Refer to Fig. 3 for inclusions of Shell only.
- **Core and Shell**: This comprises of buildings and projects where the developer controls the entire design and construction of the core, i.e. mechanical, electrical, plumbing, and fire protection system in addition to the shell of the building. The core comprises of the structure, cladding, base plant, completed common areas and external works. If applicable, it will include fitted-out main reception, lobbies, staircases, toilets, lift shafts, basement, loading bays, car parking etc. The design and construction of the fit-out is not under this scope. Refer to Fig. 4 for inclusions of Core and Shell.
- **Fit-out**: Fit-out or fully fitted buildings include interior spaces that are built ready for occupancy. Often in these developments, the base construction is completed by the developer and the final fit-out by the occupant. The occupant generally leases space as a tenant from the developer or landlord. Refer to Fig. 5 for inclusions of fully fitted spaces.
- **Full Scope**: Full scope, a combination of the above three is a complete development of commercial buildings that include all stages of design and construction, from site clearance to final fit-out, wherein the building substructure, super structure, exterior façade, core ancillary building services (MEP, HVAC, lighting etc.), internal cladding, finishes and furniture are within the scope of development, and shall be valid for Mostadam certification.

Figure 3 Inclusions of Shell only

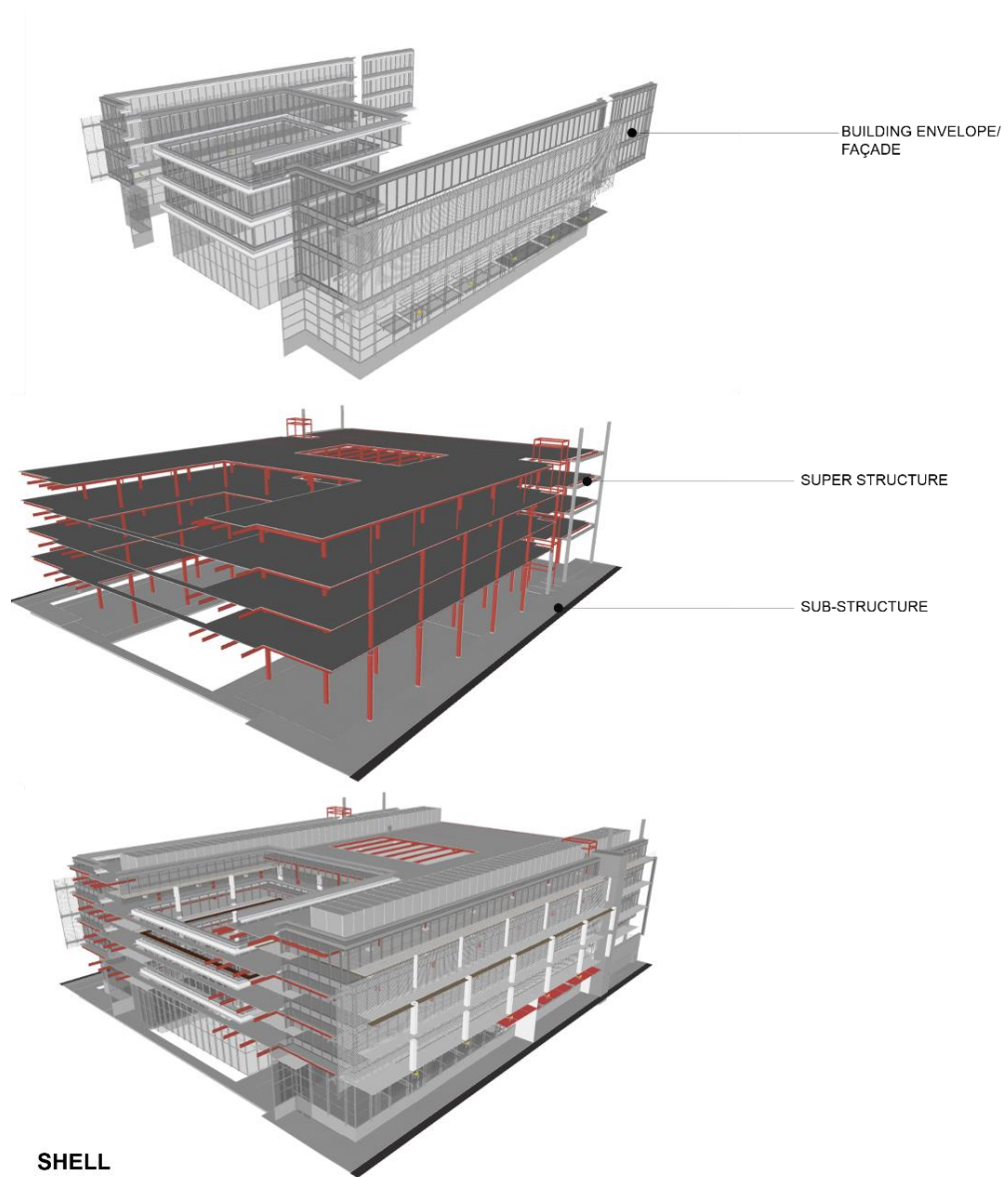
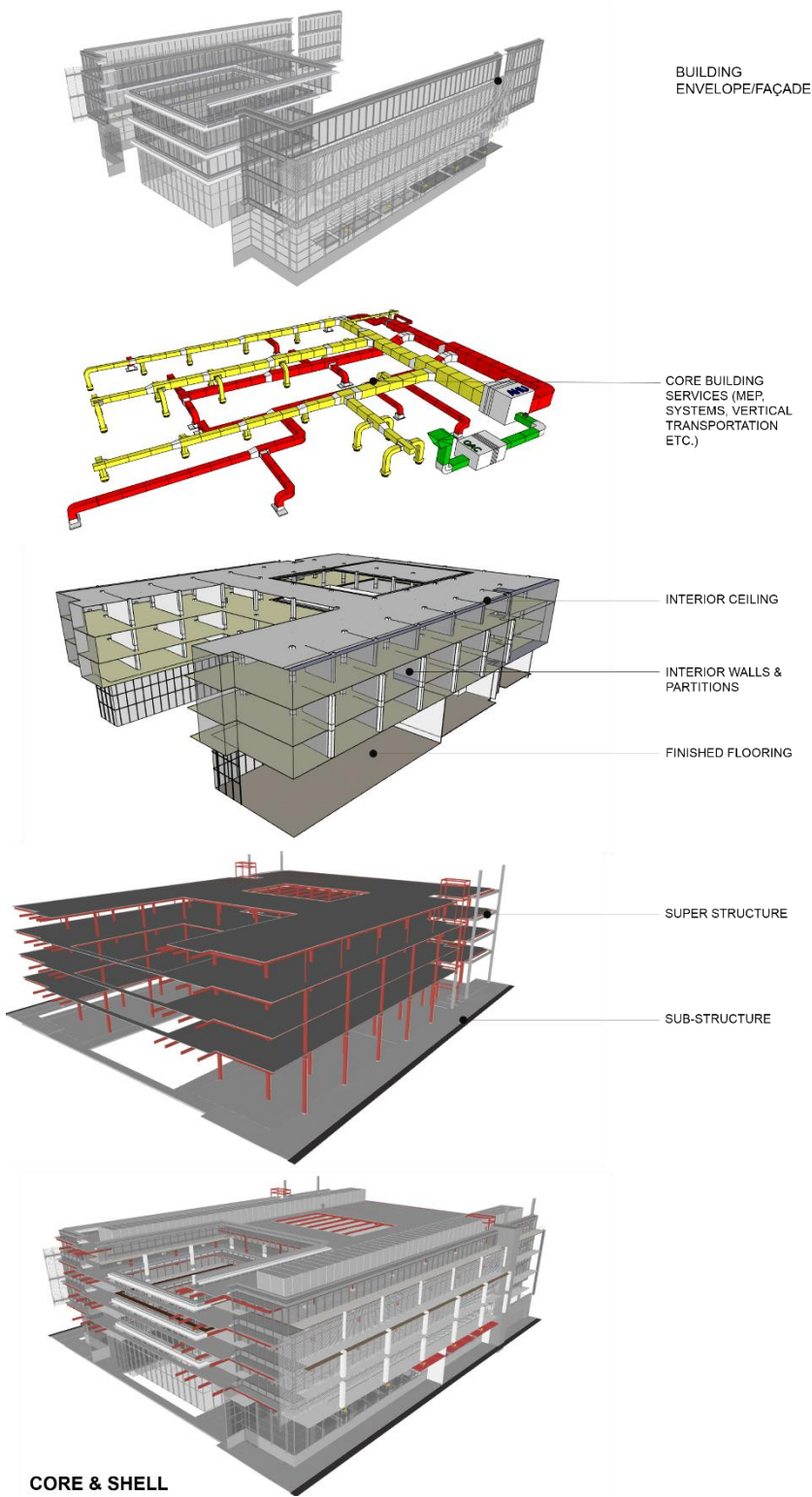


Figure 4 Inclusions of Core and Shell



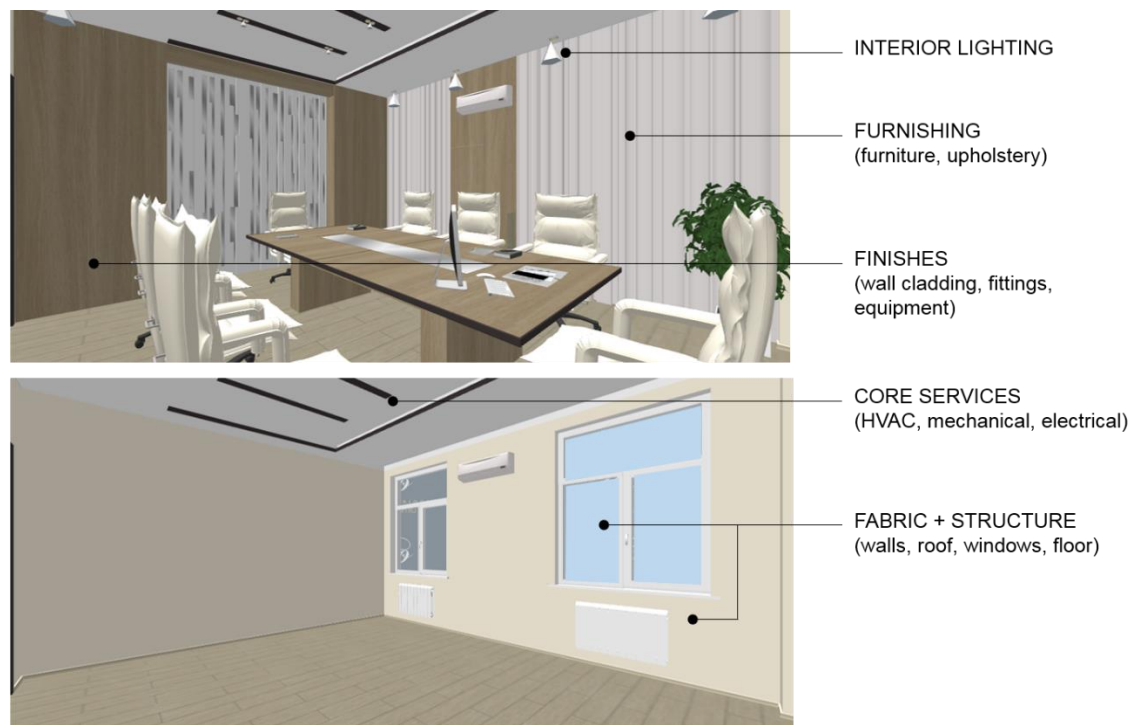


Figure 5 Inclusions of Fit-out space

The following building typologies are considered for rating in Mostadam for Commercial Buildings.

- **Educational Institutions-** Educational institutions consist of K-12 schools, nurseries, universities, and institutes of higher learning.
- **Offices/Commercial/Government-** This typology includes public buildings such as offices, banks and buildings for government entities.
- **Retail/Restaurants-** Occupancies include cafes and restaurants, shopping centers, grocery stores, apparel and specialty stores, independent enterprises etc. Retail includes both direct customer service areas and back of house areas such as those for preparation or storage.
- **Healthcare-** Healthcare buildings including hospitals operate twenty-four hours a day, seven days a week and provide inpatient medical treatment, including acute and long-term care. There will be different requirements for variations of healthcare facilities with respect to sustainability requirements under Mostadam.
- **Warehouses-** Buildings used to store goods, product assembly, merchandise, raw materials, or personal belongings, such as self-storage.
- **Mosques-** Places of worship would also be included in this rating system.
- **Hospitality-** Buildings include hotels, inns, motels, and similar lodging.

The following types of development are not covered by Mostadam for Commercial Buildings:

- Industrial buildings.
- Temporary commercial developments with a planned existence of less than 2 years.

2.2 Structure

Mostadam for Commercial Buildings comprises of two elements:

Design + Construction (D+C) (*this manual*)

Mostadam for Commercial Buildings D+C is applicable to the design and construction of new commercial buildings. As detailed in Section 2.1, applicable types of buildings include core & shell, shell only and fit-out and comprise of the following typologies: educational institutions, offices/government buildings, retail/restaurants, healthcare, warehouses, mosques, and hospitality buildings.

Operation + Existing (O+E)

Mostadam for Commercial Buildings O+E is applicable to new buildings and commercial spaces that have achieved Mostadam D+C certification and existing/older buildings / commercial spaces, including those that are undergoing minor renovation, refurbishment and/or extension. If a building is undergoing significant renovation, refurbishment or extension, i.e. the majority of the fixed buildings services are being replaced and the thermal elements are being renovated, it should follow the D+C component of Mostadam for Commercial Buildings.

2.3 Credit Categories

Mostadam D+C is organized into nine categories of credits (Fig. 6).

Six of these categories comprising of Site Sustainability, Health & Comfort, Materials & Waste, Energy, Water, and Policies, Management & Maintenance have a combination of both keystone (mandatory) and optional credits. These can be targeted for a minimum certification of 'Mostadam Green'.

Three categories, namely Transport & Connectivity, Region & Culture, and Education & Innovation contain only optional credits that can be targeted when pursuing a higher rating under Mostadam.



Figure 6 Mostadam for Commercial Buildings D+C categories

2.4 Rating Levels

A project's score is the sum of all the credit points achieved. The total points available in this rating system for Core and Shell, and Full scope are 130 points. There are five different rating levels for D+C as shown in Table 1. In order to achieve a 'Mostadam Green' rating, projects must achieve 25 points allocated for all keystone credits available in the rating system. Furthermore, to aim for higher levels of certification under Mostadam, projects can achieve more points from the optional credits in all categories.

Table 1 Mostadam rating levels

Number of Points Achieved	Rating Level
≥ 25	 Green
≥ 45	 Bronze
≥ 65	 Silver
≥ 85	 Gold
≥ 105	 Diamond

In accordance with the different building typologies defined in Section 2.1, the total number of points between different scopes varies depending on the level of execution and applicability of technical requirements.

For any building typology pursuing Mostadam certification at Shell only scope, the total points available are 35 points. For Fit-out scope, the total points available are 100 points for all building typologies.

The following table provides a summary of how the thresholds of rating levels change at each scope of development.

Table 2 Rating Levels and Applicability of Points

	Shell only	Core and Shell	Fit-Out	Full Scope
Total Points Available	35	130	100	130
Mostadam Green	≥ 10	≥ 25	≥ 20	≥ 25

Mostadam Bronze	≥ 15	≥ 45	≥ 35	≥ 45
Mostadam Silver	≥ 20	≥ 65	≥ 50	≥ 65
Mostadam Gold	≥ 25	≥ 85	≥ 65	≥ 85
Mostadam Diamond	≥ 30	≥ 105	≥ 80	≥ 105

Due to complexity of the rating system, the allocation of points may differ for the listed building typologies and for the scope of development. However, the total points available for all different typologies remain equal. This is done by compensating points allocated for technical requirements (that are not applicable to some building typologies) on other priority topics to maintain balance and ensure focus on priority topics for each typology.

2.5 Keystone Credits

To ensure the achievement of a basic level of sustainability across the board, Mostadam for Commercial Buildings D+C contains a number of mandatory credits referred to as keystone credits. These credits are applicable regardless of the rating level targeted and ensure KSA's priority goals are addressed by all commercial projects whilst maintaining flexibility in its application.

Mostadam 'Green' is the minimum rating level which can be achieved following the accomplishment of all keystone credits and thereby achieving a minimum overall score of 25 points for Full Scope and Core and Shell projects, 10 points for Shell only projects, and 20 points for Fit-Out projects.

In order to target and achieve higher rating levels (Bronze-Diamond), projects must achieve the keystone credits in addition to optional credits.

Table 3 Keystone Credits

Credit Category	Keystone Credit
Site Sustainability	SS-01 Sewage, Flood and Rainwater Management
	SS-02 Ecological Assessment and Protection
Energy	E-01 Energy Performance
	E-02 Energy Metering
Water	W-01 Indoor Water Performance
	W-02 Outdoor Water Performance
	W-03 Water Metering
Health and Comfort	HC-01 Outdoor Thermal Comfort

	HC-02 Indoor Thermal Comfort
	HC-03 Ventilation
	HC-04 Water Quality
	HC-05 Smoke Control
Materials and Waste	MW-01 Operational Waste Management
Education and Innovation	EI-01 Mostadam Guide
Policies, Management and Maintenance	PMM-01 Systems Commissioning

2.6 Credit layout

The key features of each credit are highlighted in the example provided.

1 SS-05 Heat Island Effect

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

2 Aim

To improve the microclimate of newly developed areas through appropriate material selection.

3 Requirements

#	Requirement	Points Available
1	The three-year aged Solar Reflective Index (SRI) values of the hardscape, shade structures and roofs meet the following: - Hardscape: 90% of the hardscape covering has an SRI ≥ 45. - Shade structures: 100% of the shade structures have an SRI ≥ 75. - Roofs: 100% of the roof covering has an SRI ≥ 75.	1
2	The unused roof area and/or structures used for shading have a vegetative covering over a minimum of 70% of their surface area.	1
	Total	2

4 Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	2	2	2	2	2	2	2

5 Design Stage Evidence

#	Evidence per Requirement
1	- Drawings illustrating all the areas of compliant and non-compliant hardscape, shade structures and roofs. - Calculations in table format showing that the requirements are met. - Extracts from specifications indicating the required SRI values.
2	Drawings showing the areas of roof and shade structures that will have a vegetative covering and the associated irrigation system.

	• Calculations in table format showing that the requirements are met. • List of selected plant types and their water needs.
--	--

6 Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings illustrating all the areas of compliant and non-compliant hardscape, shade structures and roofs. • Calculations in table format showing that the requirements are met. • Purchase orders and product data sheets showing the SRIs for the materials used. • Photographs of the installed hardscape, shade structures and roofs.
2	• As-built drawings showing the areas of roof and shade structures that have a vegetative covering and the associated irrigation system. • Calculations in table format showing that the requirements are met. • Photographs of the installed vegetative covering.

7 Supporting Guidance

- Manufacturers' data sheets must confirm that the SRI values of materials have been determined using ASTM E1980 at a facility independent of the manufacturer.
- Hardscape areas include paths, walkways, parking, play and amenity areas.
 - Areas of pervious, permeable or concrete (without added color) hardscape automatically comply with the credit requirement.
 - Parking areas that are shaded (where the shading meets the required SRI values) also comply with the credit requirement.
- The areas of the roof used for services, access and/or renewable energy sources are excluded from the requirements and calculations.

Solar Reflective Index (SRI):

- The SRI of a material demonstrates the material's ability to stay cool in the sun as it absorbs less heat and reflects more sunlight. The higher the SRI, the better the material is at staying cool in the sun.
- The three year-aged SRI is typically lower than the initial SRI as it accounts for weathering and soiling which reduces the material's ability to stay cool in the sun. As much of the weathering and soiling occurs within the first three years, the aged value is a more accurate measure of the material's ability to stay cool in the sun.
- The three year-aged SRI is found in the Product Data Sheet that can be obtained from the manufacturer. If this information is not available, the material can be tested at an independent laboratory according to the requirements of ASTM E1980.

Table SS-05.1 Sample of a section of product data sheet for roofing tiles

Material type	Initial SRI	Three year-aged SRI
Roofing Tile- White	93	87

Roofing Tile- Yellow	73	65
----------------------	----	----

Based on the above table, the white roofing tile would contribute towards this credit. However, the yellow roofing would not.

Vegetative Roof Covering:

- a) Plant species should be native where possible and must be drought tolerant. Refer to credit **SS-04 Ecological Enhancement** for guidance.
- b) The selected plant species must be capable of being sustained throughout the year by providing adequate irrigation and safe means of access to the roof structure for maintenance including the transportation of plant-care equipment.
- c) The plantation of vegetation must be in accordance with the roof covering manufacturer's instructions and Saudi Fire Protection Code 801.

8 Credit Tool

N/A

9 Reference Documents

1. Saudi Building Code (SBC) 201 Architectural, Section 6 Roof Assemblies and Rooftop Structures.
2. Saudi Building Code (SBC) 801 Fire Protection Requirements, Section 5C.4 Access to Building Openings and Roofs.
3. Saudi Building Code (SBC) 1001 Green Buildings, Section 408.3 Roof Surfaces.
4. ASTM E1980 – 11 Standard Practice for Calculating Solar Reflective Index of Horizontal and Low-Sloped Opaque Surfaces.

Legend:

1. Credit reference and title.
2. Credit aim.
3. Credit requirements and associated number of points. If a credit has different requirements for the building typologies, it will be highlighted in this part of the credit.
4. Applicability of the credit to all building typologies whether it is a keystone credit, and the available number of points.
5. Evidence per requirement for the submission at design stage.
6. Evidence per requirement for the submission at construction stage.
7. Supporting guidance providing any relevant additional information.
8. Name of credit tool (if any).
9. Details of relevant reference documents

Implementing Mostadam for Commercial Buildings

3 Implementing Mostadam for Commercial Buildings D+C

Mostadam for Commercial Buildings consists of seven building typologies, each available for certification as Shell only, Core and Shell, Fit-out and Full Scope. Each of these combinations can achieve a number of points by achieving both keystone and optional credits. Refer to Table 4 for the maximum score that can be attained by each building typology as per its applicability.

Table 4 Building applicability and points

Building Applicability	Maximum points for all Typologies
Shell only	35
Fit-out	100
Core and Shell	130
Full Scope	130

Mosques can achieve points for Mostadam certification under Full-scope only.

3.1 Submission and approval process

3.1.1 Submission

The submission of credit documentation occurs at the following three project stages:

D+C (*this manual*)

Submission 1: after completion of detailed design

Submission 2: after completion of construction

O+E

Submission 3: after the building has been occupied for a minimum of 1 year at a minimum occupancy level of 75% (i.e. a minimum of 75% of the commercial units have been sold or let).

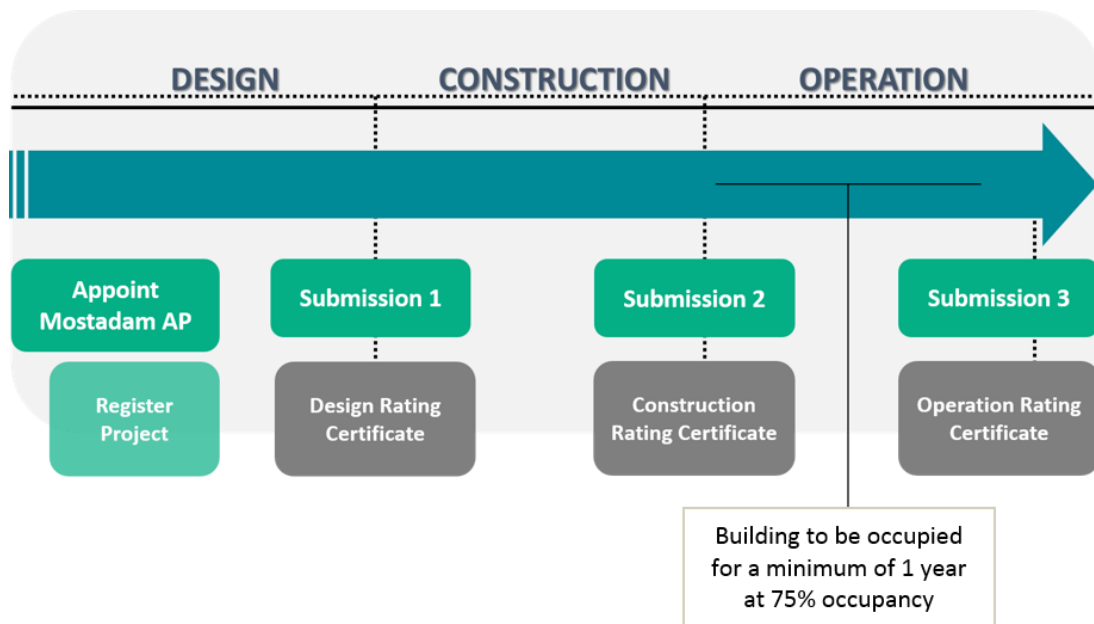


Figure 7 Submission Process

3.1.2 Approval

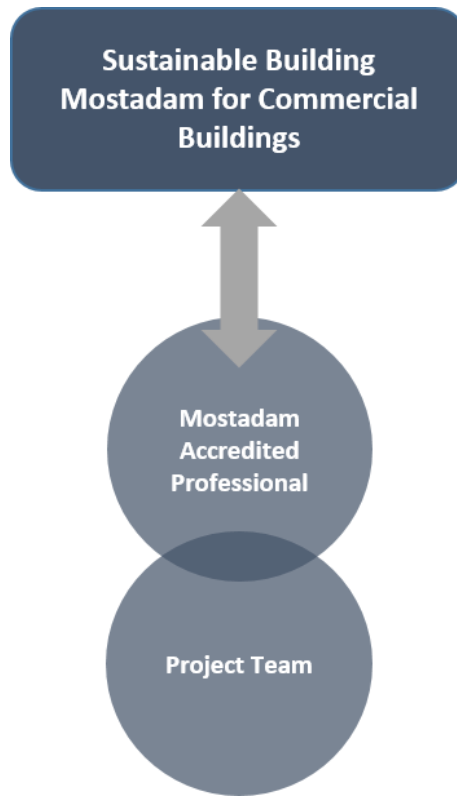
Following the review and approval of each submission, the following certificates are issued:

- D+C
 - Design Rating certificate (following the review of Submission 1).
 - Construction Rating certificate (following the review of Submission 2).
- O+E
 - Operation Rating certificate (following the review of Submission 3).
 - To maintain/retain the Operational Rating certificate, a project must be re-assessed after a minimum of 5 years.

3.2 Communication Protocol

All communication between a project team and the Mostadam Assessor must be via the Mostadam Accredited Professional (AP).

Figure 8 Communication protocol



3.3 Key roles and responsibilities

The roles and responsibilities of the various parties in the certification process for Mostadam for Commercial Buildings are defined in Table 5.

Table 5 Mostadam roles and responsibilities

Role	Responsibility
<i>Sustainable Building</i>	▪ Implementing body for Mostadam Rating System. ▪ Provides training, examinations and licensing for the Mostadam AP and Mostadam Assessors. ▪ Reviews and responds to formal credit queries. ▪ Issues Mostadam for Commercial Buildings' certification.
Mostadam Assessor	▪ Appointed by <i>Sustainable Building</i>. ▪ Point of contact for the Mostadam AP. ▪ Assesses the Mostadam for Commercial Buildings' project submissions at the design, construction and operation stages. ▪ Conducts Site Visits during the construction and operational stages of the project to verify compliance.

Mostadam Accredited Professional (AP)	▪ Point of contact for the Mostadam Assessor. ▪ Provides expert guidance and support to the project team for the achievement of the targeted Mostadam for Commercial Buildings' certification. ▪ Undertakes quality assurance of all credit documentation or evidence prepared by the project team. ▪ Submits the credit documentation to the Mostadam Assessor at the design, construction and operation stages. ▪ Coordinates with the Mostadam Assessor to provide any additional information requested from the project team.
Client/Project Owner	▪ Appoints the Mostadam AP at the earliest stage of the project. ▪ Pays the Mostadam project fees (registration, certification, site visits, credit queries etc.). ▪ Supports the Mostadam for Commercial Buildings' assessment process.
Project team	▪ Incorporates the targeted Mostadam for Commercial Buildings' credit requirements into the design and construction of the project. ▪ Maintains the required evidence and prepares the necessary documentation (including completion of any calculator tools), throughout the project stages and submits them to the Mostadam AP.

Site Sustainability

4 Site Sustainability

KSA is home to a diverse number of ecosystems that comprise of mangroves, beaches, deserts and mountains, protection of which is crucial to mitigating the disastrous consequences of climate change, preventing soil erosion and enhancing carbon sequestration. Though they vary drastically in size, every ecosystem consists of several species of flora and fauna that coexist and maintain a symbiotic relationship.

Rapid urbanization and overexploitation of these natural resources pose significant threats on the environment, economy and human health, and therefore must be safeguarded and enhanced. One of the key objectives of Vision 2030 is the conservation of biodiversity and the preservation of wildlife, which is imperative to sustain ecological equilibrium whilst addressing the challenges of environmental sustainability in the region.

The construction industry has a substantial effect on the environment directly through deforestation causing loss of habitat, pollution, excessive noise generation and causing urban heat islands. Mostadam for Commercial Buildings seeks to alleviate these adverse impacts by rewarding developments which demonstrate a persistent commitment to reducing the carbon footprint of the building through ecological enhancement and minimizing the microclimate of buildings and resultant urban heat islands.



Figure 9 Site Sustainability credits

SS-01 Sewage, Flood and Rainwater Management

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1
Requirement #2 & #3	No	2

Aim

To ensure an appropriate sewage strategy is in place and to minimize the risk of localized flooding, surface water run-off and water body/course pollution during peak rainwater discharge.

Requirements

#	Requirement	Points Available
Keystone Requirement – achieve requirement #1 (1 credit point)		
1	Where possible, the building must be connected to an existing sewage network. If there is no existing sewage network, a Sewage Treatment Plan must be prepared and implemented. <i>Note: Buildings with spaces dedicated to food preparation must install grease trap systems.</i>	1
2	The building is not located in a legally designated flood hazard area.	2
3	A Rainwater Management Plan is implemented that adopts either a site infiltration or rainwater redirection strategy.	
	Total	3

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only*	1	1	1	1	1	-	1
Core & Shell	3	3	3	3	3	-	3
Fit-Out	-	-	-	-	-	-	-
Full-Scope	3	3	3	3	3	3	3

*Requirements #2 & #3 are not applicable to all building typologies at Shell Only scope.

Design Stage Evidence

#	Evidence per Requirement
1	Plan showing the existing sewage network and the point of connection for the project. OR

	• Sewage Treatment Plan. • For buildings with food preparation areas: ○ Drawings illustrating installation and connections of the grease trap system. ○ Extract from specifications indicating technical details of the grease trap system.
2	• Flood Insurance Rate Map (FIRM) marked-up with the location of the building to demonstrate that it is not within a flood hazard area.
3	• Rainwater Management Plan demonstrating that the rainwater management system meets the credit requirements and has adopted either a site infiltration or rainwater redirection strategy (refer to Supporting Guidance for details).

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built site plan showing the existing sewage network and the point of connection for the project. OR • As-built drawings demonstrating implementation of the Sewage Treatment Plan. • For buildings consisting of food preparation areas: ○ As-built drawings of grease trap system.
2	• Flood Insurance Rate Map (FIRM) marked-up with the location of the building to confirm that it is not within a flood hazard area.
3	• Updated Rainwater Management Plan. • Date-stamped photographic evidence demonstrating that the rainwater management system has been implemented.

Supporting Guidance

Sewage Management:

Buildings which are not connected to the municipal sewage system need alternative means of sewage management procedures, which must be safe and reliable. One of the acceptable solutions is local sewage treatment, most applicable to the management of domestic sewage. Sewage treatment is a process where contaminants, micro-organisms and other types of pollutants from wastewater, primarily from solid & liquid waste from operations, are removed by specialized procedures. This may be done through physical, chemical, and biological methods to remove contaminants and produce environmentally safe treated wastewater. This treated wastewater can be used for specific uses and does not represent a risk to the environment if discharged.

Sewage Treatment Plan:

The Sewage Treatment Plan should include the following as a minimum:

- Sewage drainage strategy
- Details of sewage treatment system and minimum level or standard of treatment
- Operation and maintenance requirements

The Sewage Treatment Plan should detail the components of the proposed system that will collect and treat the wastewater, the acceptable environmental parameters of various chemicals, the composition of the chemicals as an input and the expected chemical composition after treatment. The proposed system must be designed to collect all wastewater (blackwater and graywater) that is discharged from water systems in the building. The estimated discharge from a building will depend on the number of water systems and occupants. The Plan should also include the management operational procedures including the type of treatment and the potential type and quantity of chemicals to be used for each treatment cycle among other regulatory governed operational parameters.

Figure SS-01.1 provides an illustration of a sewage treatment plant for a typical commercial building.

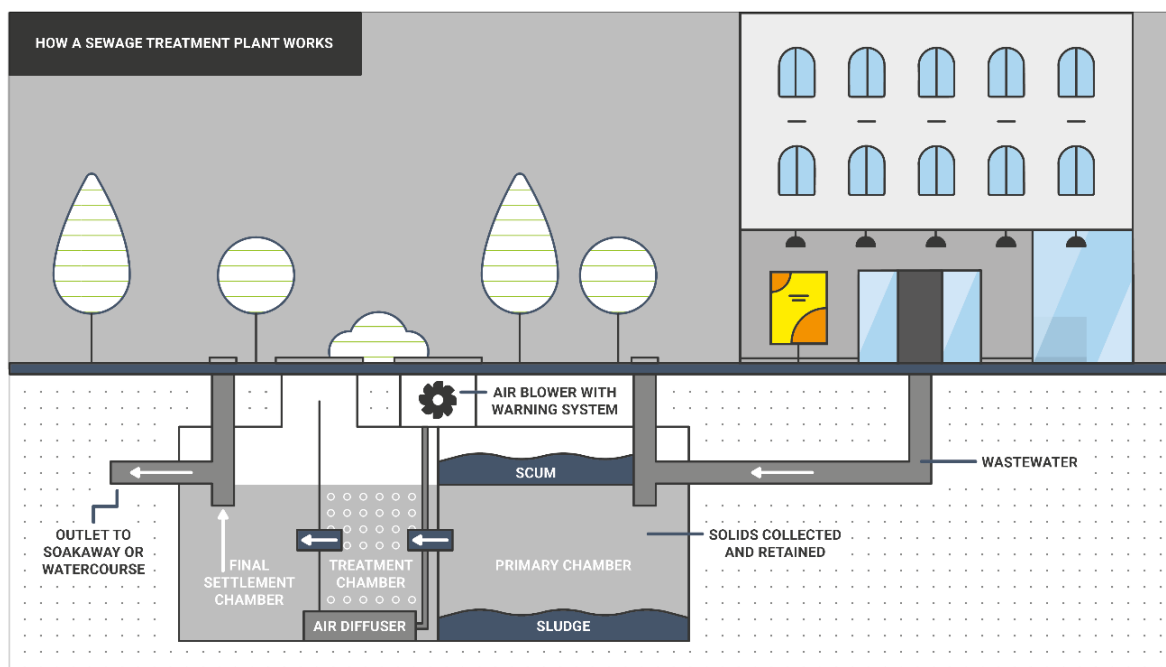


Figure SS-01.1 Sewage treatment plant for a typical building

For buildings with operational spaces dedicated to food preparation, there must be provision for separate discharge for liquid waste before it enters the wastewater disposal system. Generation of high level of liquid waste that is mixed with Fats, Oil, and Grease (FOG) is expected from establishments such as restaurants and hotels, with a higher frequency and volume of liquid waste generation than other commercial buildings. This can result in potential issues including odors, blockage of sewers, and restricted wastewater flow. To prevent such issues from occurring, grease traps should be installed for buildings with high liquid waste generation from food preparations

Grease traps are designed to intercept greasy waste before it enters the wastewater disposal system. When the outflow from the kitchen sink enters the grease trap, the solid food particles sink to the bottom, while lighter grease and oil float to the top, owing to its light density. The relatively grease-free water is then fed into the normal septic system. The food solids at the bottom and floating oil and grease must be periodically removed in a manner similar to septic tank pumping.

Figure SS-01.2 illustrates how a grease trap works.

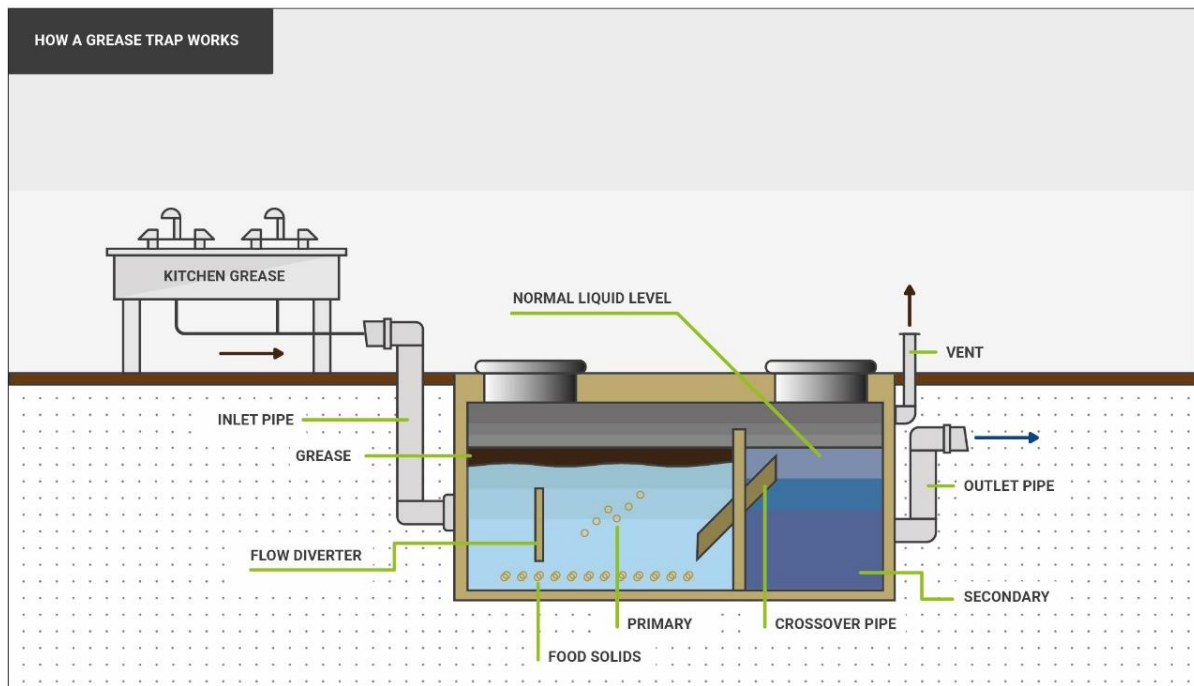


Figure SS-01.2 How a grease trap works

Sizing of grease traps:

Sizing of grease traps depends on several factors such as type of facility, wastewater flow, and hours of operation. Refer to Chapter 8, “Onsite Wastewater Treatment and Disposal Systems Design Manual” – U.S Environmental Protection Agency for guidance on appropriate sizing of grease traps.

Flood Hazard Area:

A legally designated flood hazard area is one that is subject to a 1% or more chance of flooding in any given year. Flood hazard areas are designated in the Flood Insurance Rate Maps (FIRMS) established by the General Directorate of Civil Defense flood mitigation program.

Rainwater Runoff:

Rainwater runoff occurs when water overflows the ground and roof water storage basins due to excess stormwater or any other source of rainwater flow. Rainwater runoff can cause flooding and dispersion of pollutants outside the property boundary and vicinity. Almost all roads, parking lots, rooftops and paved surfaces are impermeable surfaces that do not allow water to soak into the ground.

Rainwater runoff can be minimized by:

- Increasing the pervious surface area on site to promote infiltration. Pervious surfaces include open grid paving systems and open graded aggregate systems.
- Capturing excess water from rain and irrigation into retention basins, rain barrels or underground cisterns.

Rainwater Management:

Rainwater management is the overall set of procedures that reduce runoff. It includes detaining, retaining, and/or providing a discharge point for rainwater to be reused or infiltrated into the groundwater. When designing a rainwater management system, it is important to assess the surrounding environment to ensure there is no contamination, should water be discharged into any adjoining water bodies or preserved ecological assets in vicinity.

Rainwater Management Plan:

Where applicable, the Rainwater Management Plan must include:

- Geotechnical study addressing flood risk or equivalent document from a governing authority.
- Details of the municipal drainage network.
- Softscape and hardscape plans.
- Rainwater drainage system specifications.
- Rainwater treatment and reuse plan.
- Storage tank specifications.
- Water body/course pollution prevention measures.
- Specific instructions that coal tar sealants are not to be used on any surfaces that will be exposed to rainwater.
- Calculations demonstrating the site's capacity to retain the volume of a single storm equivalent to the 95th percentile rainfall event as recorded by the Saudi National Climatic Data Center.
- Where rainwater redirection has been adopted: strategy for maintaining and ensuring that post-construction runoff rate, volume and duration does not exceed pre-development rates. This rainwater management option requires a design strategy based on a hydrologic analysis of the site.

Calculating the site's capacity to retain rainwater:

According to Environmental Protection Agency (EPA), the 95th percentile of rainfall events is the measured precipitation depth accumulated over a 24-hour period for the period of record that ranks as the 95th percentile rainfall depth based on the range of all daily event occurrences during the period. This can be calculated using historical rainfall data from the Saudi National Climatic Data Center.

Expected runoff for the 95th percentile storm from roof and exterior hardscape can be calculated using the formula:

$$\text{Runoff} = \text{Rainfall} - \text{Depression Storage} - \text{Infiltration}$$

Depression storage is calculated using the following:

$$F_t = f_{min} + (f_{max} - f_{min})e^{-kt}$$

Where,

F_t = Infiltration rate at time t (mm/hr)

f_{min} = Minimum or saturated infiltration rate (mm/hr)

f_{max} = Maximum or initial infiltration rate (mm/hr)

k = Infiltration rate decay factor (1/hr.)

t = Time (hr.) measured from time runoff first discharged into infiltration area

Infiltration rate is the velocity at which water enters the soil. Sandy soil will allow for rapid water infiltration. Once rainwater runoff has been defined, the area of retention can be calculated to verify that the rainwater management procedures are appropriate for the estimated runoff.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 403 Stormwater Management.
2. Saudi Building Code (SBC) 1001 Green Buildings, Section 408.2.4 Pervious Pavement and Permeable Unit Pavement.
3. General Directorate of Civil Defense (Flood Insurance Rate Maps).
4. Saudi National Climatic Data Center.
5. Victorian Stormwater Committee (1999), Urban Stormwater: Best-practice Environmental Management Guidelines.

SS-02 Ecological Assessment and Protection

Credit Requirements	Keystone	Points Allocated
Requirement #1 & #2	Yes	1

Aim

To ensure that existing ecological conditions and assets associated with the site are identified and protected.

Requirements

#	Requirement	Points Available
1	An Ecological Assessment is undertaken by a qualified Environmental Professional prior to the start of the design phase and site clearance to identify: - Valuable natural assets located onsite, including any assets located off-site that may be affected by the development. - Potential ecological impacts of the development. - Opportunities for site enhancement. Protection and mitigation measures for the identified valuable natural assets.	1
2	An Ecological Protection Plan is developed prior to the start of the construction phase by a qualified Environmental Professional and is implemented by the Contractor.	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	1	1	1	1	1	-	1
Core & Shell	1	1	1	1	1	-	1
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	• Ecological Assessment Report including narratives, maps and date-stamped site photographs as listed in the Supporting Guidance. • CV of the appointed qualified Environmental Professional.
2	• Ecological Protection Plan that includes proposed protection and mitigation measures, the identification of the area(s) that need to be protected, and the number of assets that will be compensated due to unavoidable damage. • Development map that includes GPS coordinate points for all valuable natural assets that are to be protected on site, including setback zones. • Specification extracts for all ecological protection, mitigation and compensation requirements. • CV of the appointed qualified Environmental Professional, if different to the professional who completed the Ecological Assessment Report.

Construction Stage Evidence

#	Evidence per Requirement
1	• No evidence required at the construction stage.
2	• Updated Ecological Protection Plan, including evidence of the implemented protection and mitigation measures, calculations demonstrating the area(s) protected, the number of assets compensated, and date-stamped site photographs of successfully protected assets. • CV of the appointed qualified Environmental Professional, if different to the professional who completed the design stage submission. • Updated development map that includes GPS coordinate points for all valuable natural assets protected on site, including setback zones.

Supporting Guidance

Ecological Assessment Report:

The Ecological Assessment is to be based on a field survey and a desktop study using historical data and previous literature studies to establish the existing baseline conditions of the project site and its surrounding area. The report must cover, at a minimum, the following:

- Review of the project site against Environmental Protection Standards and relevant jurisdiction requirements with all related communication and approvals included.
- Ecological and environmental components likely to be affected, including:
 - Flora, fauna and habitats,
 - Topography, geology, soils and hydrology,
 - Marine and coastal conditions,
 - Waste and contamination,
 - Microclimate, noise and air quality,
 - Archaeological and cultural heritage features.

- Identification of natural ecological assets.
- Date-stamped site photographs and development map that includes GPS coordinate points of all valuable natural assets identified on site, including setback zones.
- Potential impacts and level of disturbance the development poses on the project site.
- Protection and mitigation measures that include the identification of the area(s) to be protected and the number of assets to be compensated, refer to the guidance provided under Ecological Protection Plan.
- Opportunities for site enhancement.
- List of all historical data and studies reviewed and a list of any expected or ongoing environmental studies and/or surveys to be conducted on the site.

Ecological Protection Plan:

The Ecological Protection Plan must be based on the findings of the Ecological Assessment Report and any other environmental study and/or survey (e.g. geotechnical survey or contaminated land assessment) completed after submission of the Ecological Assessment Report, or during the construction phase that directly impacts the ecological conditions of the site. The Ecological Protection Plan is to cover, at a minimum, the following:

- Updated list of all environmental studies and surveys reviewed.
- Protection strategy that details the measures to protect the valuable natural assets on site as identified in the Ecological Assessment Report. Should unavoidable removal or damage of the valuable natural asset(s) occur, as verified by the relevant jurisdiction, the appropriate mitigation and/or compensation strategy is to be developed and implemented:
 - Mitigation strategy that details the measures to mitigate against any damage to, or destruction of, the valuable natural assets.
 - Compensation strategy for any healthy native trees or shrubs identified as valuable natural assets, which should be compensated for at a replacement ratio of 2:1.
- Date-stamped site photographs and an updated development map that includes GPS coordinate points of all valuable natural assets protected on site, including setback zones.
- Calculations that demonstrate the total site area that has been protected, mitigated and/or compensated.
- All applicable communication and approvals from the relevant jurisdiction.

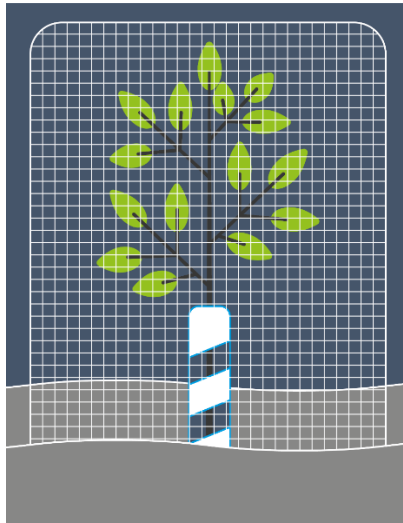


Figure SS-02.1 Example of fence protection for trees

Valuable Natural Assets:

The following are considered to be valuable natural assets:

- Land possessing natural value important to the community as designated by the relevant jurisdiction or KSA municipal government, which includes but is not limited to wildlife habitats, forests or other significant vegetation, steep slopes, ground water recharge areas, riparian corridors or wetlands.
- A species noted to be protected, critically endangered, endangered, and vulnerable or near threatened by the International Union for Conservation of Nature (IUCN) or any national KSA list of threatened species.
- An ecological or cultural heritage asset, including healthy native trees or shrubs.

Setback Requirements:

Setback requirements need to be established for any ecological asset found onsite or in the surrounding area that may be impacted by the development. These requirements must be determined by the suitably qualified Environmental Professional in consultation with the relevant jurisdiction. In the event that setback guidelines are not established for a specific habitat, the development should adhere to the following:

- Setback is at least 100 meters from wildlife habitats,
- Setback is at least 30 meters from watercourses,
- Setback from protected trees is either at the outer edge of the branch spread or half the height of the tree, whichever is greater.

The setback requirements must be implemented by the construction team throughout the duration of construction activities. It can be useful to incorporate setback requirements in the mobilization layout to prevent damaging or contaminating any identified ecological asset.

Environmental Studies and Surveys:

Environmental studies and/or surveys used to establish the existing baseline conditions of the project site and surrounding area should include, but are not limited to, the following:

- Marine ecology survey
- Terrestrial ecology survey
- Geotechnical study
- Geophysical survey
- Topography survey
- Flood risk assessment
- Bathymetry survey
- Water quality testing
- Contaminated land assessment
- Air quality testing
- Noise survey
- Archaeological survey

Environmental Professional:

A suitably qualified Environmental Professional is an individual who is registered with the General Authority of Meteorology & Environmental Protection and has achieved the following:

- An environmental degree or equivalent qualification in ecology.
- A minimum of three years of relevant experience in carrying out habitat surveys as well as acting in an advisory role providing recommendations for ecological protection, enhancement and mitigation measures.

The Environmental Professional does not need to be an independent third party and may be a part of the Design Consultant's team.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, section 402 Preservation of Natural Resources.
2. Saudi Building Code (SBC) 1001 Green Buildings, section 405.2.1 Vegetation and Soil Protection Plan.
3. General Authority of Meteorology & Environmental Protection: General Environmental Regulations and Rules for Implementation.
4. TCIA/ANSI A300 Tree Protection Zones (TPZ).
5. International Union for Conservation of Nature, IUCN, www.iucn.org.

SS-03 Construction Environmental Management

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To reduce the adverse environmental and social impacts of construction activities by implementing environmental management best practices.

Requirements

#	Requirement	Points Available
1	Develop and implement a Construction Environmental Management Plan (CEMP) to address the environmental and social impacts of construction activities. The CEMP must be developed in accordance with the regulations of the General Authority of Meteorology & Environment Protection and must be evaluated and approved by a qualified Environmental Professional.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	3	2	-	2
Core & Shell	2	2	2	3	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	2	2	2	3	2	2	2

*Requirement #1 awards 3 points to Warehouse typology at all scopes of development except fit-out.

Design Stage Evidence

#	Evidence per Requirement
1	- Extract from project tender specifications confirming that a CEMP will be produced by the Contractor prior to the start of construction activities on site. - CV of qualified Environmental Professional.

Construction Stage Evidence

#	Evidence per Requirement
1	• CEMP developed in accordance with the General Authority of Meteorology & Environment Protection's regulations. Refer to Supporting Guidance for additional information. • Site audit report provided by the contractor which includes photographic evidence verifying compliance with the CEMP.

Supporting Guidance

Construction Environmental Management Plan:

The CEMP must include the following as a minimum:

- a) Comprehensive Environmental Impact Assessment (EIA)
 - The EIA should address the impact of the project on air quality, soil, topography, surface and ground water, land environment (flora/fauna), marine and coastal environment and land-use purpose.
 - The EIA should build upon the Ecological Assessment Report and Ecological Protection Plan created for credit **SS-02 Ecological Assessment and Protection** and include an assessment of any significant impacts not covered by these documents and the associated mitigation measures.
- b) Construction dust control plan
 - Perform onsite measurement of particulate matter (PM) in the air during peak construction activity.
 - Particulate matter limits must follow National Ambient Air Quality Standards (NAAQS) from the Environmental Protection Agency.
 - Isolate dust-producing activities.
- c) Construction noise pollution monitoring plan
 - Conduct planned monitoring of noise levels at a 15-meter buffer from construction activity.
 - Noise limits should follow Commonwealth of Massachusetts Section 721.560 Construction Noise Control guidelines.
- d) Construction waste management plan
 - Refer to credit **MW-02 Construction Waste Management**.
 - Implementation of proper hazardous waste handling measures based on technical specifications.
 - Controlled onsite storage and segregation of hazardous waste from non-hazardous waste.
 - An approved waste hauler is retained for transporting waste from the project site to relevant facility.
- e) Energy and water consumption reduction plan
 - Energy conservation – implement at least two of the following conservation strategies:
 - Use of certified energy efficient generators, fuel-efficient transportation methods, renewable energy sources, and/or automated lighting controls.

- Workers living within a 25km radius of the construction site and/or coordination of transportation requirements.
 - Controlled operation of temporary air-conditioning systems.
 - Monitoring and record-keeping of energy usage against a pre-determined baseline, and implementation of mitigation measures if consumption levels exceed expected range.
 - Water conservation – implement at least two of the following conservation strategies:
 - Use of water efficient fixtures.
 - Create a water conservation strategy which minimizes wastage of water through user negligence, inefficient operations and/or leakages.
 - Use of non-potable water for construction processes e.g. secondary treatment and recycling of greywater or blackwater for irrigation, dust control, and flushing.
 - Limit access of water-using equipment to trained users only.
 - Monitoring and record-keeping of water consumption against a pre-determined baseline, and implementation of mitigation measures if consumption levels exceed expected range.
- f) Site Audit Plan
- Audits should be conducted regularly, the frequency of which should be determined by the contractor based on the total length of construction time and the duration of specific activities that might require more supervision.
 - A report is to be produced following each site audit. The site audit report must include:
 - Date-stamped photographs
 - An update on all priority CEMP plans: dust control, noise control, non-hazardous and hazardous waste management, and energy and water conservation
 - Responses to observed deviations from the CEMP with mitigation and remediation measures
 - Verification that all mitigation and remediation measures have been implemented
- g) Construction materials' transportation and procurement plan
- Use of materials that are extracted, processed and/or manufactured within the Gulf Cooperation Council (GCC) area.

Environmental Professional:

A suitably qualified Environmental Professional is an individual who is registered with the General Authority of Meteorology & Environmental Protection and has achieved the following:

- An environmental degree or equivalent qualification/certification in sustainable construction.
- A minimum of three years of relevant experience in implementing sustainable construction practices as well as acting in an advisory role providing recommendations for best practices in construction and mitigation measures.

The Environmental Professional does not need to be an independent third party and may be a part of the Design Consultant's team.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, section 502 Construction Material Management.
2. General Environmental Regulations and Rules for Implementation: The General Authority of Meteorology and Environmental Protection, 15 October 2001.
3. Commonwealth of Massachusetts Section 721.560 Construction Noise Control.
4. Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS).

SS-04 Ecological Enhancement

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To ensure that the ecological value of the site is preserved and enhanced.

Requirements

#	Requirement	Points Available
1	An Ecological Management Strategy is created by a qualified Environmental Professional to ensure the survival and enhancement of the natural landscape, and includes plans for: • Soil enhancement and protection from erosion, pollution or increase in salinity. • Low demand for resources by ensuring a minimum of 80% of newly planted species are classified as native, drought tolerant or saline tolerant. • Low maintenance requirements due to a reduced demand for fertilizers and pesticides. • Protection of natural assets as identified in SS-02 Ecological Assessment and Protection through the creation of adequate habitat areas. • Water efficient irrigation strategy developed in line with W-02 Outdoor Water Performance.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell*	2	2	2	2	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	1	1	1	1

*Requirement #1 awards 2 points to all building typologies at Core and Shell scope.

Design Stage Evidence

#	Evidence per Requirement
1	- Ecological Enhancement Report written by a qualified Environmental Professional that includes: - A narrative outlining the enhancement strategies that will be adopted for the entire site area. - Planting schedule and calculations that verify 80% of the total number of species planted are classified as native, drought tolerant or saline tolerant. - Landscape drawings showing the layout and location of habitat areas and the distribution of plant species. - Irrigation strategy and landscape maintenance procedures in line with W-02 Outdoor Water Performance.

Construction Stage Evidence

#	Evidence per Requirement
1	- Updated Ecological Enhancement Report that includes: - Updated narrative outlining the enhancement strategies implemented. - Date-stamped photographs of the site demonstrating the species planted. - As-built drawings that illustrate the location and layout of the habitat areas and planted species, with calculations that verify 80% of the total number of species are classified as native, drought tolerant or saline tolerant. - As-built drawings and specifications of the water efficient irrigation system and equipment. - Letter of Commitment or confirmation that: - A qualified entity/organization has been appointed to maintain the landscape in line with the enhancement strategy. OR - Maintenance will be undertaken by the local municipality.

Supporting Guidance

Calculations and Methodology:

- Plant habitat layout and design must be influenced by the assessment undertaken for credit **SS-02 Ecological Assessment and Protection**.
- Calculations for landscaped species must also include vegetative roof covering and/or shading if implemented under credit **SS-05 Heat Island Effect**.
- All entities and organizations appointed to maintain the landscape must undertake regular soil testing to:
 - Determine nutrient and salinity levels and their proper management.
 - Determine water retention capacity.
 - Promote low fertilizer requirements through good composting methods.

- d) Species with similar soil and irrigation requirements, and climatic conditions must be planted together.
- e) Maintenance duties carried out by qualified professionals must include the generation, survival and protection of all landscape and habitat areas considering the species type, soil type and irrigation requirements.
- f) All invasive species must be removed regularly.

Selection of Native Species:

- a) Native species can include but are not limited to those species identified by any of the following:
 - Approved city, province or regional lists.
 - Saudi Standards, Metrology and Quality Organization (SASO).
 - Classified as locally occurring or the origin is noted as from the region (as per documents listed under Reference Documents).
- b) No species classified as invasive and/or toxic shall be included in the planting palette. Selected plant species should be reviewed against the Saudi Building Code 1001 classification and all documents listed in the Reference Documents section.

Drought Tolerant and Saline Tolerant:

- a) Drought tolerant and saline tolerant species are those species with a proven track record of surviving in drought and saline conditions of a similar environment. The general classifications are as follows:
 - Drought tolerant: The ability of a plant to endure long periods of dry weather or lack of moisture.
 - Saline tolerant: The ability of a plant to withstand moderate or high concentrations of salt.
- b) Documented proof must be provided from a reliable source.

Planting Schedule:

A planting schedule should be provided that covers all landscaped areas within the development and includes the following information as a minimum:

- Common and botanical plant names.
- Code reference that corresponds to the landscape drawings.
- Classification: native, drought tolerant, saline tolerant or N/A if not applicable.
- Irrigation demand.
- Trees and palms: overall height, minimum caliper, spread, quantity and remarks.
- Shrubs, groundcovers, succulents and grasses: spread, overall height, spacing, quantity and remarks.

Irrigation Strategy:

An irrigation strategy is to be provided with the intent to reduce the overall irrigation demand of the site and includes the following as a minimum:

- Specification of a water efficient irrigation system such as drip irrigation or a sub-surface system. Spray irrigation is not permitted.

- Specification of water efficient technology such as soil moisture sensors, rain sensors and controllers as applicable to the development.
- Landscape and irrigation maintenance procedures to ensure water efficiency is achieved during operation.

Environmental Professional:

A suitably qualified Environmental Professional is an individual who is registered with the General Authority of Meteorology & Environmental Protection and has achieved the following:

- An environmental degree or equivalent qualification in ecology.
- A minimum of three years of relevant experience in carrying out habitat surveys as well as acting in an advisory role providing recommendations for ecological protection, enhancement and mitigation measures.

The Environmental Professional does not need to be an independent third party and may be a part of the Design Consultant's team.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 2 Definitions.
2. Saudi Building Code (SBC) 1001 Green Buildings, Section 404 Landscape Irrigation and Outdoor Fountains.
3. Saudi Standards, Metrology and Quality Organization (SASO).
4. Reports and publications published by the Saudi Wildlife Authority (SWA).
5. Landscape Plants for Arriyadh Region: A Reference Guide, 2014, High Commission for the Development of Arriyadh.

SS-05 Heat Island Effect

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To improve the microclimate of newly developed areas through appropriate material selection.

Requirements

#	Requirement	Points Available
1	The three-year aged Solar Reflective Index (SRI) values of the hardscape, shade structures and roofs meet the following: - Hardscape: 90% of the hardscape covering has an SRI $\geq$ 45. - Shade structures: 100% of the shade structures have an SRI $\geq$ 75. - Roofs: 100% of the roof covering has an SRI $\geq$ 75.	1
2	The unused roof area and/or structures used for shading have a vegetative covering over a minimum of 70% of their surface area.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	- Drawings illustrating all the areas of compliant and non-compliant hardscape, shade structures and roofs. - Calculations in tabular format showing that the requirements are met. - Extracts from specifications indicating the required SRI values.
2	Drawings illustrating the areas of roof and shade structures that will have a vegetative covering and the associated irrigation system.

	• Calculations in tabular format showing that the requirements are met. • List of selected plant types and their water requirements.
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Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings illustrating all the areas of compliant and non-compliant hardscape, shade structures and roofs. • Calculations in tabular format showing that the requirements are met. • Purchase orders and product data sheets showing the SRIs for the materials used. • Date-stamped photographs of the installed hardscape, shade structures and roofs.
2	• As-built drawings illustrating the areas of roof and shade structures that have a vegetative covering and the associated irrigation system. • Calculations in tabular format showing that the requirements are met. • Date-stamped photographs of the installed vegetative covering.

Supporting Guidance

- a) Manufacturers' data sheets must confirm that the SRI values of materials have been determined using ASTM E1980 at an authorized testing facility independent of the manufacturer.
- b) Hardscape areas include paths, walkways, parking, play and amenity areas.
 - Areas of pervious, permeable or concrete (without added color) hardscape automatically comply with the credit requirement.
 - Parking areas that are shaded (where the shading meets the required SRI values) also comply with the credit requirement.
- c) The areas of the roof used for services, access and/or renewable energy sources are excluded from the requirements and calculations.

Solar Reflective Index (SRI):

- a) The SRI of a material demonstrates the material's ability to stay cool in the sun as it absorbs less heat and reflects more sunlight. The higher the SRI, the better the material is at staying cool in the sun.
- b) The three year-aged SRI is typically lower than the initial SRI as it accounts for weathering and soiling which reduces the material's ability to stay cool in the sun. As much of the weathering and soiling occurs within the first three years, the aged value is a more accurate measure of the material's ability to stay cool in the sun.
- c) The three year-aged SRI is found in the Product Data Sheet that can be obtained from the manufacturer. If this information is not available, the material can be tested at an independent laboratory in accordance with the requirements of ASTM E1980.

Table SS-05.1 Sample of a section of product data sheet for roofing tiles

Material type	Initial SRI	Three year-aged SRI
Roofing Tile- White	93	87
Roofing Tile- Yellow	73	65

Based on the above table, the white roofing tile would contribute towards this credit. However, the yellow roofing would not.

Vegetative Roof Covering:

- a) Plant species should be native where possible and must be drought tolerant. Refer to credit **SS-04 Ecological Enhancement** for guidance.
- b) The selected plant species must be capable of being sustained throughout the year by providing adequate irrigation and a safe means of access to the roof structure for maintenance including the transportation of plant-care equipment.
- c) The plantation of vegetation must be in accordance with the manufacturer's recommendations for the roof covering in addition to the Saudi Fire Protection Code 801.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 201 Architectural, Section 6 Roof Assemblies and Rooftop Structures.
2. Saudi Building Code (SBC) 801 Fire Protection Requirements, Section 5C.4 Access to Building Openings and Roofs.
3. Saudi Building Code (SBC) 1001 Green Buildings, Section 408.3 Roof Surfaces.
4. ASTM E1980 – 11 Standard Practice for Calculating Solar Reflective Index of Horizontal and Low-Sloped Opaque Surfaces.

SS-06 Light Pollution

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To reduce the pollution impact of external lighting and reduce the light trespass from within the project boundary to the sky and surrounding developments.

Requirements

#	Requirement	Points Available																																																													
1	Uplight Rating The luminaire uplight rating must not exceed the values below for the relevant light pollution zone (refer to the Supporting Guidance). <table><tr><th rowspan="2"></th><th colspan="4">Light Pollution Zone (LPZ)</th></tr><tr><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>Maximum Luminaire Uplight Rating</td><td>U1 *</td><td>U2 *</td><td>U3 *</td><td>U4 *</td></tr></table> <i>*Maximum zonal lumens</i> Glare and Backlight Rating Where luminaires are mounted on buildings with their backlight oriented towards the building, such luminaires shall not exceed the following glare ratings: <table><tr><th rowspan="2">Horizontal Distance to Lighting Boundary (H_{LB})</th><th colspan="4">Light Pollution Zone (LPZ)</th></tr><tr><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td>$H_{LB} > 2h_m$</td><td>G1</td><td>G2</td><td>G3</td><td>G4</td></tr><tr><td>$h_m < H_{LB} < 2h_m$</td><td>G0</td><td>G1</td><td>G1</td><td>G2</td></tr><tr><td>$0.5h_m \leq H_{LB} \leq h_m$</td><td>G0</td><td>G0</td><td>G1</td><td>G1</td></tr><tr><td>$H_{LB} \leq 0.5h_m$</td><td>G0</td><td>G0</td><td>G0</td><td>G1</td></tr></table> <i>h_m = mounting height: the distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.</i> Other exterior luminaires shall not exceed the following backlight and glare ratings: <table><tr><th rowspan="2">Horizontal Distance to Lighting Boundary (H_{LB})</th><th colspan="4">Light Pollution Zone (LPZ)</th></tr><tr><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><td rowspan="2">$H_{LB} > 2h_m$</td><td>B3</td><td>B4</td><td>B5</td><td>B5</td></tr><tr><td>G1</td><td>G2</td><td>G3</td><td>G4</td></tr></table>		Light Pollution Zone (LPZ)				A	B	C	D	Maximum Luminaire Uplight Rating	U1 *	U2 *	U3 *	U4 *	Horizontal Distance to Lighting Boundary (H_{LB})	Light Pollution Zone (LPZ)				A	B	C	D	$H_{LB} > 2h_m$	G1	G2	G3	G4	$h_m < H_{LB} < 2h_m$	G0	G1	G1	G2	$0.5h_m \leq H_{LB} \leq h_m$	G0	G0	G1	G1	$H_{LB} \leq 0.5h_m$	G0	G0	G0	G1	Horizontal Distance to Lighting Boundary (H_{LB})	Light Pollution Zone (LPZ)				A	B	C	D	$H_{LB} > 2h_m$	B3	B4	B5	B5	G1	G2	G3	G4	1
			Light Pollution Zone (LPZ)																																																												
		A	B	C	D																																																										
	Maximum Luminaire Uplight Rating	U1 *	U2 *	U3 *	U4 *																																																										
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	G1	G2	G3	G4																																																											

	$h_m < H_{LB} < 2h_m$ $0.5 h_m \leq H_{LB} \leq h_m$ $H_{LB} \leq 0.5h_m$	B2 G1 B1 G1 B0 G1	B3 G2 B2 G2 B0 G2	B4 G3 B3 G3 B1 G3	B4 G4 B3 G4 B2 G4		
h_m = mounting height: the distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.							
	Total						1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell*	2	2	2	2	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope**	1	1	1	2	1	2	1

*Requirement #1 awards 2 points to all building typologies for Core and Shell scope.

**Requirement #1 awards 2 points to Warehouse & Mosque typologies.

Design Stage Evidence

#	Evidence per Requirement
1	- External lighting drawings and lighting schedule. - Specifications with requirements for luminaires highlighted. - Calculations demonstrating the maximum luminaire uplight ratings are not exceeded. - Confirmation that the relevant glare and backlight ratings are not exceeded.

Construction Stage Evidence

#	Evidence per Requirement
1	- As-built external lighting drawings and updated lighting schedule. - Copy of purchase orders/receipts for approved luminaires. - External lighting fixtures datasheet for installed lighting with lumens levels at different angles.

Supporting Guidance

Light Pollution and Light Trespass:

Light pollution is the presence of artificial light in the night environment. It is intensified by excessive, misdirected or obtrusive uses of light. Light pollution competes with starlight in the night sky, disrupts ecosystems and has adverse health effects on building occupants.

Light trespass occurs when direct beams of light from artificial sources are cast outside the project boundary and has a negative impact on the quality of life of occupants. For example, luminaires for external site-specific environments that are adjacent to roadways should not create any glare on the road and external lighting that is adjacent to parks should not spill into park areas and disturb the natural habitat.

A well-designed exterior lighting system fully considers the placement, direction and mounting height of luminaires. It also offers provisions for way-finding, safety and security without causing light pollution. A gradual change in lighting levels allows for people's eyes to adjust, therefore reducing direct glare from lamps. The use of shields and cut-off angles can be considered as part of the exterior lighting system to reduce misdirected light.

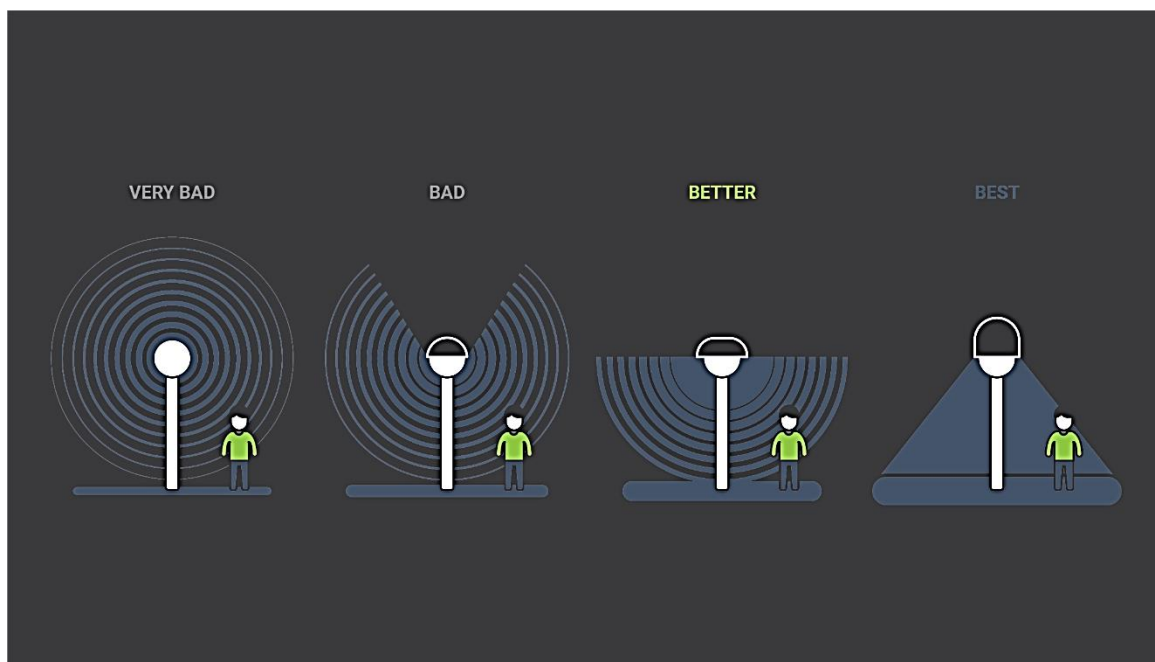


Figure SS-06.1 Impact of shields and cut-off angles

Uplight, Backlight and Glare:

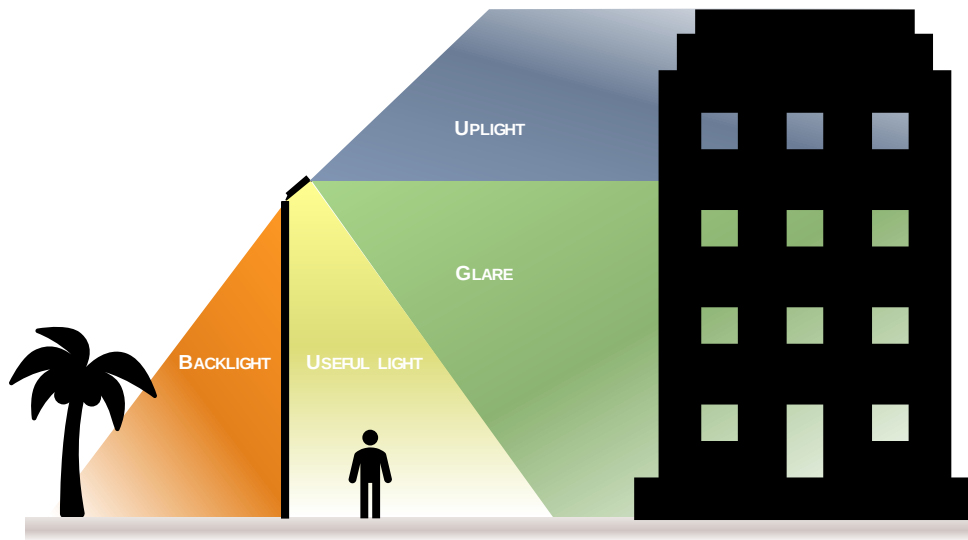


Figure SS-06.2 Uplight, glare and backlight

a) Uplight

- Uplight is either exterior lighting that is directed upwards to illuminate the building, landscape features, or unwanted light produced above a downward facing light source.
- The luminaire uplight rating is determined using the Illuminating Engineering Society (IES) TM-15-11 Addendum A- Standard for the Classification of Outdoor Luminaires.
- The rating shall be determined by the actual photometric geometry in the specified mounting orientation.
- For complex external lighting design solutions, a lighting calculation software may be required to demonstrate compliance.

b) Backlight and Glare

- Backlight is light that is not directed in a desired direction and can be a cause of light trespass.
- Glare is excessive brightness caused by the luminaire. Increasing the brightness of the luminaire does not always result in increased visibility and can cause visual discomfort.
- Backlight (B) and Glare (G) ratings are defined by IES TM-15-11 Addendum A.
- The rating shall be determined by the actual photometric geometry in the specified mounting orientation.
- Luminaires located two mounting heights or less from the lighting boundary shall be installed with backlight towards the nearest lighting boundary, unless lighting a roadway, bikeway or walkway that intersects a public roadway.
- Exterior lighting shall also comply with SBC 601, Section 9.4.3 Exterior Building Lighting Power.
- More information and guidance is available in the SBC 1001, Section 409.3 Light Trespass and Glare.

Mounting Height:

The mounting height is the distance above the finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire. For a given lighting boundary, the greater the mounting height, the more stringent the required glare and backlight ratings.

A luminaire with a mounting height of 5 meters is considered as an example in Fig SS-06.3. As the backlight and glare ratings indicate that this luminaire should be between one and two mounting heights from the lighting boundary, then the luminaire must be located between 5 to 10 meters from the nearest lighting boundary.

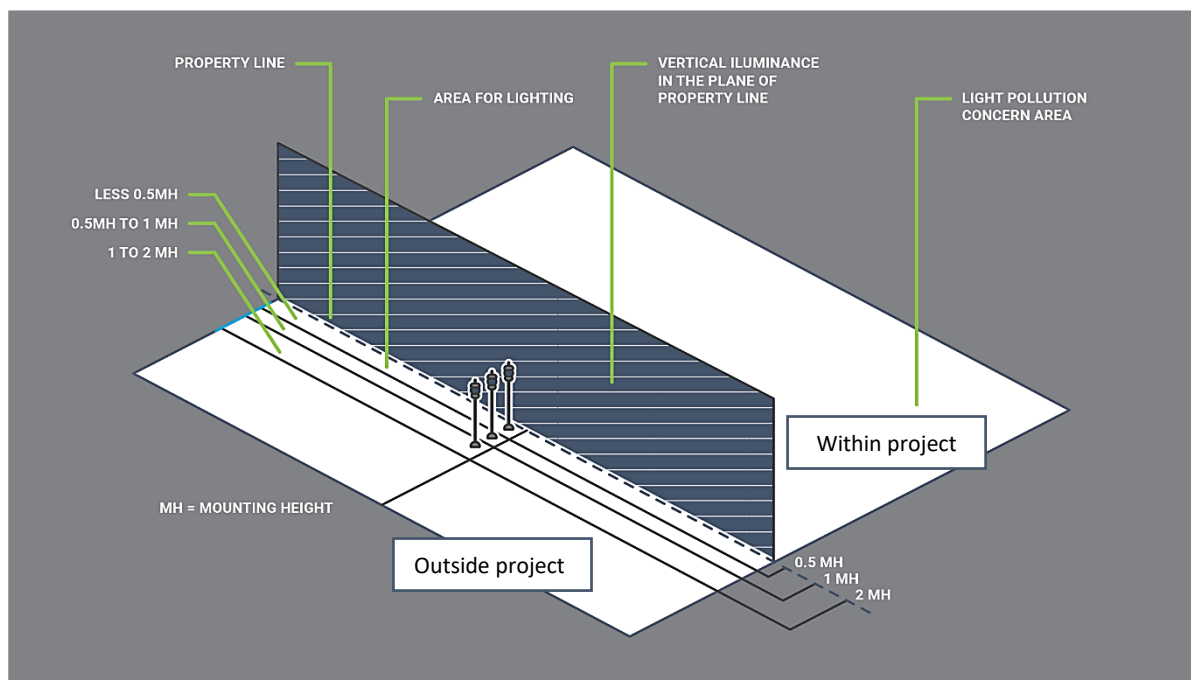


Figure SS-06.3 Mounting Height

Lighting Boundary:

- The lighting boundary is typically the property line.
- If the adjoining use is a pedestrian pathway, bikeway or parking facility, the lighting boundary is extended 1.524m beyond the property line.
- If the property is adjacent to a roadway or transit corridor, the lighting boundary is extended to the centerline of the roadway or transit corridor.
- In the figure below, the lighting boundary is defined by the orange line.

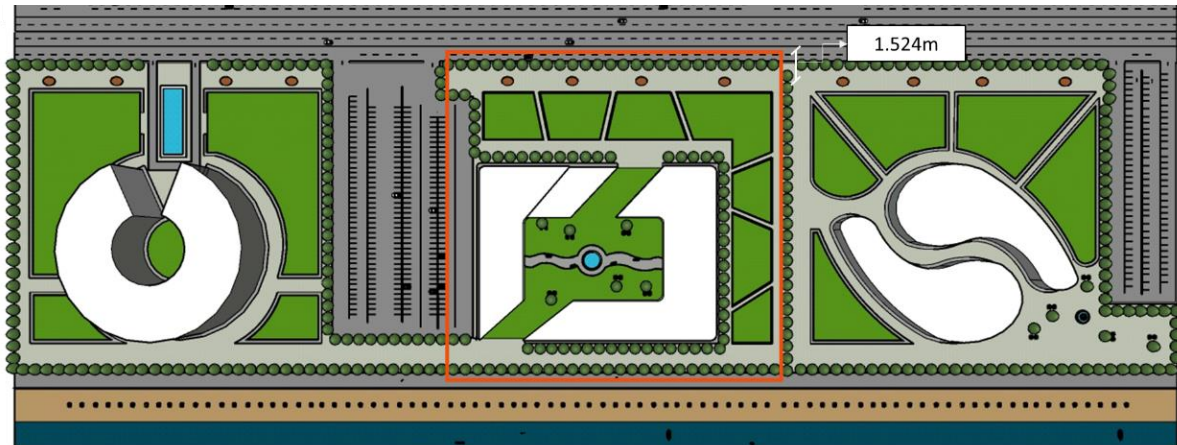


Figure SS-06.4 Lighting Boundary

Light Pollution Zones:

The light pollution zones (LPZ) are defined in Table SS-06.1.

Table SS-06.1 Light pollution zones

Light Pollution Zone	Description
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with limited nighttime activity and the developed areas within parks and open space preserves.
B	Light commercial business districts and high-density mixed-use residential districts and high-density or mixed-use residential districts, such as, but not limited to: neighborhood, business districts, light industrial areas with moderate night-time activity, multi-family residential uses, institutional residential uses, hospitals, hotels, motels, mosques, schools and neighborhood recreation facilities.
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high night time activity, high-use recreation facilities, gas stations, and other exterior retail areas with high night time activity.
D	Areas such as but, not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official.

Exemptions:

The following types of exterior lighting are exempt from the credit requirements:

- Specialized signal, directional and marker lighting associated with transportation.

- Lighting integral to equipment or instrumentation and installed by its manufacturer.
- Athletic playing fields where lighting is equipped with hoods or louvers for glare control.
- Temporary lighting (including security lighting linked to PIR controllers that operate for a short duration, e.g. when movement is detected).
- Roadway lighting required by the government.
- Lighting for swimming pools and water features.
- Lighting for the national flag (except pollution zone A).

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Table 409.2 and Table 409.3.
2. Saudi Building Code (SBC) 601 Energy Conservation, Section 9.4.3.
3. IES TM-15-11 Appendix A: Backlight, Uplight and Glare Ratings.
4. CIBSE CTT2 CIBSE Top Tips 2: Lighting in Buildings.
5. CIBSE LH18 SLL Lighting Handbook.

SS-07 Previously Developed Land

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To minimize use of naturally undisturbed land by locating new developments on land that has already been built upon, or has been in contact with human activities.

Requirements

#	Requirement	Points Available
1	A minimum of 75% of the development footprint is on land that has been previously developed or in contact with human activities.	1
2	A site investigation is undertaken by a Land Contamination Specialist. Where the site is deemed to be significantly contaminated, an appropriate remediation strategy will be implemented.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	4	2	-	2
Core & Shell	2	2	2	4	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	2	2	2	4	2	2	2

*Requirements # 1 & #2 award 2 points each to Warehouses typology at all applicable scopes of development.

Design Stage Evidence

#	Evidence per Requirement
1	- Narrative of the previous developments on the site. - Site plan highlighting the site boundary and areas of previously developed land. - Calculations to determine percentage of the site area that is on previously developed land, based on site plans. - Date-stamped photographs of the site including the previously developed land, if available.

2	• CV of the Land Contamination Specialist. • Site investigation and assessment report prepared by the Land Contamination Specialist. • Remediation strategy for the contaminated land prepared by the Land Contamination Specialist. • Site plans highlighting the contaminated areas to be remediated. • Letter of assurance from the contractor (or, if not yet appointed, from the client or their representative) confirming the remediation strategy will be implemented.
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Construction Stage Evidence

#	Evidence per Requirement
1	• Updated narrative to reflect the changes made to the previously developed land. • As-built drawings showing the proposed development in relation to the previously developed land. • Updated calculations to determine percentage of the site area that is on previously developed land, based on the site plans. • Date-stamped photographs of the site including the changes made to the previously developed land.
2	• As-built drawings highlighting the contaminated areas that have been remediated. • Verification report by the Land Contamination Specialist on completion of the land remediation.

Supporting Guidance

Previously Developed Land & Human Activities:

Land is classed as previously developed if it has been occupied by a permanent structure or has been in contact with human activities such as fixed surface infrastructure (e.g. hardscape, roads, trails or tracks), installation of utilities, and clearing of vegetation.

Reclaimed land cannot be considered under this credit requirement. Reclaimed land is land that was previously submerged under the sea and has been reclaimed in order to develop construction projects.

Development Footprint

The area within site plot limit that is impacted by urban development and associated activities such as, buildings, structures, hardscape, and non-building facilities.

Table SS-07.1 demonstrates an area calculation in compliance with the credit requirement:

Table SS-07.1 Area Calculation

Area Breakdown	Area
Building Footprint	5,000 m ²
Exterior hardscape & softscape	2,000 m ²
Exterior Surface parking	500 m ²

Substation	60 m ²
Total Area	7560 m²

Assuming the new development is located on previously developed land which is equal to an area of 6,000 m²

$$\% \text{ of development on previously developed land} = 100 \times \frac{\text{Area of previously developed land}}{\text{Area of new development footprint}}$$

Based on the above, the percentage of development located on previously developed land would be **79%** which meets the credit requirement.

Site Investigation for Contaminated Land:

To determine whether land is contaminated, a site investigation must be conducted in two phases in accordance with the American Society for Testing and Materials (ASTM). Contaminated land cannot be safely developed or built on due to the presence or possible presence of a hazardous substance, pollutant or contaminant. Remediation of the contamination must be conducted in order to initiate any development on the land.

Remediation of Contaminated Land:

Remediation is any activity undertaken to prevent, minimize, remediate or mitigate the risks caused by contaminated land to the environment or human health. The removal of surface contaminants, such as waste, is not sufficient on its own. Remediation requires the cleaning of retained onsite material, for example treatment of soil contaminated by hydrocarbon spills or chemical treatment of contaminated groundwater.

Based on the findings of the site investigation, an appropriate remediation strategy must be developed by the Land Contamination Specialist. This strategy must consider possible future contamination associated with the re-development of certain types of sites (e.g. schools and healthcare projects).

Land Contamination Specialist:

A Land Contamination Specialist is an individual who holds a degree or equivalent qualification in chemistry, environmental science or management, earth sciences, civil engineering or a related subject and has a minimum of three years of relevant experience in site investigation and risk assessment.

Credit Tool

N/A

Reference Documents

1. American Society for Testing and Materials (ASTM) E1527 – 13 Phase I Environmental Site Assessment Process.

2. American Society for Testing and Materials (ASTM) E1903 – 11 Phase II Environmental Site Assessment Process.
3. US Environmental Protection Agency (EPA), Report on the Environment - Contaminated Land, 2017 <https://www.epa.gov/report-environment/contaminated-land>
4. US Environmental Protection Agency (EPA), Technologies for Cleaning Up Contaminated Sites <https://www.epa.gov/remedytech>

Transportation and Connectivity

5 Transportation and Connectivity

Vision 2030 aims to enhance the provision of public transportation through upgraded infrastructure and reliable services, and incentivize the use of alternative means of transport. Furthermore, under Vision 2030, new urban planning schemes are to prioritize “people-centric cities”, providing an opportunity to plan and build cities in the vicinity of public transit that shall foster safe pedestrian connectivity as well as design working and playing spaces responding to citizens’ needs and desires.

Mostadam aligns with these objectives by rewarding projects that include facilities for alternative transport such as electric vehicles, bicycles etc. and demonstrate their sustained use. Developments that are located near existing or planned transit nodes can benefit from the investment in infrastructure across the country, and therefore positively influence the environment by minimizing emissions linked to private vehicular transportation. Transport and Connectivity category further complements the goals set by Vision 2030 and promotes healthy lifestyles through credits that benefit aspects of planning including the provision of bicycle facilities that would encourage physical activity through cycling, walking and other individual transportation.

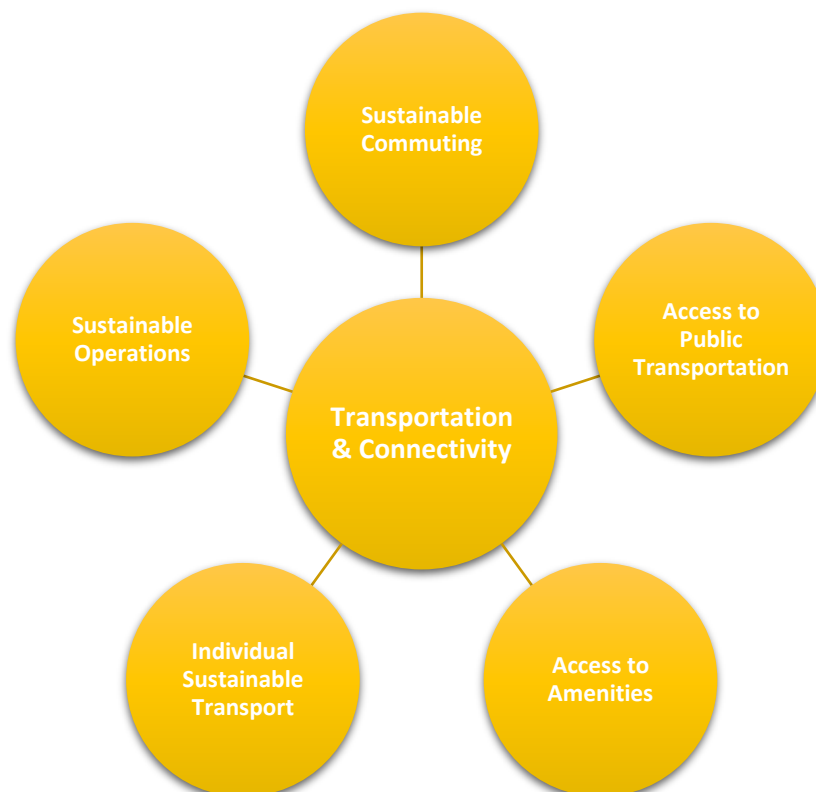


Figure 10 Transport and Connectivity credits

TC-01 Sustainable Commuting

Credit Requirements	Keystone	Points Allocated
Requirement# 1	No	1
Requirement# 2	No	1

Aim

To reduce air pollution by supporting electric-powered vehicles minimize burden on traffic networks through carpool initiatives.

Requirements

#	Requirement	Points Available
1	Option 1: Install Electric Vehicle Supply Equipment (EVSE) for at least 3% of the total parking spaces to be used by the project. The associated parking spaces must be fully shaded and reserved for the sole use of electric vehicles. OR Option 2: At least 6% of total parking spaces within the project boundary must be Electric Vehicle (EV) ready. The associated parking spaces must be co-located in favorable positions within the parking area. Obtain a written commitment from the Owner stating that when EVSE's are installed, the appropriate signage shall be provided to indicate that those spaces are reserved for the sole use of electric vehicles.	1
2	Implement a Carpooling Strategy for both males and females to encourage users to share private vehicles, in accordance with local KSA laws. AND 3% of the total parking spaces within the project boundary shall be reserved for the sole use of carpool vehicles. The associated parking spaces must be fully shaded.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out*	1	1	1	1	1	-	1
Full-Scope**	3	2	2	2	2	2	3

*Requirement #1 is not applicable to all building typologies at fit-out scope.

**Requirement #1 awards 2 points to Educational Institutions and Healthcare typologies at Full Scope.

Design Stage Evidence

#	Evidence per Requirement
1	Option 1: - Site plan and floor plans indicating total parking and identifying the location of each parking space reserved for electric vehicles and EVSE installed. - Calculations demonstrating that the minimum of 3% of required spaces is achieved. - Electrical drawings demonstrating location of charging stations, connection to distribution panel and dedicated electrical socket-outlets. Refer to Supporting Guidance for details. - Shading requirements for each reserved parking space. - Specifications for EVSE and shading devices. Option 2: - Site plan and floor plans indicating total parking and identifying the location of EV ready parking space. - Calculations demonstrating that the minimum of 6% of required spaces is achieved. - Shading requirements for each reserved parking space. - Specification for shading devices. - Electrical drawings demonstrating compliance with the requirements. - Written commitment from Owner stating that appropriate signage and floor markings to designate parking spaces for EV shall be provided upon the installation of EV equipment.
2	- Site plan and floor plans identifying the total parking and identifying the location of carpool parking spaces. - Calculations demonstrating that the minimum of 3% of parking space for carpool vehicles is achieved. - Shading requirements for each reserved parking space. - Specifications for shading devices. - Carpooling Strategy which includes written commitment from the Owner that this policy shall be enforced during operation stage, and state that appropriate signage and floor markings to designate parking spaces for carpool vehicles shall be provided. Refer to Supporting Guidance for inclusions of this Strategy.

Construction Stage Evidence

#	Evidence per Requirement
1	Option 1: • As-built drawings including site plan and floor plans indicating total parking and confirming the location of each parking space reserved for electric vehicles and EVSE installed, demonstrating that a minimum of 3% is achieved. • Calculations demonstrating that the minimum of 3% of required spaces is achieved. • As-built electrical drawings demonstrating location of charging stations, connection to distribution panel and dedicated electrical socket-outlets. • Shading requirements for each reserved parking space. • Date-stamped photographs demonstrating installation of EVSE, signage and floor markings. • Purchase receipts for the EVSEs and shading devices. Option 2: • As-built drawings including site plan and floor plans indicating total parking and confirming the location of EV ready parking space. • Updated calculations demonstrating that the minimum of 6% of required spaces is achieved, in case there is deviation from the design stage. • Updated shading requirements for each reserved parking space. • Specifications for shading devices. • As-built electrical drawings demonstrating compliance with the requirements. • Written commitment from Owner stating that appropriate signage and clear markings to designate parking spaces for EV shall be provided upon the installation of EV equipment. • Date-stamped photographs demonstrating compliance with the requirements. • Written commitment letter from Owner stating that appropriate signage and floor markings to designate parking spaces for EV shall be provided upon the installation of EV equipment.
2	• As-built drawings including site plan and floor plans identifying the total parking and indicating the location of carpool parking spaces. • Updated calculations demonstrating that the minimum of 3% of parking space for carpool vehicles is achieved. • Updated Carpooling Strategy which includes written commitment from the Owner that this policy shall be enforced during operation stage. Refer to Supporting Guidance for inclusions of this Strategy. • Updated shading requirements for each reserved parking space. • Date-stamped photographs confirming the signage and floor marking for designated parking spaces. • Purchase receipts for shading devices.

Supporting Guidance

- Calculations for parking requirements must be rounded upwards to the nearest whole number. If the project will rely on parking facilities outside the project boundary, these must be included in the calculations.
- All parking spaces reserved for electric vehicles and carpool vehicles must be clearly identified by appropriate signage and floor markings.
- Underground parking or parking within the building shall be considered as 'shaded'.
- All parking spaces reserved for electrical vehicles and carpool vehicles must be fully shaded. Refer to credit **SS-05 Heat Island Effect** for the minimum Solar Reflectance Index (SRI) of any shade awnings or canopies. The shaded area cast by trees should be based on their canopy size at a maximum of 5 years post-construction.
- Electric Vehicle Supply Equipment (EVSE) must:
 - Provide a Level 2 charging capacity (208 – 240 volts) or greater.
 - Comply with the relevant national code or international standard for electrical connectors (see Reference Documents).
- For a parking space to be considered as EV ready, the design must include all necessary components with the exception of the final ESVE. Components include wiring, raceway, panel capacity, receptacle and over protection devices. The endpoint of the system should be near the proposed EVSE location. The service panel and conduit endpoints must include permanent labelling stating EV ready.
- Parking spaces for EVSE and carpool vehicles must be available to all building users; occupants and visitors. These spaces should be located such that there is optimal access to the building, however, disabled parking spaces shall have precedence in building access.

Carpooling Strategy:

Carpooling is when at least two people share a private vehicle to reach the same destination, and should be encouraged in compliance with local laws. The use of ride sharing services by building occupants to commute to and from the same destinations can be considered as an alternative approach to carpooling. Carpool and rideshare programs help commuters share transportation and have several beneficial outcomes including reduces traffic congestion, emissions, help increase mobility and improve overall quality of life.

Owners must develop and implement a Carpooling Strategy and include the following at a minimum:

1. Narrative of current transportation situation including the availability of public transport, planned parking facilities and note trends in commuter patterns.
2. Name and contact details of the organizational team members responsible for implementation of the Strategy and management of a database of interested riders.
3. Provide a methodology, incorporating qualitative and quantitative measurable for the project for carpooling, rideshare initiatives or park-and-ride facilities.
4. Establish assessable objectives such as reducing individual commuting costs, peak period vehicle trips, expenses associated with road and parking facilities, and pollution emissions.

5. Continuous monitoring and review effectiveness of the scheme, assess achievements and identify where improvements can be made.
6. Record logs against these objectives on an annual basis.
7. Incentivize carpooling and rideshare participants with rewards including but not limited to preferential parking areas, flexible working hours and reduced parking fees.
8. Comparison with baseline, demonstrate improvement achieved by integration of carpooling.
9. Brief summary of communication to building occupants regarding results of the scheme and continually iterate upon the benefits of carpooling for occupants, buildings and the environment.

Credit Tool

N/A

Reference Documents

1. SASO GSO IEC 62196 Plugs, Socket-outlets, Vehicle Connectors and Vehicle Inlets - Conductive Charging of Electric Vehicles.
2. SAE Surface Vehicle Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler.
3. 2016 California Green Building Standards Code, Part 11 (5.106.5.3 Electric Vehicle (EV) Charging).
4. Siting and Design Guidelines for Electrical Vehicle Supply Equipment, US Department of Energy.
5. Ao, K., Hoffman, V., & Jolly, C. (2001). UBC Carpool Strategy: Recommended Incentive / Discount Program [R]. doi:<http://dx.doi.org/10.14288/1.0108184>.

TC-02 Access to Public Transportation

Credit Requirements	Keystone	Points Allocated
Requirement# 1	No	1
Requirement# 2	No	1

Aim

To promote transportation efficiency and active living by ensuring all building occupants and visitors can easily access public transportation.

Requirements

#	Requirement	Points Available
1	- A building entrance for pedestrians is located within 200 meters of safe walking distance from an existing bus stop OR an existing metro/commuter rail station. The minimum day-time frequency for both the bus service and the metro/commuter rail service enlisting specific timing of departure and arrival at waypoints along the route <u>must be at least</u> 30 minutes. - Future expansion to transit services may qualify if they are planned, funded, and expected to be operational within 3 years of building occupancy.	1
2	In addition to Requirement #1: The minimum day-time frequency for both the bus service and the metro/commuter rail service enlisting specific timing of departure and arrival at waypoints along the route is <u>more frequent</u> than 30 minutes.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	2	2	-	2
Core & Shell	2	2	2	2	2	-	2
Fit-Out*	2	3	2	2	2	-	3
Full-Scope*	2	3	2	2	2	-	3

*Requirement #2 Awards 2 points to Offices and Healthcare building typologies except for shell only and core and shell scopes.

Design Stage Evidence

#	Evidence per Requirement
1 & 2	• Site plan highlighting each building entrance for pedestrians, the location of the existing bus stop or metro/commuter rail station, and the actual safe walking distance from either, as applicable, in meters. • For bus services or metro/commuter rail stations, the most recent official schedule or timetable of service frequency for defined routes. For future expansion, official confirmation of planned date of full operation, funding and expected schedule of construction.

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	• As-built site plan confirming each building entrance for pedestrians, the location of the existing bus stop or metro/commuter rail station, and the actual safe walking distance from either, as applicable, in meters. • Date-stamped photographs of the pedestrian walkway or safe walking route to the bus stop or metro/commuter rail station as applicable. • For bus services or metro/commuter rail stations, the most recent official schedules of service frequency. For future expansions, official confirmation of planned date of full operation, funding, and expected schedule of construction, updated if necessary.

Supporting Guidance

- The safe walking distance is calculated from the building entrance designed for pedestrian entry and available to all building occupants and visitors, to the entrance of the bus stop or metro/commuter rail transit station. The building entrance does not include external pedestrian gates or building entrances through vehicle parking structures.
- For the walking distance to be classified as “safe”, it must be a route along a dedicated pedestrian walkway at least 1.8 meters wide with defined crosswalks e.g. traffic lights, stop signs or marked pedestrian walkways at intersections. For further information regarding safe walking distances, refer to credit **TC-03 Access to Amenities**- Supporting Guidance.
- For buses and metro/commuter rail services, the minimum day-time service frequency must be for one-way service between 5am and 10pm, on both weekdays and weekends.
- Transit routes must run in both directions.



Figure TC-02.1 Safe walking route

Credit Tool

N/A

Reference Documents

1. Development/Enhancement of Public Transport, The High Commission for the Development of Arriyadh.
2. Institute for Transportation & Development Policy (ITDP) TOD Standard.
3. EMBARQ TOD Guide for Urban Communities.

TC-03 Access to Amenities

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To promote vibrant communities, active living and transportation efficiency by coordinating easy access to neighborhood amenities.

Requirements

#	Requirement	Points Available
1	A pedestrian entrance is located within 350m safe walking distance from the following amenities: • A mosque • A grocery store Amenities planned for future expansion may qualify if they are already zoned, funded/leased, and expected to be operational within 3 years of building occupancy.	1
2	In addition to Requirement #1: The pedestrian entrance is located within 350m safe walking distance from 3 additional amenities. Refer to Supporting Guidance for details.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government*	Retail/ Restaurants	Warehouses	Hospitality**	Mosques	Healthcare
Shell Only	2	2	2	-	2	-	2
Core & Shell	2	2	2	-	2	-	2
Fit-Out	2	2	2	-	4	-	2
Full-Scope	2	3	2	-	4	-	2

*Requirement #2 awards 2 points to Offices and Hospitality typologies at full scope.

**Requirement #1 and 2 awards 2 points each to Hospitality typology at fit-out and full scopes only.

Design Stage Evidence

#	Evidence per Requirement
1 & 2	• Site plan identifying each building pedestrian entrance, the location of the applicable amenities and actual safe walking distance in meters. • For planned amenities, confirmation of zoning or Master Plan, documents demonstrating funding/lease, and planned date of full operation signed by the building owner or tenant.

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	• As-built site plan confirming each building pedestrian entrance, the location of applicable amenities and actual safe walking distance in meters. • Date-stamped photographs of each sidewalk along the shortest pedestrian route. • For planned amenities, zoning layout or Master Plan, documents demonstrating funding/lease, and planned date of operation signed by the building owner or tenant.

Supporting Guidance

- The safe walking distance is calculated from the building entrance designed for pedestrian entry and available to all building occupants and visitors, to the entrance of amenity. The building entrance does not include external pedestrian gates or building entrances through vehicle parking structures.
- For the walking distance to be classified as “safe”, it must be a route along a dedicated pedestrian walkway at least 1.8 meters wide with defined crosswalks e.g. traffic lights, stop signs or marked pedestrian walkways at intersections. Refer to Figure 03.1.
- Amenities available within the building premises qualify for this credit requirement. For example, a designated prayer room in the building must be able to accommodate 0.9 sq. m. of area per building occupant in order to meet the requirement.
- A grocery store must sell more than five types of fruits and vegetables in order to qualify as an amenity.
- Additional amenities include the following (only one of each type shall be counted):
 - Bank with ATM facility
 - Barber/ hairdresser
 - Café
 - Daycare
 - Government Service Centre
 - Gym or fitness center
 - Laundry
 - Public Library
 - Medical Clinic
 - Post Office
 - Pharmacy
 - Public Park or landscaped open space

- Restaurant
- School
- Other Retail facility
- Retail areas must be permanent facilities that are open to the public every day.

Safe Walking Routes:

The following are examples of routes that do not qualify as being safe:

- Pedestrians are using uncontrolled sandy paths to cross through the area and reach the amenity or transit stop.
- Pedestrians are using the side lane of a road to reach to amenity or transit stop.
- Pedestrians are using a 1.8m walkway but are required to cross a highway that does not have a proper pedestrian crossing.

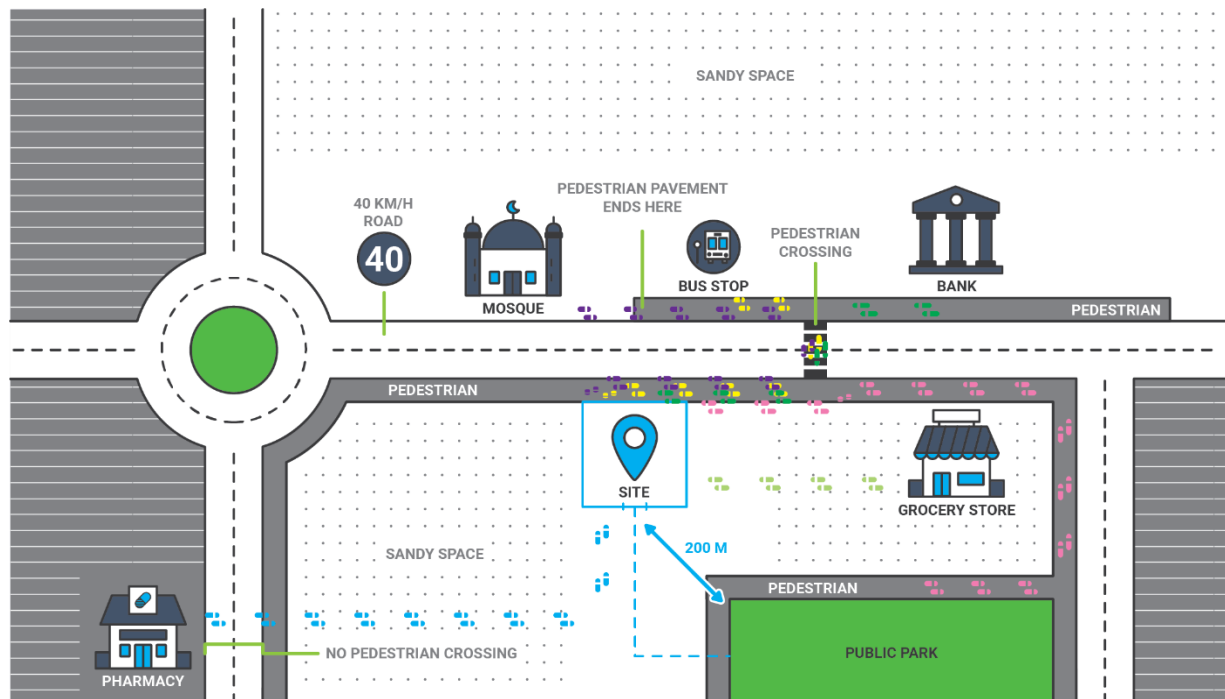


Figure TC-03.1 Safe walking routes

In Figure TC-03.1, the following routes are considered as safe walking routes:

- Pedestrians use the pavement to reach the public park and grocery store.
- Pedestrians use the pavement and pedestrian crosswalk to reach the bank.
- Pedestrians use the pavement and pedestrian crosswalk to reach the bus stop.

In Figure TC-03.1, the following routes are not considered as safe walking routes:

- The route to the pharmacy as there is no safe pedestrian crossing.

- The route to the mosque (even though there is a pedestrian crossing, there is no continuous pedestrian pavement and a user would have to walk along the side of the road).
- The route across the sandy space to the grocery store.

Credit Tool

N/A

Reference Documents

1. Ministry of Municipal and Rural Affairs (MOMRA), The Enhancement of Traffic Performance on Streets and Roads in the Kingdom of Saudi Arabia.
2. National Association of City Transportation Officials (NACTO), Urban Street Design Guide.
3. U.S. Environmental Protection Agency (EPA) Smart Growth Program.
4. Pedestrian and Bicycle Information Center, <https://ewwww.pedbikeinfo.org/>
5. Walkscore® Methodology, <https://www.walkscore.com/methodology.shtml>
6. Walkable Communities Inc., <https://www.walkable.org/>

TC-04 Individual Sustainable Transport

Credit Requirements	Keystone	Points Allocated
Requirement #1 & #2	No	1
Requirement #3	No	1

Aim

To promote active living and transportation choices by providing convenient parking for bicycles and other individual transportation modes.

Requirements

#	Requirement	Points Available
1	Long-term individual sustainable transport parking spaces For every 20 building occupants: - Install one permanent fully-shaded bicycle rack within 30 meters of a building entrance. - Reserve one parking space at a minimum, for other individual transportation modes. Short-term individual sustainable transport parking spaces In addition, for every 500m² of Gross Floor Area (GFA): - Install one permanent fully-shaded bicycle rack within 30 meters of the main building entrance. - Reserve one parking space at a minimum, for other individual transportation modes. Shading of bicycle racks must be compliant with minimum SRI requirements in accordance with credit SS-05 Heat Island Effect.	1
2	The building must be located within 180 meters actual bicycling distance of a bicycle network that connects directly to five amenities within 5,000 meters. Planned bicycle networks may qualify if they are fully planned, funded, and expected to be operational within 3 years of building occupancy.	
3	In addition to Requirements #1 and #2, provide the following at a favorable location on site. - One shower and changing room per gender for every 100 building occupants. - One clothes locker for each long-term individual sustainable transport parking space provided.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions*	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses**	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	3	2	-	2
Fit-Out	3	2	2	3	2	-	2
Full-Scope	2	2	2	3	2	2	2

*Requirement #3 awards 2 points to Educational Institutions at full scope.

**Requirement #3 awards 2 points to Warehouses typology at all applicable scopes.

Design Stage Evidence

#	Evidence per Requirement
1	- Calculations determining the required number of bicycle racks and parking space reserved for individual transportation modes. - Site plan identifying the building entrance, location of each permanent bicycle rack, the actual walking distances (in meters) from the bicycle racks to the nearest building entrance and the location of each reserved parking area. - Design drawings (plans and elevations) demonstrating the demarcation and dimensions of each parking space reserved for individual transportation modes. - Specification of shading for each bicycle parking rack and overall parking space, in compliance with minimum SRI requirements of SS-05 Heat Island Effect.
2	- Site plan identifying the location of each permanent bicycle rack, the location of the bicycle network, the location of applicable amenities and the actual bicycling distance (in meters) highlighted. - Official confirmation such as photographs of the existing bicycle network with a clearly marked bicycle lane at least 3 meters wide, or a street with a design speed of 40 km/h or less. - For planned bicycle networks, official confirmation of funding, expected construction schedule and planned date of full operation.
3	- Calculations determining the required number of showers and clothes lockers required. - Design drawings (plans and elevations) demonstrating the location of shower facilities and changing rooms, highlighting pedestrian access to these facilities from the bicycle racks and the walking distance from the bicycle racks to these facilities.

Construction Stage Evidence

#	Evidence per Requirement
1	Updated calculations determining the required number of bicycle racks and parking space reserved for individual transportation modes.

	- As-built site plan identifying the building entrance, location of each permanent bicycle rack, the actual walking distances (in meters) from the bicycle racks to the nearest building entrance and the location of each reserved parking area. - Shop drawings confirming the dimensions of each installed bicycle rack. - Purchase receipts of all shading devices installed in the bicycle parking space. - Date-stamped photographs of shaded bicycle racks and demarcation of reserved parking area.
2	- As-built site plan confirming the location of each permanent bicycle rack, location of the bicycle network, location of applicable amenities and actual bicycling distance (in meters). - Date-stamped photographs or other official confirmation that the bike network comprises a clearly marked bike lane at least 3 meters wide, or a street with a design speed of 40 km/h or less. - For planned bicycle networks, official confirmation of funding, expected construction schedule and planned date of full operation (updated as necessary).
3	- Updated calculations determining the required number of showers, changing rooms and clothes lockers. - Date-stamped photographs of shower facilities, changing areas and clothes lockers and access to these facilities from bicycle racks.

Supporting Guidance

- Long-term parking spaces are intended for building occupants who are expected to use the parking space for at least 4 hours per day, typically employees. Short-term parking spaces are intended for visitors who will use the parking space for less than 4 hours per day.
For school projects, building occupants considered are all staff employees and students from Grade 7 and above.
- Bicycle racks must have the following characteristics:
 - Each bicycle space must be at least 2m x 0.75m, with an aisle at least 1.5m wide (Alternative designs that comply with the Association of Pedestrian and Bicycle Professionals- APBP Bicycle Parking Guidelines are also accepted).
 - Stands must be permanently fixed and allow two points of contact, such that a single U-lock can capture both the bicycle frame and a wheel.
 - Stands in public racks should be constructed with tamper-resistant and weather-resistant materials, such as stainless steel or galvanized steel. Square tubing, rather than round tubing, should be used.
 - All bicycle racks must be fully shaded (refer to credit **SS-05 Heat Island Effect** for the minimum SRI requirements for the shading).
 - If the bicycle racks are not visible from both the street and the building, clear signage must be provided.
- Recommended bicycle rack designs include:
 - Inverted U (or Stable Loop), the Post & Ring, and the Wheelwell-Secure.
 - High- density racks applicable in constrained spaces: Staggered Wheelwell-Secure, Vertical, and Two-Tier.

- Bicycle rack designs that are not recommended include: Wave, Schoolyard, Coathanger, Wheelwell, Bollard, Spiral, and Swing Arm Secured configurations.
- Bicycle rack parking spaces available outside the project boundary, or specifically allocated for visiting tenants, shall not be accounted for in the calculations.
- Other individual transport modes include dock-less shared bicycles. These can include “power-assist” vehicles with regenerative braking and/or no hub motor.
- “Full-power” vehicles that use a hub motor and require an external fuel source, such as mopeds, motor bikes, motorcycles, neighborhood electric vehicles and golf carts, cannot be included.
- Parking areas demarcated for other individual transportation modes must equal in area designated as bicycle parking space (e.g. at least 2m x 0.75m, with an aisle at least 1.5m wide) and must be fully shaded.
- Parking areas demarcated for other individual transportation modes must be clearly reserved with the help of floor markings and signage, and must be fully shaded.
- Basic bicycle maintenance tools such as tire pump, hex keys and patch kits shall be provided in proximity to the bicycle racks.
- Actual bicycling distance is the route along a clearly marked bicycle lane at least 3 meters wide, or a street with a speed limit of 40 km/h or less.
- Amenities are defined in credit **TC-03 Access to Amenities**.
- Shower facilities and changing areas for each gender must be located adjacent to each other.
- Shower facilities must always be provided for both genders, unless it is demonstrated that the project will only be frequented by one gender, for example a single gender educational institution.

Calculating the number of bike racks required:

An example for a 9,000m² 10-storey office building project is provided below.

In order to identify the number of long term bicycle racks required, the following aspects need to be determined and identified:

- Office spaces in the building based on size and corresponding number of each.
- Calculate the number of building occupants based on the number of office spaces in each size.

Following the above, the building can accommodate 750 building occupants.

The credit requires one long-term bicycle rack for every 20 building occupants, therefore:

$$\begin{aligned}
 \text{Total number of bicycle racks required} &= \frac{750}{20} \\
 &= 37.5 \\
 &\approx 38 \text{ long term bicycle racks}
 \end{aligned}$$

In order to identify the number of short-term bicycle racks required, the following calculation needs to be undertaken:

$$\text{Total number of bicycle racks required} = \frac{9,000}{500}$$

= **18** *short term bicycle racks*

The number of bicycle racks required should be rounded up to the nearest whole number.

Credit Tool

N/A

Reference Documents

1. The Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guidelines.

TC-05 Sustainable Operations

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To reduce emissions by implementing sustainable operational transport systems for material-handling equipment.

Requirements

#	Requirement	Points Available
1	50% of the equipment and vehicles used for onsite indoor & outdoor goods and materials handling are electrical.	1
2	100% of the equipment and vehicles used for onsite indoor & outdoor goods and materials handling are electrical.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	-	-	-	-	-	-	-
Fit-Out	-	-	2	2	-	-	-
Full-Scope	-	-	2	2	-	-	-

Design Stage Evidence

#	Evidence per Requirement
1 & 2	- Letter of commitment provided by Owner providing assurance to implement a sustainable operational transport program upon building handover and to provide all necessary electric vehicles associated charging equipment free of charge to building users. - Sustainable Operational Transport Plan that includes the following: - Anticipated operational activities on site, depending on building typology. - Location of all charging equipment. - Signage for wayfinding.

	○ Estimation of number of electrical vehicles needed, size of vehicles and load carrying capacity. ○ Intended routes to be taken by all operational transportation vehicles. ○ Percentage of vehicles that are electrical, in compliance with credit requirement. ● Site plan with marked-up route established for all material-handling equipment and vehicles and turning radii (if applicable for larger vehicles), and provision of off-road parking bays to prevent free traffic flow within the site. ● Drawings highlighting planned location of charging stations for all electrical material-handling equipment and vehicles. ● HVAC drawings demonstrating provision of ventilation and air extraction for battery charging facilities in enclosed space(s) in accordance with the requirements of credit HC-03 Ventilation. ● Specifications for all electrical material-handling equipment and vehicles and charging equipment.
--	--

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	● Letter of commitment provided by Owner confirming implementation of the sustainable operational transport program upon building handover and installation of charging equipment free of charge to building users. ● As-built site plan with marked-up route established for all material-handling equipment and vehicles and turning radii (if applicable for larger vehicles), and provision of off-road parking bays to prevent free traffic flow within the site. ● As-built drawings confirming the location of charging stations for all electrical material-handling equipment and vehicles. ● As-built HVAC drawings confirming provision of ventilation and air extraction for battery charging facilities in enclosed space(s) in accordance with the requirements of credit HC-03 Ventilation. ● Updated list of all material-handling equipment and vehicles to be used during project operations, highlighting specific electrical vehicles and indicate actual percentage in compliance with credit requirements. ● Purchase receipts of all electrical material-handling equipment and vehicles. ● Date-stamped photographs of all electrical vehicles purchased and/or in operation, installed signage and charging stations.

Supporting Guidance

Material-handling equipment refers to mechanical equipment that is used for the movement, storage, control and protection of materials, goods and products throughout various processes such as manufacturing and distribution. Their use across building typologies vary.

- Applicable vehicles used for material-handling activities include transport equipment such as cranes and industrial trucks, positioning equipment such as forklifts, man lifts, hoists and balancers.
- Dedicated charging points or charging stations must be adequately ventilated. During the charging process, hydrogen is generated and it starts to accumulate. Charging being done in enclosed spaces has health & safety risks that need to be controlled. Air rates for supply and exhaust for the dedicated charging stations must be in accordance with Saudi Building Code Section 501.
- Any material-handling vehicle that is used to transport waste of any kind must be a dedicated vehicle(s), to avoid contamination or contact with building occupants other than operational transport staff.
- All pick-up or drop-off points must have covered shade for the electric vehicles, in accordance with credit **SS-05 Heat Island Effect**.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 501 Mechanical, Chapter 4 Ventilation.

Region and Culture

6 Region and Culture

The Region & Culture category focuses on the promotion of KSA's heritage and culture. It also recognizes the importance of involving the individual municipalities in the Mostadam for Commercial Buildings' rating system by providing them with the opportunity to integrate the culture of KSA in their commercial buildings through these credits.

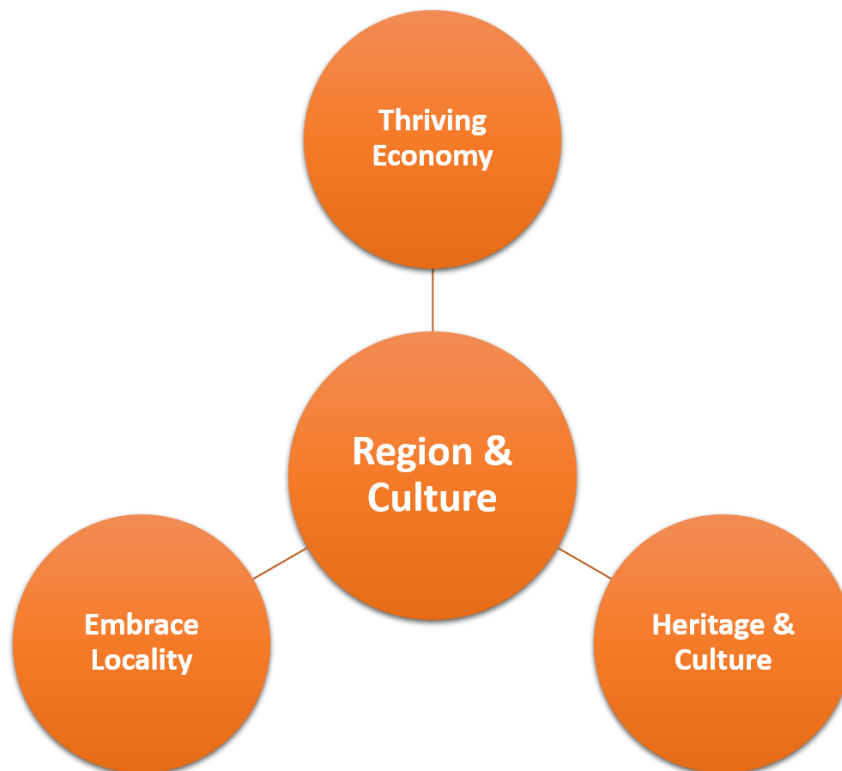


Figure 11 Region and Culture credits

RC-01 Thriving Economy

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To give preference to the purchase of materials that boost the local economy and provide the added benefit of reduced transportation impacts.

Requirements

#	Requirement	Points Available
1	20% of the construction materials (by cost) used on the development are sourced from within KSA.	1
2	40% of the construction materials (by cost) used on the development are sourced from within KSA.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	2	2	-	2
Core & Shell*	3	2	2	3	3	-	3
Fit-Out*	3	2	2	3	3	-	3
Full-Scope*	3	2	2	3	3	3	3

*Requirement #2 awards 2 points to all typologies except Offices and Retail at all scopes except for Shell Only.

Design Stage Evidence

#	Evidence per Requirement
1 & 2	- Calculations of the cost of compliant and non-compliant materials, demonstrating that the requirement of 20% or 40% is achieved. - Specifications highlighting the requirement for proof of manufacture in KSA, and the overall percentage of local material targeted for the project.

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	• Calculations of the cost of compliant and non-compliant materials, demonstrating that the requirement of 20% or 40% is achieved. • Purchase orders and proof of manufacture in KSA for all compliant materials.

Supporting Guidance

- a) Construction materials include the following:
- Materials used for the sub-structure
 - Materials used for the superstructure
 - Finishes
 - Fixtures
 - Fittings
 - Furnishings
 - Equipment/appliances
- b) For a construction material to be compliant with the credit requirements, it must meet at least one of the following conditions:
- Extracted in KSA
 - Manufactured in KSA
 - Final point of assembly in KSA
- c) For composite materials, the material with the largest percentage of content shall be used in the calculation. Where a material constitutes 90% of the total weight (mass) of a product, it can then be considered as 100% for calculation purposes.
- d) Materials that are primarily made from recycled content can also be included in the calculations.
- e) Labor and equipment costs must be excluded from the total material costs.
- f) Include the following divisions from the Construction Specification Institute (CSI): Division 03 Concrete, Division 04 Masonry, Division 05 Metals, Division 06 Wood, Plastics, and Composites, Division 07 Thermal and Moisture Protection, Division 08 Openings, Division 09 Finishes, Division 10 Specialties, Division 31 Earthwork, and Division 32 Exterior Improvements.
- g) It is important to ensure that the source of extraction, manufacturing, or assembly is validated against Mostadam requirements before procurement. Suppliers must provide their Trade Licenses and the Country of Origin Certificates for their materials and these must be confirmed acceptable.
- h) Below is an example of a cost analysis of construction materials to assess the project's compliance with the requirements of this credit. In this example 64.4% of the material cost can be attributed to materials sourced in KSA, therefore the project would be eligible for 2 points.

Table RC-01.1 Sample of Cost Analysis of Construction Materials

CSI	Description of Material	Product	Supplier	Local Material Cost (SAR) (exc. labor & equipment)
03 Concrete				
03300	Cast-in-place concrete	Concrete grade C10/10	Supplier 1	650,000
03400	Precast concrete	Concrete grade 50/20	Supplier 2	200,000
04 Masonry				
042000	Masonry unit	Concrete masonry units	Supplier 3	250,000
05 Metals				
051223	Structural steel for buildings	Reinforcing steel bars, high yield steel deformed bars	Supplier 4	600,000
07 Thermal/Moisture Protection				
072719	Polythene sheet	1000gauge, 0.25mm thick polyethylene	Supplier 7	20,000
08 Doors & Windows				
08200	Wood & plastic doors	Wooden doors	Supplier 8	70,000
08500	Windows	Aluminium windows	Supplier 9	120,000
Local Material Cost (SAR)				1,910,000
Total Material Cost (SAR) (to be supported by Bill of Quantities)				2,940,000
% Local Materials				65%

Credit Tool

N/A

Reference Documents

1. Construction Specification Institute (CSI) Division Specifications.

RC-02 Heritage and Culture

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To promote design practices that reflect KSA's cultural and regional heritage, promote local traditions and showcase authentic KSA architecture and vernacular.

Requirements

#	Requirement	Points Available
1	The building design harmoniously aligns with the local cultural and regional identities and traditions.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	-	2	-	2
Fit-Out	2	2	2	-	2	-	2
Full-Scope*	2	2	2	-	2	3	2

*Requirement #1 awards 3 points to Mosques.

Design Stage Evidence

#	Evidence per Requirement
1	- A concept narrative outlining the design strategy implemented which demonstrates how the cultural and regional elements are incorporated in the design of the building, signed by a registered Architect with experience of preserving Saudi heritage and culture through inclusion in design. - Drawings and/or visualizations which communicate the design strategy.

Construction Stage Evidence

#	Evidence per Requirement
1	Updated narrative which demonstrates how the cultural and regional elements have been incorporated into the design of the building.

- | | |
|--|---|
| | <ul style="list-style-type: none"> • As-built drawings and photographic evidence of the implementation of the specific cultural and regional elements. |
|--|---|

Supporting Guidance

The following are considered cultural and/or regional features and at least two must be incorporated into the building's design:

- **Mashrabiya**

An architectural element consisting of geometric patterns and typically made from wood, concrete, brick or metal. Mashrabiya can have several different functions:

- Shading element to control heat gain
- Screen to provide privacy
- Structural element as a truss in a lattice girder
- Screen to control airflow
- Architectural decoration

- **Deep window reveals**

Recessed windows which provide passive shading and reduce heat gain and glare.

- **Islamic geometric motifs on the building façade and/or interior**

Geometric designs based on Islamic art, often consisting of combinations of repeated squares and circles, which may be overlapped and interlaced. These geometric designs can be combined with arabesques to form intricate and complex patterns including a wide variety of tessellations.

- **Local materials with high thermal mass**

Materials with a high thermal mass include concrete, bricks and tiles.

- **Interior courtyards naturally lit and shaded**

An outdoor space that is surrounded on at least three sides by the building. The space is naturally day lit and shading is provided by the surrounding building. The courtyard is generally used as a private garden or outdoor living or gathering space.

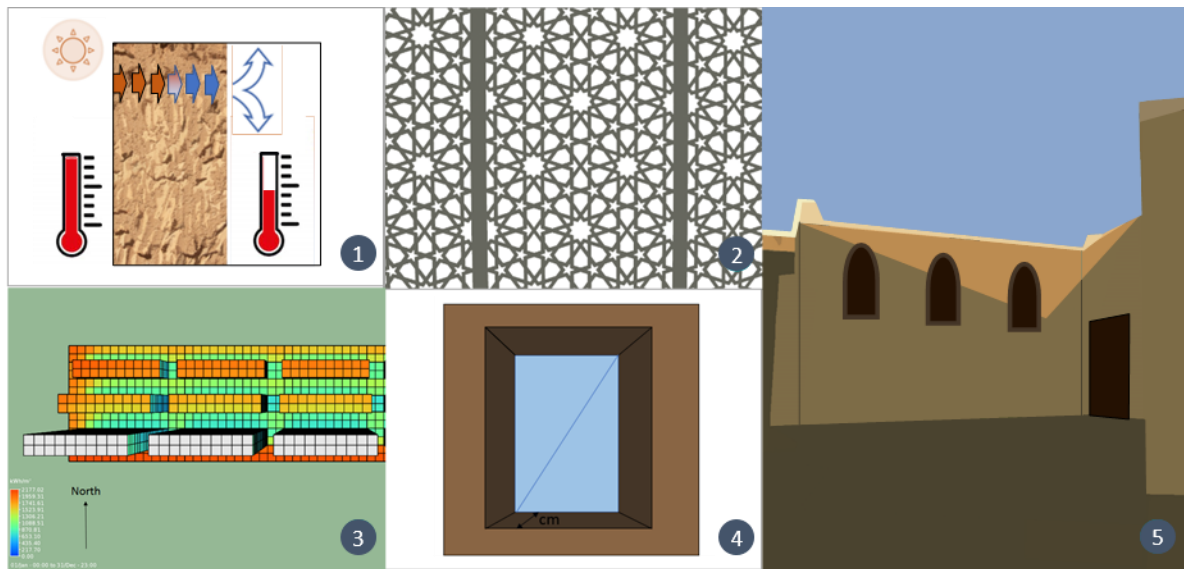
- **Low water demand planting in 'transitional' spaces**

Transitional, or transient spaces connect two different types of accommodation or act as buffer spaces between the interior and exterior environment. These transitional spaces should contain native and/or drought tolerant plant species.

- External corridor
- Foyer/lobby
- Courtyard/atrium
- Balcony/terrace

- **Orientation to reduce direct sunlight and utilize prevailing winds**

The orientation of a building will influence the amount of direct sunlight a building receives and can be used to reduce solar gain, thereby reducing the amount of energy required for cooling the building. Orientation can also be used to take advantage of prevailing winds to provide passive cooling and provide natural daylighting.



- 1 Local materials with high thermal mass
- 2 Mashrabiya
- 3 Orientation to reduce direct sunlight
- 4 Deep window reveals
- 5 Interior courtyards naturally lit and shaded

Figure RC-02.1 Examples of cultural and regional features

Credit Tool

N/A

Reference Documents

N/A

RC-03 Embrace Locality

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To empower local talent and entrepreneurs to grow in their ideas and businesses in support of the objectives of Vision 2030, particularly to diversify economy.

Requirements

#	Requirement	Points Available
1	5% (by area), or a minimum of two of all leasable spaces in the building are allocated exclusively for local Small to Medium Enterprises (SME) and Homegrown enterprises that sell products manufactured in KSA, or services that are operated by local Saudi talent.	1
2	Allocate an area within the building to be used as a co-working space consisting of all facilities needed for individuals to run businesses or work as per the Supporting Guidance. <i>Note: Requirement #2 is applicable to Offices and Retail typologies only.</i>	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell*	1	2	2	-	1	-	-
Fit-Out*	1	2	2	-	1	-	-
Full-Scope*	1	2	2	-	1	-	-

*Requirement #2 is not applicable to Educational Institutions and Hospitality typologies.

Design Stage Evidence

#	Evidence per Requirement
1	Drawings demonstrating space allocation to SME and/or homegrown businesses, in addition to supporting area calculations to confirm compliance with the technical requirement.

	- Letter of commitment by the Owner, confirming compliance with the technical requirement. - Copy of tenancy agreement template to be used for leasing the applicable spaces, highlighting any unique clauses and sections that demonstrate compliance with the technical requirement.
2	- Co-working service strategy including: - Information about service objectives, business strategy, and targeted audience. - Details of the features provided within the space as per the supporting guidance. - Drawings highlighting space allocated for co-working activities and supporting area calculation confirming capacity. - Extract from specifications for the air-conditioning system, lighting, and electrical power supply provided for the space. - Extracts from specifications for commercial furniture manufactured to meet established industry standards, to be provided in the co-working space. - Co-working service strategy detailing accessibility and limitation of usage by occupants.

Construction Stage Evidence

#	Evidence per Requirement
1	- As-built drawings with supporting area calculations demonstrating compliance with the technical requirement. - Updated Letter of commitment, signed by building owner, confirming compliance with the technical requirement. - Copy of signed tenancy agreement for leasing the applicable spaces highlighting any unique clauses and sections that demonstrate compliance with the technical requirement.
2	- Updated co-working service strategy including: - Information about service objectives, business strategy, and targeted audience. - Details of the features provided within the space as per the supporting guidance. - As-built drawings highlighting space allocated for co-working activities and supporting area calculation confirming capacity, access to F&B and WCs for males and females. - Manufacturer's datasheets for air conditioning system, lighting, and electrical power supply provided for the space. - Photographic evidence of installed loose furniture provided in the co-working space. - Updated co-working service strategy detailing accessibility and limitation of usage by occupants.

Supporting Guidance

SME & Homegrown enterprises:

- Affordable Leasing rates are introduced for the allocated spaces compared to normal rate offered for the remaining of the leasable spaces or the surrounding market.

- b) Enterprises selling products can qualify only if the same products are meeting one of the following:
- Extracted in KSA
 - Manufactured in KSA
 - Final point of significant assembly in KSA
- c) Enterprises must be officially registered with relevant authority to operate in KSA.
- d) Enterprises providing technical services to the end user can also qualify for this requirement only if majority of professionals and operation team members are local Saudi talent.

Co-working Space

Space allocated for co-working activities must have the following characteristics and features:

- Easily accessible through separate entrance or main building entrance.
- Area of space is adequate to accommodate designed capacity as per the local regulation for open space offices.
- Area is having minimum ventilation in line with **HC-03 Ventilation** credit requirements.
- Adequate lux levels is provided in line with CIBSE's Lighting Handbook, Chapter 9.
- Enclosed or separate allocated restrooms for males and females within the building.
- Food and beverage lounge or access to light snacks is provided for users of the space.
- Fully enclosed meeting room with capacity of 30% of total occupancy of co-working space and projection technology.
- Access to internet or Wi-Fi.
- Access to paper scanning & printing.

Credit Tool

N/A

Reference Documents

1. CIBSE- The SLL Lighting Handbook, 2018.

Energy

7 Energy

Per-capita energy consumption has been increasing every year in KSA with a 20% escalation recorded between 2010 and 2016¹. Therefore, as the population of KSA grows, the overall energy consumption of KSA is also expected to grow substantially. Vision 2030 seeks to develop and implement policy and infrastructure that advocates for improved energy performance, increased energy efficiency and adoption of renewable energy technologies. This will help diversify the economy, achieve Sustainable Development goals and alleviate challenges associated with increased energy consumption.

Mostadam-certified commercial buildings will support these goals by demonstrating their improved energy performance through evidence-based means and ensuring that the buildings continue to operate as intended. The monitoring and analyzing of energy consumption will be used to determine the energy performance of a building in operation. In addition, projects will be rewarded for adopting renewable energy technology and providing energy efficient appliances, which align with policy initiatives aimed at strengthening the domestic market and diversifying the economy.

Vision 2030 also addresses the promotion and localization of the renewable energy sector. The government is committed to an initial target of generating 9.5 GW of renewable energy to diversify the energy mix, support the KSA industry and meet the increasing demands for energy as the economy grows. The King Salman Renewable Energy Initiative will be launched to build the expertise of KSA companies in the field of renewable technology. The legal and regulatory framework will be reviewed and modified to allow the private sector to participate in renewable energy investment. The R&D and manufacture of renewables in KSA will be emphasized. The adoption of free market prices will also improve the viability of renewable energy such as small-scale PV due to reduced pay-back periods. The new net-metering regulation for small-scale PV, due to be implemented in the foreseeable future, is also likely to incentivize small-scale renewables for electricity consumers.

¹ Electricity consumption per capita 2010-2016, General Authority for Statistics

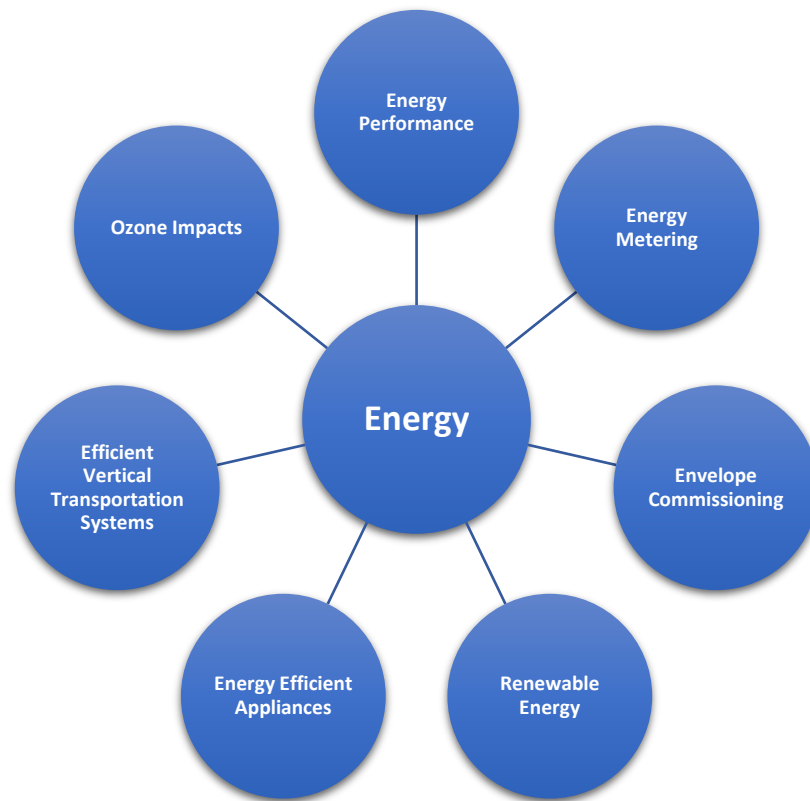


Figure 12 Energy credits

E-01 Energy Performance

Credit Requirements	Keystone	Default Points Allocation
Option 1 – Requirement #1	Yes	5
Option 2 – Requirement #2	Yes	15

Aim

To promote informed decisions on the selection and installation of building components that achieve improved levels of energy efficiency and reduced carbon emissions.

Requirements

Project teams may pursue either the Prescriptive Option OR the Performance Option.

Option 1 – Prescriptive Option

#	Requirement	Points Available
Keystone Requirement - Projects pursuing the Prescriptive Option must achieve the requirement below (5 credit points).		
1	For ALL types of buildings, comply with SBC Section 601 Buildings Except Low-Rise Residential Buildings Conservation: Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia.	5
	Total	5

Option 2 – Performance Option

#	Requirement	Points Available
Keystone Requirement - projects pursuing the Performance Option must consume no more energy than the ASHRAE baseline building (5 credit points).		
1	For ALL types of buildings conduct dynamic energy modeling, using appropriate energy modeling software, to compare the total building energy consumption (kWh) to a baseline prescribed by ASHRAE Standard 90.1-2013. The number of points awarded is dependent on the percentage improvement over the baseline. Refer to Supporting Guidance below for more details.	15
	Total	15

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only*	5	5	5	5	5	-	5
Core & Shell	15	15	15	15	15	-	15
Fit-Out	15	15	15	15	15	-	15
Full-Scope	15	15	15	15	15	15	15

*Option #2 is not applicable to all building typologies at shell only scope.

Design Stage Evidence

Option 1 – Prescriptive Option

#	Evidence per Requirement
1	- Drawings, specifications and calculations demonstrating compliance with SBC 601. - Prescriptive Energy Tool.

Option 2 – Performance Option

#	Evidence per Requirement
1	- Drawings, specifications, and calculations confirming parameters reported in Performance Energy Tool. - Performance Energy Tool.

Construction Stage Evidence

Option 1 – Prescriptive Option

#	Evidence per Requirement
1	- As-built drawings and calculations, technical datasheets and purchase orders/receipts demonstrating compliance with SBC 601. - Prescriptive Energy Tool.

Option 2 – Performance Option

#	Evidence per Requirement
1	- As-built drawings and calculations, technical datasheets and purchase orders/receipts confirming parameters reported in Performance Energy Tool. - Performance Energy Tool.

Supporting Guidance

Performance Option:

To determine the number of points achieved under this credit, a suitably Qualified Professional must develop a detailed energy model of two buildings:

- **Baseline** building as prescribed by:
 - ASHRAE Standard 90.1-2013, Appendix G
- **Proposed** building based on the design specifications and drawings

The total annual energy consumption is determined (kWh per year) for both buildings. The percentage improvement of the proposed building over the baseline building is calculated using the following equation:

$$\% \text{ Improvement} = \frac{\text{Baseline Annual Energy Consumption} - \text{Proposed Annual Energy Consumption}}{\text{Baseline Annual Energy Consumption}}$$

The number of credit points achieved for any type of building is as per the following table:

Table E.01.1 Points achieved for all buildings types

Points Achieved	Percentage improvement
5	0%
6	3%
7	6%
8	10%
9	14%
10	18%
11	22%
12	26%
13	30%
14	35%
15	40%

Additional Clarifications:

- a) The proposed and baseline simulations must use the same energy modelling software and the same weather data file. The energy modelling software must meet the minimum requirements of ASHRAE Standard 90.1-2013, Appendix G (Section G2.2).
- b) The simulation program shall be capable of performing design load calculations to determine required HVAC equipment capacities and air and water flow rates in accordance with generally

accepted engineering standards and handbooks for both the proposed design and baseline building.

- c) Compliance with mandatory provisions of ASHRAE 90.1-2007 can be followed. However, overall comparison between proposed and baseline buildings shall be demonstrated against ASHRAE 90.1 2013.
- d) It is important to consider the correct climate zone relevant to project location as per the list of zones defined in ASHRAE Standards. KSA generally is categorized under Climate Zone 1 which is "Very Hot". However, the sub-zone must be accurately identified depending on weather conditions at the project's location. Subzone 1A shall be used for humid cities such as Jeddah, whereas subzone 1B shall be used for dry cities such as Riyadh. Additionally, zones 2 & 3 can be used for cities with mild / cold weather.
- e) Suitably Qualified Professional: A suitably qualified energy modeller must have a minimum of 3 years of relevant experience and a recognized qualification or chartership. The professional's expertise should be sufficient to cover all required technical aspects to ensure the energy model is appropriate and reflects the actual performance of the building.
 - It is recommended that the modeler's qualifications and experiences are carefully reviewed to ensure the professional is able to undertake modelling exercise and report accurate and reliable results for the percentage improvement in energy consumption against the baseline. Previous experience in modelling relevant types of commercial buildings will be ideal as defining geometry, zoning, and building systems performance parameters are crucial steps which require judgment and awareness of principles of buildings design considerations.
- f) District Cooling:
 - Buildings served by district cooling shall obtain the seasonal coefficient of performance (sCOP) from the district cooling provider. The sCOP should incorporate any thermal losses within the network.
 - If the design team is not able to obtain the sCOP from the network provider, a seasonal average COP of 4.5 must be assumed for the proposed building. The baseline building cooling system efficiency is determined using ASHRAE Standard 90.1-2013 Appendix G.
 - Baseline building shall include all equipment of both plant and demand sides. Proposed building to include demand side only along with the obtained / assumed COP.
- g) Renewable Energy: whilst renewable energy is separately assessed under credit **E-04 Renewable Energy**, any onsite renewable energy technologies (e.g. solar hot water panels, photovoltaic panels) may be accounted for in this credit by subtracting the annual renewable energy generated (whether used on-site or exported to the grid) from the total proposed annual energy consumption).

Preliminary Energy Model:

In the early stages of concept design, it is recommended that a preliminary energy model is developed by a qualified energy modeler. The benefits of performing this exercise are:

- Provide an estimated projection of energy usage depending on various options proposed for building elements. This will support further design development activities.

- Help identify best efficiency measures of building design and performance parameters to avoid inaccurate sizing of building systems, specifically HVAC, and other aspects of architectural design of the building.

Thermal Performance of the Building Envelope:

Thermal conductivity (U-value) is the measurement of the flow of heat through a building material. It is defined as the rate of heat flow in watts (W) through an area of 1 square meter (m²) for a temperature difference across the structure of 1 degree centigrade (C) or Kelvin (K). The U-value unit of measurement is therefore W/m²K.

The following procedure is recommended for a comprehensive calculation of the area-weighted U-value for the envelope's opaque surfaces, which typically accounts for more than 50% of the envelope. It must be properly assessed to ensure the building is designed for efficiency in energy performance.

- The different sectional details of each exterior wall need to be identified at all levels and elevations. It is recommended that color coded drawings are generated to define the different types of exterior walls and its related area for all four elevations. Refer to Figure E-01.1 for guidance.

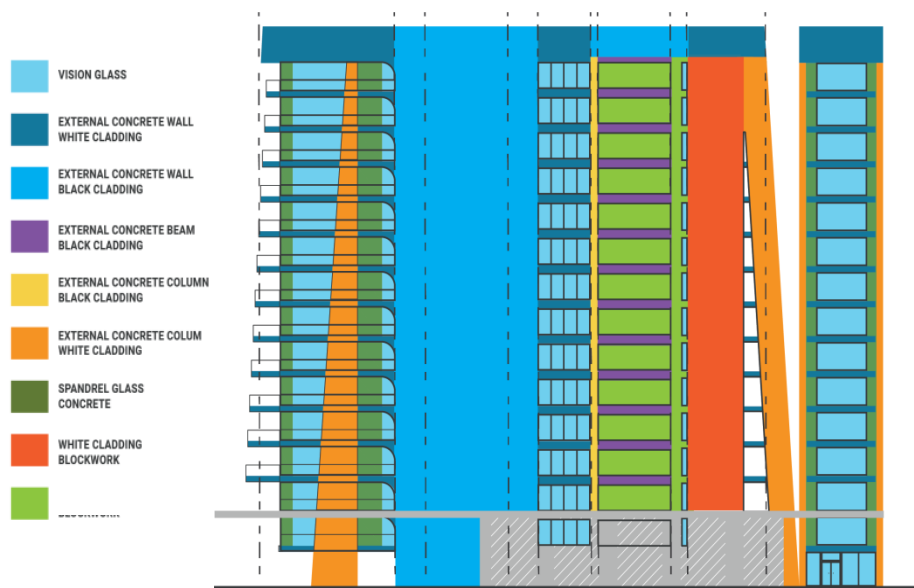


Figure E-01.1 Color-coded drawing defining different types of exterior walls

- Once the different areas for wall types are identified, it is important to define sectional details of each wall type by defining the materials and related thicknesses.
- The suppliers of the proposed materials should be contacted to provide the thermal conductivity (K-value) of each type of material in order to build up the information for the area-weighted U-value calculations.
- Using the sectional details, the thermal resistance of the wall section can be calculated using the following formula:

$$R - \text{value } (m^2K/W) = \frac{\text{Material Thickness } (m)}{\text{Thermal Conductivity } (W/mK)}$$

- Once the sectional R-value is identified, the U-value of the same section is calculated using the following equation (this methodology is appropriate for tall buildings with a single continuous façade system):

$$U - \text{value } (W/m^2K) = \frac{1}{R - \text{value } (m^2K/W)}$$

Material	Layer Thickness (m)	Thermal Conductivity (w/m.°k)	R-value (m².°k/w)
Outside Air Film			0.05
Fibre Cladding	0.02	0.200	0.10000
Airgap	0.03	1.060	0.02830
Hydrophobised mineral fiber cladding insulation	0.050	0.032	1.56250
RCC	0.3000	1.900	0.15789
Plaster	0.0150	0.160	0.09375
Inside Air Film			0.13
Total R-value			2.12245
U Value	0.471154		

Figure E-01.2 Example of R-value and U-value calculations

- Once the sectional U-values have been calculated, the Average Area-Weighted U-value can be calculated using the following formula:

$$\text{Weighted U - value } (W/m^2K) = \frac{\sum A \times U}{\sum A}$$

Wall type	Area (m2)	U-value	A*U
EW 1	693.36		0.00000
EW 2	330.36	0.47	155.26920
EW 3	823.62	0.47	387.10140
EW 4	102.20	0.44	44.96800
EW 5	33.67	0.47	15.82490
EW 6	367.67	0.47	172.80490
EW 7		0.36	0.00000
EW 8	244.72	0.37	90.54640
EW 9	266.83	0.132	35.22156
EW 10	306.07	0.132	0.00000
TOTAL	3168.50		901.73636

$$\begin{aligned}
 \text{Weighted U Value} &= \frac{\sum (A \times U)}{\sum A} \\
 &= \frac{901.73636}{3168.50} \\
 &= 0.28
 \end{aligned}$$

Figure E-01.3 Example of average area-weighted U-value calculations

- Transparent, or semitransparent, glass is not considered as the above calculation is for the opaque surfaces only. Transparent, or semitransparent, glass U-values need to be calculated separately due to the different thermal performance of glazing and taking into consideration the thermal bridging of the windows frame as part of the overall U-value calculations.

Credit Tools

Prescriptive Energy Tool

Performance Energy Tool

Reference Documents

1. Saudi Building Code (SBC) 601, Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia.
2. ASHRAE Standard 90.1-2013 Energy Standard for Buildings Except Low-Rise Residential Buildings.
3. ASHRAE Standard 90.1-2007 Energy Standard for Buildings Except Low-Rise Residential Buildings.
4. ASHRAE Handbook – Fundamentals (2017).
5. Air Conditioning, Heating, and Refrigeration Institute (AHRI) Standards:
 - 550/590-2011: Performance Rating of Water-Chilling and Heat-Pump Water-Heating Packages Using the Vapor Compression Cycle.
 - 210/240-2008: Unitary Air Conditioning and Air-Source Heat Pump Equipment.
 - 340/360-2007: Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
 - 310/380-2004: Packaged Terminal Air-Conditioners and Heat Pumps.
 - 1230-2010: Performance Rating of Variable Refrigerant Flow (VRF) Multi-split Air-Conditioning and Heat Pump Equipment.

E-02 Energy Metering

Credit Requirements	Keystone	Default Points Allocation
Requirement #1	Yes	1
Requirement #2	Yes	1

Aim

To install energy meters with data ports to report and monitor energy consumption to allow for future improvement.

Requirements

#	Requirement	Points Available
1	Meters are provided at whole building level for all landlord areas and for each tenant individually.	1
2	Create a sub-metering strategy that addresses energy sub-meters for the various end-uses as detailed in the Supporting Guidance section and conforms to SBC 1001 Green Buildings Code, Chapter 6.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1 & 2	- Energy distribution schematic(s) showing the type, extent and locations of all meters. - Specifications highlighting meter requirements complying with credit requirements Mostadam Guide (refer to credit EI-01 Mostadam Guide) section on energy metering providing user support and understanding of the level of sub-metering installed, including remote access abilities and guidance on how to utilize the data to reduce consumption levels.

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	- As-built energy distribution schematic(s) showing the type, extent and locations of all installed meters. - Manufacturer's data for the installed meters along with photographic evidence. - Mostadam Guide (refer to credit EI-01 Mostadam Guide) section on energy metering providing updated user support and understanding of the level of sub-metering installed, including remote access capabilities and guidance on how to utilize the data to reduce consumption levels.

Supporting Guidance

Energy Metering:

Energy metering will inform the operators about the systems and areas that have higher energy consumption than expected. The development of an energy metering strategy shall start at the schematic design stage in order to ensure that all different energy end uses are considered and the right metering strategy is developed and verified by end of Detailed Design stage. The metering strategy shall consider all sources of energy. Any alternative sources such as on-site PV generation, liquid fuels, gaseous fuels, or waste-to-energy systems must be identified as part of the strategy.

Metering and Sub-Metering:

All meters and sub-meters must:

- Be within a sealed location.
- Have clear readings of kWh.
- Have available data ports for connection to a smart monitoring device.
- Not have any functionality for manually changing the readings.
- Be clearly labelled and easily accessible with no special requirements needed to review the consumption.

The following table defines the end-use sub-metering requirements:

Table E-02.1 Sub-metering requirements

Building End-Use	All Building Typologies	
	Landlord Areas ³	Tenant Areas
Air-conditioning ¹	✓	✓
Service Water Heating	✓	✓
Lighting system	✓	✓
Receptacle and process loads $\geq 10\text{kW}^2$	✓	✓ ⁴

Energy generation	✓	✓
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¹ This includes all external condensers and associated pumps and air handling units.

² All panels that supply 90% of a specific energy load must be metered. Any end-use that draws less than 10% of the power load of the panel need not be sub-metered.

³ This includes common areas such as lobbies, receptions, gyms, multi-purpose rooms and outdoor areas that are landlord operated.

⁴ This can be combined with the metering for lighting if <10 KW

District Cooling:

Where the building is connected to district cooling network, BTU meters must be installed on the secondary chilled water side to monitor the energy demand of the building's cooling system.

Alternative Energy Sources:

All alternative energy sources such as liquid fuels, gaseous fuels, district cooling and/or waste energy must be installed with sub-metering capabilities and have high level of user interface connectivity for monitoring. It's important to ensure that different energy sources are separately metering in the case more than one energy source is present on site.

Data Acquisition:

- All energy meters should be connected to a data acquisition and monitoring system which is capable of being remotely connected to *Sustainable Building*. All data will be treated as confidential. This requirement should be included in the Mostadam Guide (credit **EI-01 Mostadam Guide**) as information for the building operator.
- The data monitoring system should provide hourly, daily, weekly, monthly and annual energy consumption for each end-use and be able to compare consumption levels to previous data.
- The system should also be capable of alerting building operator to unusually high consumption levels.

Energy Sub-metering Strategy:

Energy sub-metering is essential part of the monitoring strategy which will inform operators and occupants of the building of systems and areas that have higher energy consumption than expected. The development of an energy sub-metering strategy shall start at the schematic design stage. The following should be considered to ensure a comprehensive strategy that complies with the requirements of this credit:

- The sub-metering strategy will consider all sources of energy. Any alternative sources such as on-site electricity generation, liquid fuels, gaseous fuels, and waste-to-energy systems must be identified and considered in the strategy.
- Landlord areas and tenant areas need to be clearly defined and relevant systems need to be sub-metered separately. For example, receptacles in the common area should not be combined in the same sub-meter of the same end-use within the tenancy area, and vice versa.

- The total energy demand required for each end-use needs to be identified in order to calculate the annual energy demand required by the project.
- Ensure that at least 90% of the total energy demand of the building as well as the major end-uses listed below are sub-metered:
 - Air conditioning
 - Service Water Heating
 - Lighting systems
 - Receptacle and process loads > 10kW
 - Energy generation

Figure E-02.1 shows how energy sub-meters are annotated in Schematic Diagram.

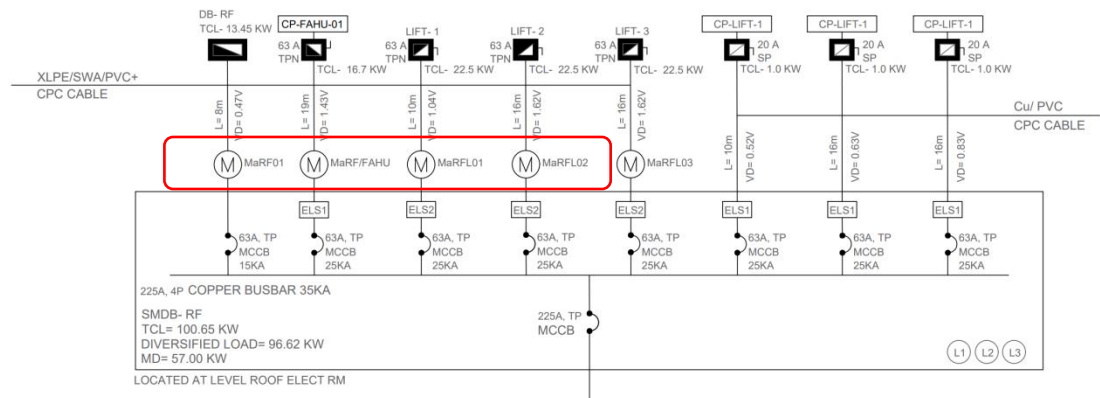


Figure E-02.1 Annotated Energy Distribution Schematic

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 6 Energy Conservation, Efficiency and CO_{2e} Emission Reduction.
2. Saudi Building Code 801 Fire Code.
3. NFPA 70 National Electrical Code.
4. CIBSE TM39 2009, Building Energy Metering.

E-03 Envelope Commissioning

Credit Requirements	Keystone	Default Points Allocation
Requirement #1 & #2	No	2

Aim

To ensure the building envelope performs as designed and intended.

Requirements

#	Requirement	Points Available
1	Appoint a Building Envelope Commissioning Agent (BECxA) to produce an Envelope Commissioning Plan and oversee advanced building envelope verification as performed by a Commissioning Contractor.	2
2	In addition to #1, the building envelope is tested for condensation, water ingress, air infiltration and thermal bridging to ensure performance is as designed and in accordance with ASTM, ATTMA and ASTAT standards. All installed products, including custom-made cladding systems, must have a pre-testing certificate.	
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	2	2	-	2
Core & Shell*	2	2	2	3	2	-	3
Fit-Out	2	2	2	2	2	-	2
Full-Scope**	2	2	2	2	2	3	2

*Requirement #1 awards 3 points to Warehouse and Healthcare typologies for Core & Shell scope.

**Requirement #1 awards 3 points to Mosque typology.

Design Stage Evidence

#	Evidence per Requirement
1 & 2	CV of BECxA and confirmation of their appointment for the duration of the design stage of the project.

	Narrative outlining details of the envelope testing requirements relevant for the building typology, prepared by the BECxA and to be included in the Envelope Commissioning Plan (refer to credit PMM-01 Commissioning and Tuning).
--	--

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	- CV of BECxA and Envelope Commissioning Contractor and confirmation of their appointment for the duration of the construction stage of the project. - Pre-testing certificates for relevant installed products. - Date-stamped photographic evidence of Contractor conducting tests. - Signed verification report by the BECxA detailing the results of the tests conducted and confirming that the building envelope is installed and performs as designed.

Supporting Guidance

Building Envelope Commissioned Systems:

- The building elements covered by this credit include: fenestrations, walls, wall crawl spaces, roofs, basements and floors.
- Air-tightness tests and thermal bridge detection (thermography) must be undertaken on-site by qualified and certified Envelope Commissioning Contractor.
- Water ingress tests must be performed either on mock-up or on-site, by qualified and certified Envelope Commissioning Contractor.
- It is recommended that the above tests are carried out before the completion of construction, in case any air intrusion or water penetration is observed and remedial work required.

Building Envelope Commissioning Agent (BECxA):

- The Building Envelope Commissioning Agent (BECxA) must be appointed prior to the start of the commissioning review process in the design phase.
- The BECxA must have a minimum of five years of experience in building envelope assessment.
- The BECxA may be an employee of the Owner, design company, construction management company, project management company, or an independent consultant and must report directly to the Owner.
- The BECxA may not be an employee of the project's Contractor or sub-contractor.
- The BECxA must not be involved in the design and construction process of the project in any other capacity.

Envelope Commissioning (Cx) Contractor:

- The Cx Contractor must be appointed for the purpose of envelope performance testing on site during the construction phase.
- The Cx Contractor must have a minimum of three years of experience in envelope performance testing procedures as per ASTM, ATTMA and related standards.
- The Cx Contractor may be an employee of the Owner, design company, construction management company, project management company or be an independent consultant.

Envelope Commissioning:

The Building Envelope Commissioning Agent (BECxA) will oversee the building envelope tests for air infiltration, condensation, water ingress and thermal bridging and undertake the following:

- Review the OPR, BOD, design documents and project specifications.
- Review exterior building drawings/submittals to check compliance with the design intent, code provisions, industry best practice and manufacturer's recommendations/warranties.
- Detail the envelope testing requirements and include these in the Envelope Commissioning Plan (refer to credit **PMM-01 Commissioning and Tuning**).
- Review and verify the testing procedure and method of statement developed by Envelope Commissioning Contractor.
- Review and update the Envelope Commissioning Plan and include tests approved at Construction Stage. Once testing commences, report directly to the Owner/Owner's Representative if there is evidence of air infiltration or water intrusion that may require remedial work.
- Compile and review the envelope commissioning method statements for tests being performed.
- Witness key testing and commissioning activities performed by Cx Contractor.
- Chair building commissioning meetings and issue minutes of building commissioning meetings.

Sample Testing:

- a) For large buildings with an envelope system such as curtain walls, tests may be done on-site on mock-up installations and assemblies.
- b) For large developments with grouped buildings, envelope commissioning may be done for 50% of the buildings with the same floorplan.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC 1001) Green Buildings, Chapter 9 Commissioning, Inspections, Operation and Maintenance.
2. NIBS Guideline 3-2012 Building Enclosure Commissioning Process BECx.
3. ASHRAE Guideline 0-2005: The Commissioning Process.
4. ASTM E779 - 10 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
5. ASTM E3158-18, Standard Test Method for Measuring the Air Leakage Rate of a Large or Multi-zone Building.
6. ATTMA TSL2 Technical Standard 2010 – Measuring Air Permeability in the Envelopes of Buildings (Non-Dwellings).
7. ASTAT10 – Carry out Air Tightness Testing on Large and Complex, High-rise and Phased Hand-over Zonal Buildings.
8. AAMA 502 Voluntary Specification for Field Testing of Newly Installed Fenestration Products
9. ASTM E2128-17 Standard Guide for Evaluating Water Leakage of Building Walls.
10. AAMA 501.1 Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.

11. ASTM E331-2016 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

E-04 Renewable Energy

Credit Requirements	Keystone	Default Points Allocation
Requirement #1	No	1
Requirement #2	No	5

Aim

To encourage the use of clean renewable energy, thus reducing reliance on fossil fuel energy and minimizing the impact on the environment of associated carbon emissions.

Requirements

#	Requirement	Points Available
1	Solar Water Heating Solar hot water (SHW) panels are specified and installed to provide 50% of the building's hot water demand, including pool's heating demand along with the associated shower facilities (where applicable).	1
2	On-site Electricity Generation* Photovoltaic (PV) panels are specified and installed onsite and provide a percentage of the total annual building energy demand. The number of points awarded is dependent on the percentage of energy generated by the PV panels. The renewable energy generated by the PV panels can either be used on-site or exported to the grid. Refer to Supporting Guidance for more details.	5
	Total	6

* The points for Requirement #2 are only available for projects pursuing the "Performance option" of credit **E-01 Energy Performance**.

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques*	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	6	6	6	9	6	-	6
Fit-Out	6	6	6	9	6	-	6
Full-Scope	6	6	6	9	6	9	6

*Requirement #1 awards 2 points and Requirement #2 awards 7 points to Warehouses and Mosque typologies for all applicable scopes.

Design Stage Evidence

#	Evidence per Requirement
1	• Drawings confirming the location of the SHW panels. • Extract from specifications showing requirements of the SHW panels. Refer to the Supporting Guidance for the minimum parameters to be included. • Software simulations confirming the estimated annual hot water demand, and estimated annual pool heating demand (if present), of the project along with the estimated annual hot water generated by the SHW system. • Supplier's datasheet confirming the annual thermal efficiency of the SHW system.
2	• Electrical drawings confirming the location of the PV panels. • Architectural drawings indicating the location of the PV panels, the shading from surrounding surfaces and the azimuth angle and slope of the panels. • Extract from the specifications showing requirements of the PV panels. • Software simulations confirming the estimated annual electricity consumption of the project along with the estimated annual electricity generated by the PV system, taking into consideration balance-of-system and dust-related losses. • If the renewable energy generated by the PV panels is to be used on-site, provide a narrative describing the planned end use(s) of the energy.

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings confirming the location of the SHW panels. • As-built calculations confirming the estimated annual hot water demand, and estimated annual pool heating demand (if present), of the project along with the estimated annual hot water generated by the SHW system. • Manufacturer's technical datasheets for the SHW panels.
2	• As-built drawings confirming the location of the PV panels, the shading from surrounding surfaces and the azimuth angle and slope of the panels. • Manufacturer's technical datasheets for the PV panels. • As-built calculations confirming the estimated annual electricity consumption of the project along with the estimated annual electricity generated by the PV system, taking into consideration balance-of-system and dust-related losses. • Commissioning certificate of the system.

Supporting Guidance

Solar Water Heating:

The solar water heaters must comply with the technical requirements of Chapter 14 of SBC 501 Mechanical, in addition to UL 174 or 1453. All solar water heating systems must have integrated pressure relief valves designed and set for the specific installation. All solar water heating systems must be provided with top-up or back-up immersion heaters. The design and installation of the system shall be undertaken by competent and certified designers and installers.

Specialty, non-domestic processes that require 100% hot water at all times can be excluded from the solar hot water requirement. However, detailed technical documentation needs to be provided to justify exclusion.

The percentage of the hot water demand that is provided by solar energy is calculated as follows:

$$\% \text{ Hot water demand provided by SHW panels} = \frac{\text{Annual hot water generated by SHW panels}}{\text{Annual hot water demand}}$$

On-Site Electricity Generation:

To determine the number of points achieved, the Electrical Engineer or PV specialist must provide detailed calculations and/or simulations to predict the annual electricity generated by the PV system (kWh per year). This is then divided by the proposed building annual energy consumption determined by the energy model of credit **E-01 Energy Performance**, taking into consideration all PV system losses and projected annual efficiency reduction, as per the following equation:

$$\% \text{ Renewable energy} = \frac{\text{Energy generated by the PV System}}{\text{Proposed building annual energy consumption}}$$

The number of points achieved for all buildings except warehouses and mosques are as per Table E-04.1.

Table E-04.1 Points achieved for all buildings except warehouses and mosques

Points Achieved	Percentage reduction
1	4%
2	6%
3	9%
4	12%
5	15%

For warehouses and mosques, the available points for the requirements can be achieved as per Table E-04.2.

Table E-04.2 Points achieved for warehouses and mosques

Points Achieved	Percentage Reduction
3	4%
4	6%
5	9%
6	12%

7	15%
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Renewable Energy Systems Specifications:

All on-site electricity generation systems must comply with the Electricity and Cogeneration Regulatory Authority (ECRA) regulations, including the Small-Scale Solar PV Systems Regulations Version 1 (2017). As a minimum, the design stage specifications of the renewable energy systems shall include the following parameters:

- Azimuth and inclination of the SHW or PV panels
- Size of the SHW or PV panels
- Type of the SHW or PV panels
- Number of SHW or PV panels
- Storage tank size for SHW system
- Percentage of hot water to be met by the SHW system, or percentage of electricity to be generated by the PV system

Simulation Software:

The renewable energy systems must be designed using approved simulation software, which provide more accurate calculations and result in a better system design. Such software includes:

- T*SOL for SHW systems
- PVSyst for PV systems
- Polysun for SHW and PV systems

Maintenance:

O&M manuals for any solar hot water or PV systems installed, including the methods for cleaning the systems and how to cover them if the occupants will be away for a period of time, are to be included in the Mostadam Guide (refer to credit **EI-01 Mostadam Guide**).

Credit Tools

Performance Energy Tool

Reference Documents

1. Saudi Building Code (SBC) 501 Mechanical, Chapter 14 Solar Systems.
2. SASO IEC 62817:2018 Photovoltaic Systems.
3. KACST PV Solar Reliability Laboratory.
4. ECRA: Small-Scale Solar PV Systems Regulations, 2017.
5. UL 174 Standard for Household Electric Storage Tank Water Heaters.
6. UL 1453 Standard for Electric Booster and Commercial Storage Tank Water Heaters.

E-05 Energy Efficient Appliances

Credit Requirements	Keystone	Default Points Allocation
Requirement #1	No	1

Aim

To reduce a building's energy consumption through the provision or purchase of energy efficient appliances.

Requirements

#	Requirement	Points Available
1	For those electrical appliances provided by the developer: All relevant electrical appliances must have an Energy Efficiency Label from the Saudi Standards, Metrology and Quality Organization (SASO), refer to the Supporting Guidance for more details. For those appliance categories not currently covered by SASO, the appliances must be Energy Star or EPEAT certified. For those electrical appliances not provided by the developer: Information shall be provided to the occupant on the energy efficiency labelling scheme of SASO, the Energy Star scheme and the EPEAT scheme and their benefits. This should form part of the Mostadam Guide (credit EI-01 Mostadam Guide).	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	-	-	-	-	-	-	-
Fit-Out*	2	2	1	2	1	-	2
Full-Scope	1	1	1	1	1	1	1

*Requirement #1 awards 2 points to Educational Institutions, Offices, Warehouses, and Healthcare typologies at fit-out scope.

Design Stage Evidence

#	Evidence per Requirement
1	For those electrical appliances provided by the developer: • Specifications stating the minimum energy efficiency rating of all appliances. The relevant section of the specification must be highlighted. For those electrical appliances not provided by the developer: • Mostadam Guide with relevant section highlighted (refer to credit EI-01 Mostadam Guide).

Construction Stage Evidence

#	Evidence per Requirement
1	For those electrical appliances provided by the developer: • List of installed appliances and the manufacturer, model and type of energy certification for each one. • Date-stamped photographic evidence or purchase orders/receipts for each installed appliance. • Manufacturer's technical data sheets for each installed appliance confirming the energy efficiency rating. For those electrical appliances not provided by the developer: • Mostadam Guide with relevant section highlighted (refer to credit EI-01 Mostadam Guide).

Supporting Guidance

The following appliance categories are covered by this credit:

- Refrigerators
- Freezers
- Dishwashers
- Water coolers
- Televisions
- Ice machines
- Air conditioners
- Office equipment (computers, printers, scanners, monitors, servers)
- Commercial washers and dryers

For those electrical appliances provided by the developer:

If an appliance category is covered by SASO's Energy Efficiency Label regulation, then all appliances in that category must have a SASO Energy Efficiency Label with a minimum rating of B. If an appliance category is not covered by SASO's Energy Efficiency Label regulation, all installed appliances in that category must be Energy Star certified.

SASO Energy Efficiency Label:

The Energy Efficiency Label is an awareness label granted by SASO that provides consumers with the ability to make comparisons of electrical appliances according to their energy efficiency. In the original version of the label, this is expressed by the number of stars from 1 to 6, with 6 being the most energy efficient and 1 the least. In the new version of the label, this is expressed by letters A to G, with A being the most energy efficient and G the least. The Energy Efficiency Label also includes product information such as the type of device, model and brand, electric energy consumption and test standard. An example of the label is shown in Figure E-05.1.

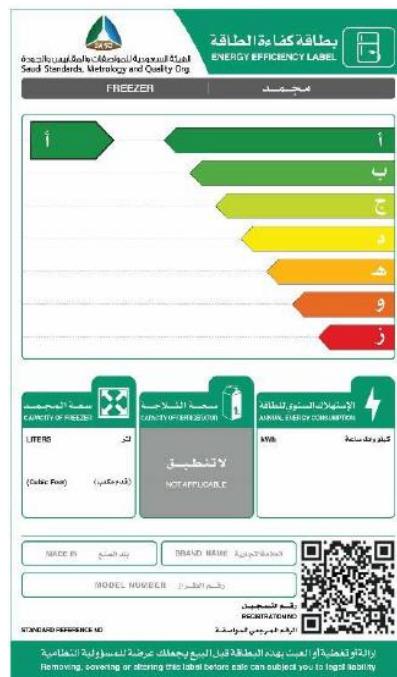


Figure E-05.1 SASO Energy Efficiency Label

Energy Star:

Energy Star is a voluntary energy efficiency scheme run by the US Environmental Protection Agency. All Energy Star products meet the minimum energy efficiency requirements set out by Energy Star. There are no rating levels in the Energy Star certification system. Therefore, to find out how Energy Star products compare to each other in terms of energy efficiency and their annual energy consumption, use www.energystar.gov or consult appliance details. All Energy Star certified products will have a sticker indicating that they meet the EnergyStar requirements.

EPEAT

EPEAT is a voluntary certification developed by the Electronic Councils (GEC), specifically for ICT products. There are three certification levels; Bronze, Silver and Gold. All EPEAT certified products meet Energy Star requirements. In addition to energy efficiency requirements, EPEAT also assesses the environmental

impact of the product over its lifecycle from extraction of raw material to recyclability at the product's end-of-life.

Credit Tool

N/A

Reference Documents

1. Saudi Standards, Metrology and Quality Organization (SASO) Energy Efficiency Label:
 - a. SASO 2663:2018 for Small Air Conditioners
 - b. SASO 2892: 2018 for Refrigerators and Freezers
2. Energy Star (<https://www.energystar.gov/>)
3. EPEAT (<https://www.epeat.net/>)

E-06 Efficient Vertical Transportation Systems

Credit Requirements	Keystone	Default Points Allocation
Requirements #1 & 2	No	1

Aim

To promote energy efficiency in design of transportation systems.

Requirements

#	Requirement	Points Available
1	Smart Elevators All elevators within the building are in compliance with SBC 601 in relation to the following energy efficiency features: - Each elevator is set up to operate in standby mode during off-peak periods. Displays, lighting and ventilation fans within the elevator turn off when the elevator is idle. - Each elevator uses only LED lights with no less than 35 lumens / circuit watt and no more than 125 lumens / circuit watt - All elevators are equipped with LED display screens (wherever applicable). - The drive controllers and motors are variable speed, variable-voltage and variable frequency. - Elevator cab ventilation fans must not exceed 0.7 W-l/s at maximum speed. - Each elevator incorporates a regenerative drive system whereby the motor acts as a generator when the elevator travels down.	1
2	Escalators All escalators within the building are in compliance with SBC 601 in relation to the following energy efficiency features: - Each escalator contains a load sensor which detects passenger weight and controls the motor output via a variable speed drive. - Each escalator has a passenger motion sensor and has the setup to operate in standby mode when passengers are not present.	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	-	1	-	1
Fit-Out	1	1	1	-	1	-	1
Full-Scope	1	1	1	-	1	-	1

Design Stage Evidence

#	Evidence per Requirement
1	- Drawings indicating the locations of all elevators in the building. - Extracts from elevators specifications showing all energy efficiency requirements.
2	- Drawings indicating the location of all escalators in the building. - Extracts from escalators specifications showing all energy efficiency requirements.

Construction Stage Evidence

#	Evidence per Requirement
1	- As-built drawings indicating the locations of all elevators with reference labels. - List of all elevators (with reference labels) stating the manufacturer and model for each elevator. - Manufacturer's datasheets for each installed elevator model confirming the presence of: - Standby mode features - LED lighting with a minimum of 125 lamp lumens/Watt - Variable speed, variable-voltage and variable frequency drive controller and motor - Fan power - Regenerative drive system
2	- As-built drawings showing the location of all escalators with reference labels. - List of all escalators (with reference labels) stating the manufacturer and model for each escalator. - Manufacturer's datasheets for each installed escalator model confirming the presence of: - Load sensor and variable speed drive of motor - Motion sensor - Sequenced operations

Supporting Guidance

Smart Elevators:

Smart elevators have the following key energy efficiency features:

- **Standby Mode**

- When the elevator is not occupied, sensors in the elevator turn off the lights, ventilation and screens (ideally 15 minutes post idle position). This can lead to significant energy savings since elevators in commercial buildings may often be idle during off-peak hours and particularly during night-time. **Regenerative Drives**

Regenerative drives recycle energy rather than wasting it as heat. When a lift car with a light load goes up, or a lift car with a heavy load goes down, the system generates more power than it needs. This electrical power must then be fed back into the building's internal electrical grid where it can be used by other building loads.

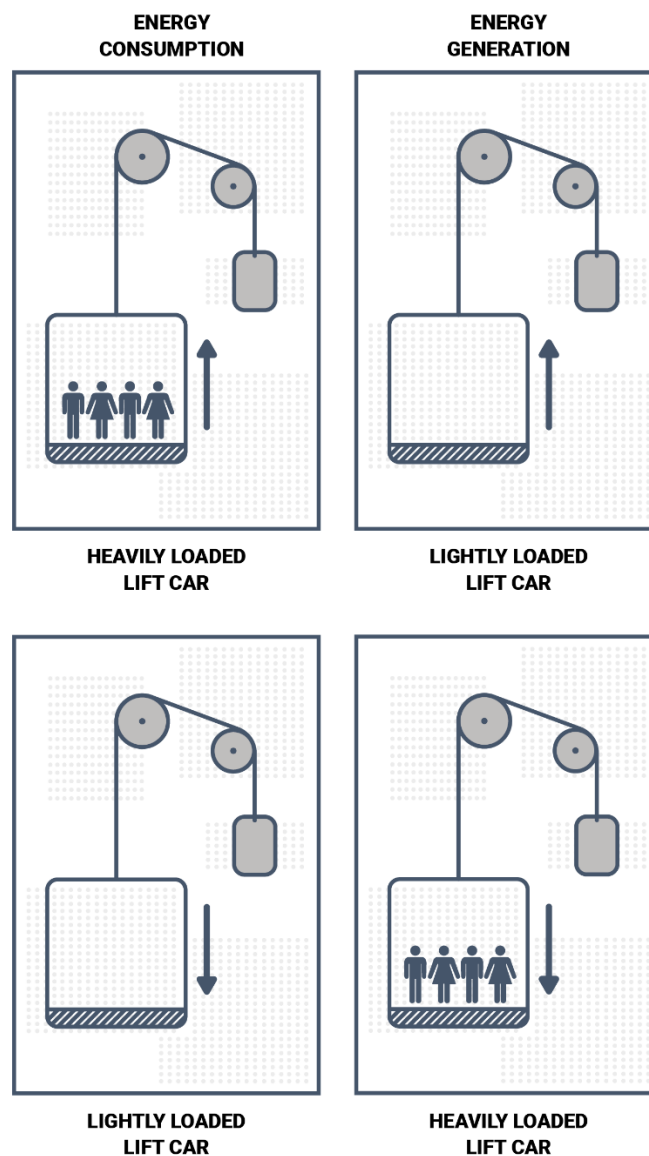


Figure E-06.1 Elevator's regeneration drives

- **Variable Frequency Drives**

A variable frequency drive (VFD) is an adjustable speed drive used on an elevator to control the motor speed (torque) by changing frequency and voltage. A VFD allows the elevator to only use the power it requires, based on the motor speed.

Escalators:

Energy efficient escalators have the following features:

- **Load Sensing Devices**

Escalators with load sensing devices are able to detect passengers on the escalator and adjust the output of the motor accordingly. A VFD controls the speed of the escalator, and is able to reduce the consumption of energy at lower speeds.

- **Standby Mode**

A motion sensor detects when an escalator is not occupied and the escalator is halted. This can lead to significant energy savings since escalators in the buildings may often be idle, particularly during the night time.

Credit Tool

N/A

Reference Documents

1. SBC 601 Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia.
2. ISO FDIS 25745-1 Energy performance of lifts, escalators and moving walks.
3. CIBSE Guide D Transportation systems in buildings 4th Edition, 2015.
4. ASME: Energy Efficient Elevator Technologies.
5. ASHRAE 90.1-2016 Appendix G.

E-07 Ozone Impacts

Credit Requirements	Keystone	Default Points Allocation
Requirement #1	No	1
Requirement #2	No	

Aim

To ensure refrigerants, fire suppression systems and maintenance gases have an Ozone Depletion Potential (ODP) of zero.

Requirements

#	Requirement	Points Available
1	All refrigerants, fire suppression systems and maintenance gases installed and used within the project boundary have an ODP of zero.	1
2	The project does not use CFCs or halon-based materials.	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	Specifications for all proposed refrigerants, fire suppression systems and maintenance gases highlighting the requirement for zero ODP.
2	Specifications prohibiting the use of CFCs or halon-based materials.

Construction Stage Evidence

#	Evidence per Requirement
1	Manufacturer's data for all purchased refrigerants, fire suppression systems and maintenance gases confirming zero ODP.
2	Confirmation that no CFCs or halon-based materials have been used.

Supporting Guidance

- Strategy for phasing out any existing refrigerants that do not comply with the US Environmental Protection Agency (EPA) under the Significant New Alternatives Policy (SNAP) evaluation criteria, or that are only acceptable until a specified year (Table E-07.1).
- Strategy for phasing out any unacceptable fire suppression system gases and maintenance gases. Table E-07.2 lists acceptable and unacceptable gases.
- The ODP of a chemical compound is a relative value that indicates the potential of a substance to destroy the ozone layer compared to the potential of chlorofluorocarbon-11 (CFC-11), which is assigned a reference value of 1. Thus, a substance with ODP of 2 is twice as harmful as CFC-11.
- Projects must comply with the list of acceptable and unacceptable gases published by the US Environmental Protection Agency (EPA) under the Significant New Alternatives Policy (SNAP) evaluation criteria.

Table E-07.1 Common refrigerants

Refrigerant	ODP	Building Application	Status
Chlorofluorocarbons			
CFC-12	1	Refrigerators and chillers	Not acceptable
Hydrochlorofluorocarbons (HCFC)			
HCFC-22/R-22	0.055	Air-conditioners and chillers	Not acceptable
HCFC-123	0.02	CFC-11 replacement	Acceptable until 2020
Hydrofluorocarbons (HFC)			
HFC-134a	0	CFC-12 and HCFC-22 replacement	Acceptable until 2021
HFC-152a	0	Refrigeration	Acceptable
HFC-245fa	0	Insulating agent, centrifugal chillers	Acceptable until 2024
HFC-407c	0	HCFC-22 replacement	Acceptable until 2024
HFC-410a	0	Air conditioning	Acceptable until 2024
HFC-417a	0	HCFC-22 replacement	Acceptable until 2024
HFC-427a	0	HCFC-22 replacement	Acceptable
HFC-450a	0	HFC-134a replacement	Acceptable
Natural Refrigerants			
Carbon Dioxide (CO ₂)	0	Refrigeration	Acceptable

Ammonia (NH ₃)	0	Refrigeration	Acceptable
Propane (C ₃ H ₈)	0	Air conditioning	Acceptable
Isobutene	0	Refrigeration	Acceptable
Air	0	Refrigeration	Acceptable
Water	0	Refrigeration	Acceptable

- During the operational phase, venting and/or direct discharging of any refrigerant equipment must be avoided at all times. During the maintenance of the refrigerant systems, all refrigerants should be recovered, recycled or reused.
- The following table lists the acceptable and unacceptable gases used in fire suppression systems and for maintenance purposes. All acceptable gases have an ODP of zero:

Table E-07.2 Fire suppression system and maintenance gases

Fire Suppression System and Maintenance Gases	
Acceptable	Unacceptable
Inergen/ IG-541	Halon 1211
FM200/ HFC-227ea	Halon 1301
Novec 1230	HBFC-22B1/FM-100
ATK OS-10	HCFC-22/R-22
Carbon Dioxide	HFC-32
Firebane® 1179	CFC-11
HFC-125/FE 25	HFC-123
IG -01, 55, 100	
N2 Towers® System	
PhostrEx	

Credit Tool

N/A

Reference Documents

1. Montreal Protocol - Kigali Amendment.
2. US EPA Significant New Alternatives Policy (SNAP), <https://www.epa.gov/snap>

Water

8 Water

The per capita demand for water has increased approximately 15% in the past 5 years² and the upward trend is expected to continue. With an arid climate, water is a precious resource in KSA and Vision 2030 promotes the optimal use of these water resources by establishing policies and infrastructure that minimize the consumption of potable water and adopt the use of treated graywater.

The Water category in Mostadam for Commercial Buildings enables building owners to capitalize on the financial incentives brought forth by Vision 2030 as the market for efficient fittings and fixtures is strengthened. Mostadam rewards projects that demonstrate a sustained reduction in water consumption when the building is in operation. This reduction can be achieved through efficient products and systems as well as the use of alternative water sources. Projects also benefit from integrating building monitoring systems that analyze water consumption as this is the first step to truly being able to understand the building's consumption patterns and taking initiatives to manage the same.

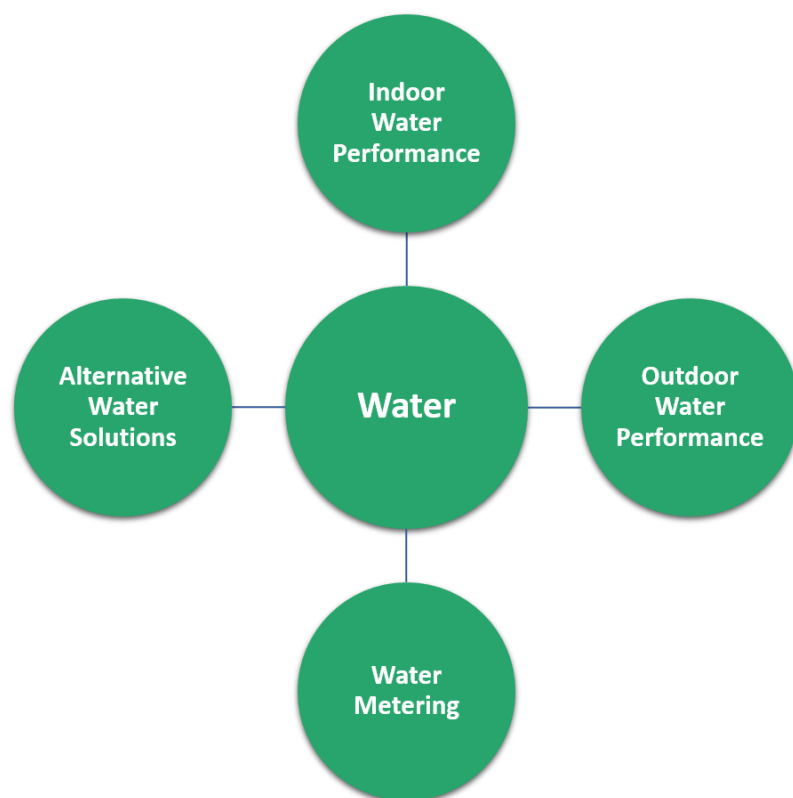


Figure 13 Water credits

² Statistical Yearbook of 2016, General Authority for Statistics.

W-01 Indoor Water Performance

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	3
Requirement #2	No	7

Aim

To reduce indoor water consumption and minimize the load on waste water systems through the installation of efficient fixtures, fittings and appliances.

Requirements

#	Requirement	Points Available
Keystone Requirement- achieve requirement #1 (3 credit points)		
1	Reduce indoor water consumption by 10% compared to the baseline.	3
2	Further reduce indoor water consumption compared to the baseline. The number of points awarded is dependent on the percentage improvement over the baseline (refer to Supporting Guidance).	7
	Total	10

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	10	10	10	10	10	-	10
Fit-Out	10	10	10	10	10	-	10
Full-Scope	10	10	10	10	10	10	10

Design Stage Evidence

#	Evidence per Requirement
1 & 2	- Indoor Water Tool. - Specifications for plumbing fixtures, fittings and appliances highlighting the required flow rates and water use.

Construction Stage Evidence

#	Evidence per Requirement
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1 & 2	- Indoor Water Tool. - Manufacturers' data for all installed plumbing fixtures, fittings and appliances indicating flow rates and flow regulation systems. - Date-stamped photographic evidence confirming the installation of the fixtures, fittings and appliances.
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Supporting Guidance

- a) The number of points achieved is dependent on the level of reduction of indoor water consumption compared to the baseline:

Table W-01.1 Points achieved for percentage improvement

Points Achieved	Percentage Improvement
3	10%
4	15%
5	20%
6	25%
7	30%
8	35%
9	40%
10	45%

- b) The baseline water consumption criteria is based on the following maximum flow rates:

Table W-01.2 Maximum flow rate/volume per water fixture

Fixture	Maximum Flow Rate/Volume
Lavatory faucet	5.7 lpm at 414 KPa
Kitchen faucet	6.84 lpm at 414 KPa
Urinals	1.89 lpf
Water closet – tank type	4.86 lpf Watersense labeled
Water closet – flushometer type	4.86 lpf
Showerhead/hand-held spray	7.6 lpm at 552 KPa Watersense labeled
Drinking fountain (manual)	2.66 lpm
Washing Machine	125.9 lpc
Dishwasher	24lpc

lpm: liters per minute, lpf: liters per flush, lpc: liters per cycle

- The water use of faucets, showerheads, hand-held sprays and drinking fountains is measured using flowrate, which is the amount of water used in one minute with the units of measure being liters per minute (lpm).

- The water use of water closets is measured in flush rates, which is the amount of water used per flush, with the units of liters per flush (lpf). The flowrates and the flush rates can be found in the product specifications.
- The water use of dishwashers is measured in liters per cycle (lpc).
- For lavatory and kitchen faucets, the flowing pressure is set at 414KPa as this is the most common water pressure. Table W-01.3 provides an example of a section of the product specifications for a kitchen faucet.

Table W-01.3 Sample of a section of product specifications for a kitchen faucet

Technical Information	
Flow rate (lpm)	5.7
Pressure (KPa)	414

Credit Tool

Water Tool

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 7 Water Resource, Conservation, Quality and Efficiency.

W-02 Outdoor Water Performance

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	2
Requirement #2	No	3
Requirement #3	No	2
Requirement #4	No	2
Requirement #5	No	1

Aim

To reduce outdoor water consumption and minimize the load on waste water systems.

Requirements

#	Requirement	Points Available
Keystone Requirement - achieve requirement #1 (2 credit points).		
Irrigation system		
1	The irrigation system is designed and installed to reduce potable water use by 50% compared to the midsummer baseline.	2
2	The irrigation system is designed and installed to further reduce potable water use compared to the midsummer baseline. The number of points awarded is dependent on the percentage improvement over the baseline (refer to Supporting Guidance).	3
3	The irrigation system is controlled by smart controllers, rain sensors and/or soil moisture sensors.	2
Landscaping		
4	There are no turfed areas within the project boundary.	2
Water features		
5	There are no outdoor water features within the project boundary.	1
	Total	10

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	10	10	10	10	10	-	10
Fit-Out	-	-	-	-	-	-	-
Full-Scope	10	10	10	10	10	10	10

Design Stage Evidence

#	Evidence per Requirement
1, 2 & 3	- Outdoor Water Tool. - Irrigation plan highlighting planted areas, irrigation zones and their water requirements, and the location of smart controllers, rain sensors and/or soil moisture sensors. - Specifications for the irrigation system including the requirement for smart controllers, rain sensors and/or soil moisture sensors.
4	Site plan showing that no turf is present.
5	Site plan showing that no outdoor water features are present.

Construction Stage Evidence

#	Evidence per Requirement
1, 2 & 3	- Outdoor Water Tool. - As-built irrigation plan highlighting planted areas, irrigation zones and their water requirements, and the location of smart controllers, rain sensors and/or soil moisture sensors. - Manufacturers' data for the irrigation system including the smart controllers, rain sensors and/or soil moisture sensors. - Date-stamped photographic evidence of the installed irrigation system.
4	As-built site plan confirming that no turf is present.
5	As-built site plan confirming that no outdoor water features are present.

Supporting Guidance

- a) The number of points achieved is dependent on the level of reduction of outdoor water use compared to the midsummer baseline:

Table W-02.1 Points achieved for percentage improvement

Points achieved	Percentage improvement
2	50%
3	60%
4	70%
5	80%

- b) All irrigation systems must be planned and installed by a Certified Professional accredited by a WaterSense labeled program or an equivalent national or international program.
- c) Irrigation zones must be planned by grouping plants of similar water requirements together.
- d) The use of native plant species is addressed in credit **SS-04 Ecological Enhancement**.

Credit Tool

Water Tool

Reference Documents

1. Saudi Building Code (SBC) 701 Sanitary Code – Plumbing.
2. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 7 Water Resource, Conservation, Quality and Efficiency.
3. WaterSense Irrigation Program (<https://www.epa.gov/watersense>).

W-03 Water Metering

Credit Requirements	Keystone	Points Allocated
Requirement #1 & #2	Yes	2

Aim

To install water meters for monitoring internal and external water use, and to use the data to encourage effective management of consumption levels.

Requirements

#	Requirement	Points Available
1	Meters are provided at whole building level for main supply and/or landlord areas. For individual tenant spaces refer to Supporting Guidance.	1
2	Create and implement a sub-metering strategy which monitors the building's internal and external water usage as detailed in the Supporting Guidance section and conforms to SBC 1001 Chapter 7.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	- Drawings indicating the type, extent and location of all water meters. - Specifications of water meter requirements. - Mostadam Guide (refer to credit EI-01 Mostadam Guide) section on water metering providing user support and understanding of the level of: - The end-use category and level of installed sub-metering - Remote access capabilities - Guidance on best practices for using metering data to reduce water consumption.

2	Sub-metering strategy outlining estimated water usage of the building and system categories to be monitored.
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Construction Stage Evidence

#	Evidence per Requirement
1	- As-built drawings showing the type, extent and location of all water meters. - Manufacturer's data for the installed water meters to confirm required technical functionality along with date-stamped photographic evidence. - Mostadam Guide (refer to credit EI-01 Mostadam Guide) section on water metering providing user support and understanding of the level of: - The end-use category and level of installed sub-metering. - Remote access capabilities - Guidance on best practices for using metering data to reduce water consumption.
2	Updated sub-metering strategy confirming estimated water usage of the building and system categories being monitored.

Supporting Guidance

Water Sub-metering Strategy:

Water metering will inform the operators about the systems and areas that have higher water consumption than expected. The development of a sub-metering strategy should start at the schematic design stage. This strategy should consider all water sources, including external and internal. Any alternative sources such as recycled wastewater must be identified and considered in the strategy.

Sub-metering:

The following table defines the end-use sub-metering requirements:

Table W-03.1 Metering requirements

Area of Installation	Any Commercial Building	
	Landlord Areas	Tenant Areas
Tenant spaces		✓
Water based cooling systems	✓	
Irrigation	✓	
Swimming pools & shower facilities	✓	
Indoor and outdoor water features	✓	
External hose bibs (including roof)	✓	
Internal hose bibs (including garage)	✓	
Indoor public water usage	✓	✓

- a) Examples of internal water usage in landlord areas include public showers and toilets for the gym or guard's toilet, and pantries.
- b) For projects with chiller yard or other closed loop systems, makeup water must be separately sub-metered.

All meters and sub-meters must:

- Have data ports.
- Have a pulsed output.
- Have remote data accessibility.
- Have provision to be connected to a data acquisition and management system which can store data for at least three years.
- Be capable to provide hourly, daily, weekly, monthly and annual water consumption for each meter and have logging capabilities for comparison of consumption levels to previous data.
- Be systematically labeled as per the end-use.
- Installed for ease of access and maintenance.

Meter Tagging:

All meters should be appropriately tagged with the following information:

- System ID: Identification of the system that the meter is connected to.
- Level of Meter: Represents the layer the meter is on.
- Meter ID: Meter identification number.

Ideally the meter tagging should reflect the following format: *[System ID] - [Level of Meter] - [Meter ID]*. In the example (Figure W-01.1), the system ID is 'HW', the level of meter is '01' and the meter ID is '02'.



Figure W-01.1 Meter tagging

Data Acquisition:

- a) All sub-meters must be connected to a data acquisition and monitoring system which is capable of being remotely connected to *Sustainable Building*. All data will be treated as confidential. This requirement should be included in the Mostadam Guide (credit **EI-01 Mostadam Guide**) as information for the building's occupants.

- b) The data monitoring system must provide hourly, daily, weekly, monthly and annual water consumption for each meter and have logging capabilities and be programmed to show comparison of consumption levels to previously collected data.
- c) The system must also have the capability and be programmed to alert facility management to unusually high consumption levels.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 7 Water Resource, Conservation, Quality and Efficiency.

W-04 Alternative Water Solutions

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1
Requirement #3	No	1

Aim

To reduce dependence on potable water by encouraging projects to implement alternative water conservation solutions.

Requirements

#	Requirement	Points Available
1	Air conditioning water condensate 100% of air conditioning water condensate from the following HVAC systems is recovered and reused on-site for water closet (WC) flushing and/or irrigation: - Indoor units - Fresh Air Handling Units (FAHUs)	1
2	Graywater recycling 100% of graywater from available sources in the building such as showers, sinks, washing machines and dishwashers is collected and recycled to be used on-site for WC flushing and/or irrigation.	1
3	Treated wastewater At least 50% of wastewater is treated on-site and infiltrated or used on-site for irrigation. Tertiary treatment is required, refer to the "Supporting Guidance" for more information.	1
	Total	3

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques*	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	3	3	3	4	3	-	3
Fit-Out	3	3	3	4	3	-	3
Full-Scope	3	3	3	4	3	4	3

*Requirement #1 awards 2 points to Warehouses and Mosques typologies at all applicable scopes.

Design Stage Evidence

#	Evidence per Requirement
1	• Calculations confirming the amount of water condensate recovered from the AC units. • Mechanical drawings confirming the end-use of the recovered condensate (i.e. irrigation tank or water tank for WC and urinal flushing).
2	• Water balance calculations confirming the estimated amount of graywater to be recovered against the amount of irrigation and/or toilet flushing water consumption. • Mechanical drawings confirming the collection, treatment and distribution of graywater. • Technical specifications of the graywater treatment system.
3	• Water balance calculations confirming the estimated volume of wastewater from the project against the amount of irrigation water consumption. • Mechanical drawings confirming the collection, treatment and distribution of wastewater. • Technical specifications of the wastewater treatment system.

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built calculations confirming the amount of water condensate recovered from the AC units. • As-built mechanical drawings confirming the end-use of the recovered condensate (i.e. irrigation tank or water tank for WC and urinal flushing).
2	• As-built water balance calculations confirming the estimated amount of graywater to be recovered against the amount of irrigation and/or toilet flushing water consumption. • As-built mechanical drawings confirming the collection, treatment, and distribution of graywater. • Manufacturer's data and specifications for the graywater treatment system.
3	• As-built water balance calculations confirming the volume of wastewater from the project against the amount of irrigation water consumption. • As-built mechanical drawings confirming the collection, treatment and distribution of wastewater. • Manufacturer's data and specifications for the wastewater treatment system.

Supporting Guidance

The design and calculations associated with all three requirements of water recycling systems are to be undertaken by a Waste Water Engineer. The amount of recycled water generated should be entered in the Water Tool. The Water Tool will incorporate this data into the calculation of the percentage reduction in water consumption for **W-01 Indoor Water Performance** and **W-02 Outdoor Water Performance**.

Air Conditioning Water Condensate:

Condensation occurs when the evaporative coil in the air conditioning unit cools down the warm air blown over it and moisture is formed on the coil. This is similar to how water droplets form on a cold water bottle kept outside on a hot day. In hot and humid weather, an air conditioner may produce up to 75 liters of water per day. This water is typically piped to the floor drain/sewage system. However, air conditioning condensate water is of good quality and ideal for WC and urinal flushing, as well as irrigation. AC condensate water is not safe for human consumption.

When designing a system to capture air conditioning condensate, it is important that the system captures condensate from all air conditioning units in the building and the piping network is properly designed to transfer water to the relevant tank or water system.

Graywater Recycling:

Following a treatment process, greywater can be utilized for toilet flushing and/or irrigation. Graywater is generally obtained from showers, sinks, washing machines, dishwashers etc.

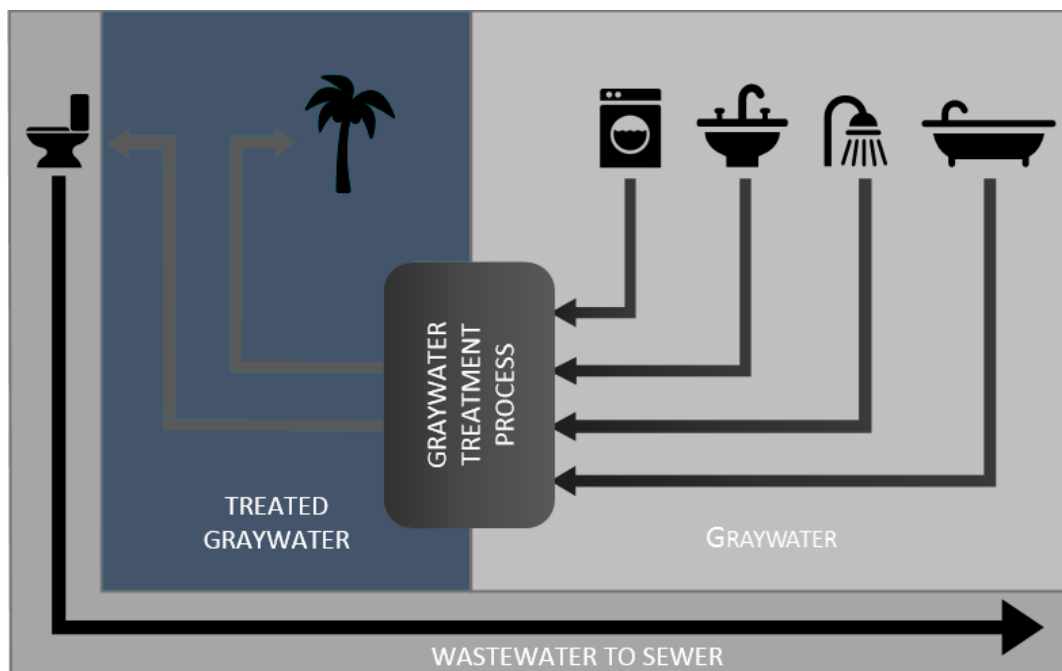


Figure W-03.1 Graywater recycling schematic

When designing a mixed network, the potable water must be separated from the graywater to prevent contamination and human contact.

For a system being designed to capture and reuse graywater, it is important to consider the following:

- **System should not store graywater for more than 24 hours**

Any nutrients in the graywater will break down if the graywater is stored for long periods of time, also resulting in bad odors. Therefore, the amount of water required for flushing and irrigation should be properly calculated to define the estimated volume of graywater that will be recycled.

- **Direct human contact with untreated graywater should be minimized**

The system network should be designed to soak graywater into the ground and away from any human contact or water outlets that are for domestic use.

- **Assess flushing and irrigation demand**

It is important to quantify the water demand required for flushing and irrigation. If the amount of recycled graywater is not sufficient, an additional supply of potable water must be considered.

Treated Wastewater:

Wastewater treatment involves three stages, in the following order:

1. Primary treatment, which includes screens to remove solids, sedimentation, and grit.
2. Secondary treatment, which includes the removal of carbonaceous organic matters, nutrients and separation of biomass from liquid.
3. Tertiary treatment, which includes a filtering and disinfecting process that improves the water quality before it is recycled or infiltrated.

Tertiary treatment produces high quality water and is the advanced treatment process following the secondary treatment of wastewater. Tertiary treatment includes the removal of organics, solids, and nutrients such as phosphorus and nitrogen, as well as biological or chemical polishing, generally to effluent limits of:

- Biological oxygen demand (BOD) of 10 mg/L
- Total suspended solids (TSS) of 10 mg/L

Credit Tool

Water Tool

Reference Documents

1. SBC 1001, Section 702.6 Municipal Reclaimed Water.
2. SBC 1001, Section 703.4 Condensate Drainage Recovery.
3. US Environmental Protection Agency (USEPA) Onsite Wastewater Treatment Systems Manual, 2002.

Health and Comfort

9 Health and Comfort

Vision 2030 aims to create and maintain a vibrant society in which residents live fulfilling lives. The built environment has profound effects on human health, and buildings can be powerful promoters of health, comfort and well-being. For example, comfort can include thermal comfort, visual comfort and good indoor air quality, achieving which occupants shall have the added benefit of promoting physical and mental health.

The Health and Comfort category in Mostadam provides a number of mechanisms through which the goals and objectives of Vision 2030 are supported. These include the promotion of good indoor air quality through ventilation and the application of non-polluting construction materials to ensure occupant health, wellbeing and overall satisfaction with their surroundings. Moreover, this category aims to push the boundaries of physical accessibility through innovative and indigenous design strategies to foster inclusivity in its approach. Another aspect of this category is the provision of cooler outdoor environments where projects are rewarded based on their strategies of incorporating a conducive outdoor setting, one that is comfortable for occupants throughout the year.

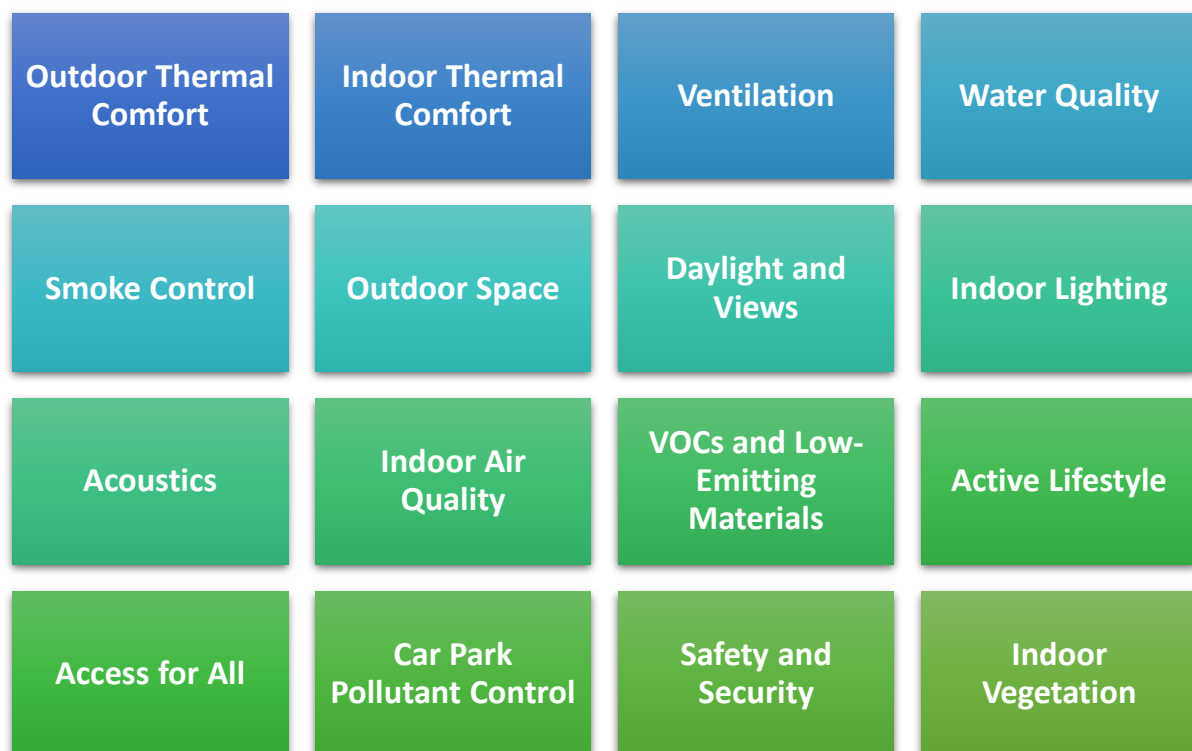


Figure 14 Health and Comfort credits

HC-01 Outdoor Thermal Comfort

Credit Requirements	Keystone	Points Allocated
Requirement #1 & 2	Yes	1

Aim

To improve outdoor thermal comfort and encourage more active lifestyles.

Requirements

#	Requirement	Points Available
1	Develop and implement an Outdoor Thermal Comfort Strategy that includes consideration of the following: - Prevailing wind and seasonal weather. - Building location, orientation and pedestrian connectivity. - Shading (from buildings and shade structures). - Selection of solar reflective materials.	1
2	Provide a minimum of 50% shading cover to the following where they exist within the plot: - Courtyards, - Public open spaces. Provide a minimum of 75% shading cover to the following where they exist within the plot: - Pedestrian walkways, - Playgrounds, - Car and bicycle parking. <i>Note: Requirement is not applicable to 'Shell only' projects.</i>	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	1	1	1	1	1	-	1
Core & Shell	1	1	1	1	1	-	1
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	Outdoor Thermal Comfort Strategy including visualizations of the development and the strategies employed.
2	- Drawings highlighting the areas that require shading. - Calculations in table format showing that a minimum percentage of shading cover is achieved.

Construction Stage Evidence

#	Evidence per Requirement
1	Updated Outdoor Thermal Comfort Strategy including photographs of the strategies employed.
2	- As-built drawings highlighting the areas that require shading. - Calculations in table format showing that a minimum percentage of shading cover is achieved.

Supporting Guidance

The outdoor thermal environment is greatly influenced by the built environment, e.g. anthropogenic heat, evaporation and evapotranspiration of plants, shading by trees and man-made objects, and ground surface cover such as natural grass and permeable paving, etc. Outdoor spaces provide a pleasurable thermal comfort experience for people and effectively improve the quality of urban living.

People experience different thermal sensation while carrying out the outdoor activities in streets, plazas, playgrounds, urban parks, etc. Thermal Comfort is the condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation (ANSI/ASHRAE Standard 55, 2017). Based on a project's context, the following strategies can be implemented on-site to enhance outdoor thermal comfort by cooling the exterior microclimate:

- Shading
- Ventilation
- Building orientation
- High-albedo surfaces
- Evaporative cooling
- Thermal mass
- Radiative cooling

Outdoor Thermal Comfort Strategy

The Outdoor Thermal Comfort Strategy must include:

- A description of how the credit requirements are met.
- Examples of the shading strategies to be employed.
- Relevant images/3D visualizations of the strategies.

- Shading calculations must be based on the sun's position at midday on the equinox and the summer solstice. The analysis is to be undertaken using simulation software.
 - Equinox: The time at which the sun crosses the celestial equator, when day and night are of equal length (around 22nd September and 20th March).
 - Summer Solstice: When the sun reaches its highest position in the sky on the day with the longest period of daylight (21st June or 22nd June).

Table HC-01.1 Example of shading simulation results

Area Type	Area (Sq.m)	Shaded Area - June 21 (Summer Solstice) - 1:00pm	Shaded Area - June 21 (Equinox) - 1:00pm	Shading Percentage Summer Solstice	Shading Percentage Equinox	Mostadam Requirement
Front Entrance, Patios and Courtyard	681.66 sq.m	440.21 sq.m	447.91 sq.m	64.57%	65.70%	50%
Pedestrian Walkway- Primary	15.83 sq.m	15.83 sq.m	15.83 sq.m	100%	100%	75%
Pedestrian Walkway- Secondary	47.61 sq.m	40.82 sq.m	40.36 sq.m	85.73%	84%	75%
Playground	N/A	0	0	0	0	50%
Surface Parking	N/A	0	0	0	0	75%
Bicycle Park and Path	48.7 sq.m	45.3 sq.m	44.84 sq.m	92.07%	93.01%	75%

- The shaded area cast by trees can be based on their canopy size at a maximum of 5 years post-construction.
- Grid or lattice structures that create dappled shading and provide more than 75% shade can be considered as providing 100% shade. Otherwise, shaded areas under a grid or lattice that provide less than 75% shade must only calculate the actual shaded portion.
- Where structural shading is provided, it must comply with the requirements of credit **SS-05 Heat Island Effect**.

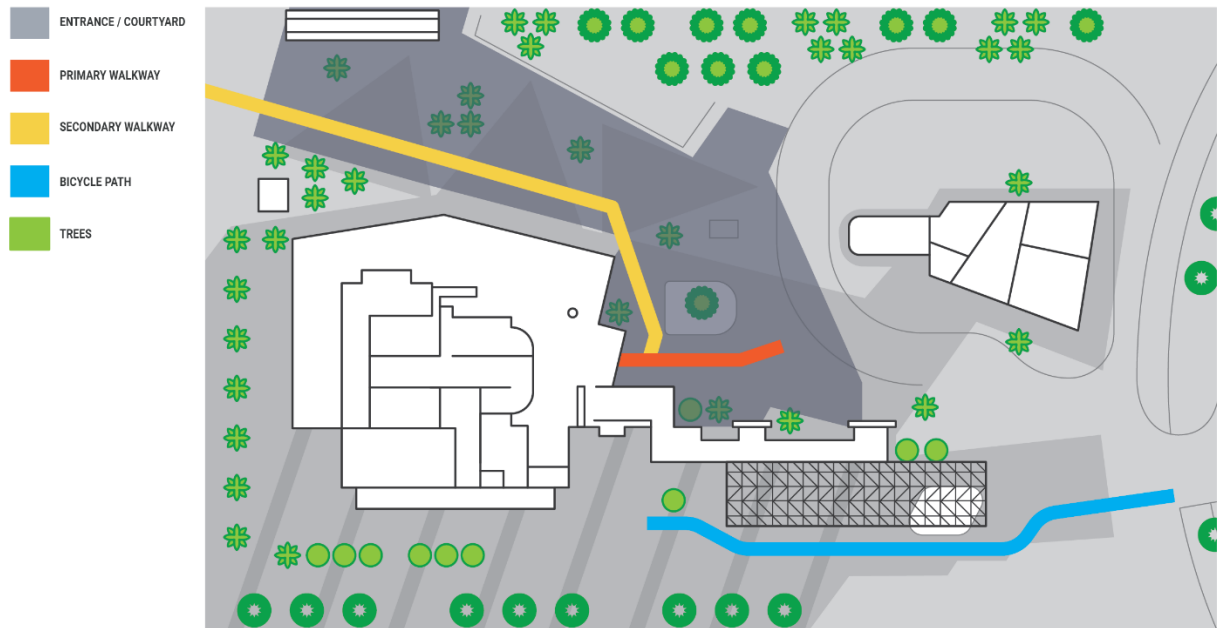


Figure HC-01.1 Shading provided in a project

Credit Tool

N/A

Reference Documents

1. ASHRAE Standard 55, Thermal Environmental Conditions for Human Occupancy Standard, 2017.
2. ASTM E1980-11 Standard Practice for Calculating Solar Reflective Index of Horizontal and Low Sloped Opaque Surfaces.
3. ASTM C1549-16 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
4. ASTM E408-13 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

HC-02 Indoor Thermal Comfort

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	3

Aim

To increase thermal comfort by providing occupants with control over their indoor environment.

Requirements

#	Requirement	Points Available
Keystone Requirement – achieve requirement #1 (1 credit point)		
1	Thermostatic controls are provided in each regularly occupied space (as per the Supporting Guidance).	1
2	Occupancy sensors are provided for the following: 100% of individual occupant spaces. 100% of multi-occupant spaces. 50% of open-plan spaces. Occupancy sensors must be linked to the air conditioning system to enable the temperature and air flow rate to be adjusted based on the detected occupancy.	1
3	Demonstrate that Thermal Modeling is carried out to evaluate comfort levels in the building using Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD) Methods in accordance with ISO 7730:2005.	1
	Total	3

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques*	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	3	3	3	3	3	-	3
Fit-Out	3	3	3	3	3	-	3
Full-Scope	3	3	3	3	3	4	3

*Requirement #3 awards 2 points to Mosques typology.

Design Stage Evidence

#	Evidence per Requirement
1	• Drawings highlighting the regularly occupied spaces and showing the locations of the thermostatic controls.
2	• Drawings highlighting the occupant spaces and showing the locations of the occupancy sensors. • Drawings of all multi-occupant spaces showing the thermal zones and the location of the thermostatic controls and occupancy sensors.
3	• Simulations of thermal model with PMV and PPD results in required limits, in accordance with ISO 7730:2005.

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings highlighting the regularly occupied spaces and showing the locations of the thermostatic controls. • Date-stamped photographic evidence of the thermostatic controls.
2	• As-built drawings highlighting the occupant spaces and showing the locations of the occupancy sensors. • As-built drawings of all multi-occupant spaces showing the thermal zones and the location of the thermostatic controls and occupancy sensors. • Date-stamped photographic evidence of the thermostatic controls and occupancy sensors.
3	• Updated simulations of thermal model with PMV and PPD results in required limits, in accordance with ISO 7730:2005, reflecting any deviation from the design stage.

Supporting Guidance

- a) Thermal comfort is used to describe the state of mind associated with satisfaction with the thermal environment.
- b) “Regularly occupied spaces” are areas where any building user spends more than one hour per day performing any activity inside the building. Examples of regularly occupied spaces can be the following per building typology, as listed in Table HC-02.1:

Table HC-02.1 Regularly occupied spaces in different building typologies

Building Typology	Examples of Occupancy type
Educational Institutions	Classrooms, lecture halls Cafeteria Administrative areas Laboratories Multi-purpose halls Library Auditoria
Offices, Commercial, Government	Workstations Lobby Meeting and Conference Rooms Pantry
Retail, Restaurants	Retail space Dining area Commercial kitchens
Warehouses	Assembly/manufacture space Worker rest area
Hospitality	Living space Lobby Gymnasium Banquet Hall Conference Rooms Kitchens, restaurants and dining
Mosques	Majlis Men's praying area Communal area
Healthcare	Treatments, care & examination rooms Specialized services Administrative areas Patient rooms Waiting rooms Lobby Cafeteria

- c) "Multi-occupant spaces" are areas which are dedicated for grouped activities or to be used by more than one occupant at the same time. Those areas that can be sub-divided by partitions and moveable walls must have one control for each space subdivision as per ASHRAE 55-2010.
- d) Thermostatic controls must, at a minimum, allow occupants to adjust the air temperature and air speed.

- e) The building mechanical systems, controls, and thermal envelope must comply with the conditions stated in ASHRAE 55 Sections 6.1 and 6.2.
- f) Communal areas such as lobbies and corridors have designated thermal zones with thermostatic controls. Occupancy sensors are provided in these zones and are linked to the air conditioning system.
- g) Retail areas can be excluded from Requirements #1 & 2.

Thermal Modelling

Thermal Modelling must be calculated in using the PMV and PPD indices in accordance with ISO 7730:2005, achieved during standard hours of operation for 98% of the year. Table HC -02.1 defines the recommended PMV and PPD range for typical applications. Additional guidance can be obtained from ANSI/ASHRAE 55-2010.

Table HC 02.2 Acceptable Thermal Environment for General Comfort

PPD	PMV Range
< 10	-0.5 < PMV < +0.5

Credit Tool

N/A

Reference Documents

1. ASHRAE 55-2010 Thermal Environmental Conditions for Human Occupancy.
2. ASHRAE 62.1-2016 Ventilation for Acceptable Indoor Air Quality.
3. ISO 7730:2005 Ergonomics of the thermal environment -- Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria.

HC-03 Ventilation

Credit Requirements	Keystone	Points Allocated
Requirements #1 & #2	Yes	1

Aim

To provide adequate fresh air to all occupied spaces to enhance the indoor environment and improve human comfort.

Requirements

#	Requirement	Points Available
1	Mechanically ventilated spaces: The fresh air flow rates and exhaust rates must comply with Saudi Building Code (SBC) 501, Chapter 4 Ventilation. Mixed mode/ Naturally ventilated spaces: For buildings designed to be operated as mixed mode buildings with openable windows, the minimum openable area to the outdoors must be 5% of the floor area being ventilated.	1
2	Demand Controlled Ventilation (DCV) CO ₂ sensors are installed in all densely occupied areas of the building larger than 50m ² . The sensors are capable of modulating the fresh air supply rates for these areas as required, through an appropriate ventilation system such as a variable air volume (VAV) box. Refer to Supporting Guidance for more information.	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	1	1	1	1	1	-	1
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	Mechanically ventilated spaces: • Mechanical schedules confirming the fresh air flow rates of the proposed AHUs/FAHUs. • Tabulated results comparing the fresh air flow rates to the SBC 501 levels. Mixed mode/ Naturally ventilated spaces: • Drawings including architectural plans and elevations highlighting the occupied spaces which are designed for mixed mode operation or have openable windows, their net area and the location of the openable windows. • Window schedule confirming the openable free area. • Tabulated results comparing the GFA to the openable free area for each occupied space demonstrating that the 5% requirement is achieved.
2	• Drawing highlighting the densely occupied areas of the building larger than 50m² and showing the locations of the CO₂ sensors. • System schematic showing the CO₂ sensors and their link to the ventilation system to modulate the fresh air supply rate.

Construction Stage Evidence

#	Evidence per Requirement
1	Mechanically ventilated spaces: • As-built mechanical schedules and manufacturer's technical datasheets confirming the fresh air flow rates of the proposed AHUs/FAHUs, based on commissioning test results. • Tabulated results comparing the fresh air flow rates to the SBC 501 levels. • Date-stamped photographic evidence of the installed AHUs/FAHUs. Mixed mode/ Naturally ventilated spaces: • As-built drawings including architectural plans and elevations highlighting the occupied spaces which are designed for mixed mode operations or have operable windows, their net area and the location of the openable windows. • As-built window schedule confirming the openable free area. • Tabulated results comparing the GFA to the openable free area for each occupied space confirming that the 5% requirement is achieved.
2	• As-built drawing highlighting the densely occupied areas of the building larger than 50m² and showing the locations of the CO₂ sensors. • As-built system schematic showing the CO₂ sensors and their link to the ventilation system to modulate the fresh air supply rate.

Supporting Guidance

Natural Ventilation:

Natural ventilation is the process of supplying air to, and removing air from, an indoor space without using mechanical systems. It refers to the flow of external air into an indoor space as a result of pressure differences arising from natural forces.

Naturally Ventilated Space – Adjoining Spaces:

Where rooms and spaces, without openings to the outdoors, are ventilated through an adjoining room, the opening to the adjoining rooms shall be unobstructed and shall have an area not less than 8% of the floor area of the interior room or space, and not less than 2.3 m². The minimum operable area to the outdoors shall be based on the total floor area being ventilated.

Mixed Mode Ventilation:

Mixed-mode ventilation requires space conditioning using a combination of natural ventilation from operable windows and mechanical systems, including HVAC.

Openable Free Area:

The openable free area is the ventilation area created when a ventilation device, e.g. window, is open to its full extent (refer to Figure HC-03.1). It is not the total window/glazed area or the area of the part of the window that opens (unless it is fully openable).

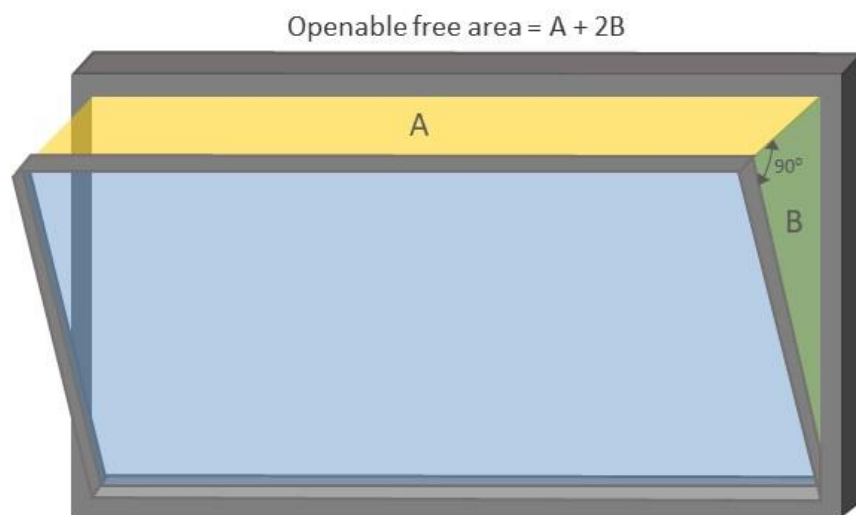


Figure HC-03.1 Openable free area

Mechanical Ventilation:

When designing ventilation systems to provide fresh air to occupied spaces, it is important to maintain efficiency in sizing to optimize performance and prevent unnecessary energy consumption. In order to achieve this, the Saudi Building Code SBC 501 defines the parameters for designing mechanical ventilation.

For occupied spaces, SBC 501 defines specific values for fresh air rates that need to be achieved by the ventilation system. To demonstrate compliance with this requirement, it is expected that space by space fresh air calculations will be developed for the building. These calculations will provide the fresh air rate required for each space based on the area and occupancy, ensuring that it is within SBC 501 requirements. Below is a sample of such a fresh air calculation:

Table HC-03.1 Sample Fresh Air Calculation

Space	Location	Area (m ²)	Occupancy (Persons)	Fresh Air Rate/ Person	Fresh Air Rate/ Area	Total SBC 501 required Fresh Air (L/s)	Proposed Fresh Air rate
Office 1	First Floor	20	3	2.5	0.3	(3*2.5)+(0.3*20) = 13.5 L/s	14 L/s

Demand Controlled Ventilation:

Demand controlled ventilation systems include CO₂ sensors. CO₂ sensors provide data to smart controllers, or a building energy management system, which monitors the levels within the building and modulates the fresh air ventilation rates accordingly. Spaces are thus provided with an appropriate amount of fresh air in the most efficient way to prevent energy waste. Such a system should be considered for densely occupied areas.

Densely occupied areas are those with an occupant density greater than 1 person per 2.5m² (40 persons per 100m²). CO₂ sensors must be installed at an appropriate height from the floor within the breathing zone (1 to 2 meters above finished floor level FFL) and programmed so that CO₂ levels do not exceed 1000ppm. As a minimum, there must be one CO₂ monitor per densely occupied area or one per ventilation zone, whichever is greater.

Calculating Occupant Density:

Consider a meeting room that with an internal area of 129m² and designed maximum occupancy of 30 people.

$$\text{Occupant Density} = \frac{30}{129} = 0.23$$

The occupant density in this scenario is 0.23, which is less than the requirement of 0.4 (or 40 persons per 100m²), therefore, CO₂ sensors are not required.

Consider another example using the same space of 129m² area but with an expected occupancy of 55 people.

$$\text{Occupant Density} = \frac{55}{129} = 0.42$$

The occupant density is 0.42, which is higher than 0.40. Therefore, CO₂ sensors will be required for this space.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 501 Mechanical, Chapter 4 Ventilation.
2. International Mechanical Code, 2015.

HC-04 Water Quality

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1
Requirement #2	No	1

Aim

To mitigate the risk of Legionella in water-based building systems and provide occupants with access to high quality drinking water.

Requirements

#	Requirement	Points Available
1	Legionella Management Develop and implement a Legionella Management Plan for all relevant water-based systems and undertake sample testing at the end of construction and commissioning. Refer to Supporting Guidance for details.	1
2	Provision of Drinking Water - Provide building occupants with access to mains supplied drinking water that incorporates filtration systems to maintain water quality and is supplied at both mains and chilled temperatures. The building should have a minimum of one water fountain per floor. - Develop and implement maintenance procedure for installed drinking fountains.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques*	Healthcare**
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	3	2	-	2
Fit-Out	2	2	2	3	2	-	3
Full-Scope	2	2	2	3	2	3	2

*Requirement #2 awards 2 points to Warehouses and Mosque typologies for all applicable scopes.

**Requirement #2 awards 2 points to Healthcare typology for fit-out scope.

Design Stage Evidence

#	Evidence per Requirement
1	• Inventory of all water-based systems and water treatment systems. • Drawings of all water-based systems and water treatment systems. • Legionella Management Plan. • Extract from specifications for water treatment systems to be installed, for requirement of legionella prevention and water sample testing. • Design for Legionella mitigation signed off by the Commissioning Agent (CxA).
2	• Drawings highlighting the location of drinking fountains and its connection to the water mains. • Extract from specifications for the water filtration systems and associated water chilling equipment. • Operations and Maintenance (O&M) manuals for the installed water fountains and equipment.

Construction Stage Evidence

#	Evidence per Requirement
1	• Inventory of all water-based systems and water treatment systems. • As-built drawings of all water-based systems and water treatment systems. • Updated Legionella Management Plan. • Date-stamped photographs of all water treatment systems. • Test reports of Legionella testing for all relevant water-based systems, signed off by the Commissioning Agent (CxA).
2	• As-built drawings highlighting the location of drinking fountains and its connection to the water mains. • Date-stamped photographs of installed water fountains. • Test reports of water quality for all installed drinking fountains, signed off by Commissioning Agent (CxA). • Operations & Maintenance Manuals (O&M) for the installed water fountains and equipment.

Supporting Guidance

Legionnaires' disease is a severe form of pneumonia, caused by Legionella bacterium. The disease is transmitted by inhaling the bacteria and is easily spread through mist or water vapor. Legionella bacteria tends to grow in biofilms that typically form when water is allowed to stagnate, or the water flow is low. Water based systems include all plants, equipment and components associated with the system, and is considered as a whole. Relevant water-based building systems includes but is not limited to:

- Swimming pools and water features
- Hot and cold water systems

- Drinking fountains
- Irrigation
- Cooling towers
- Water features and fountains
- Fire Fighting Systems
- Evaporative Coolers
- All other plants and systems which may release aerosol or spray of water during operations and are likely to exceed 20° C of water temperature.
- Water sample testing must be conducted at the end of construction prior to occupancy to verify that all relevant water based systems are free from Legionella bacteria.

Legionella Management Plan

The Legionella Management Plan (LMP) should contain the following as a minimum:

- Risk assessment and identification for all water-based systems.
- Risk management plan defining roles and responsibilities, training, and competency requirements for all personnel overseeing procedures of legionella management on the project.
- Control plan to limit exposure risk.
- Record-keeping mechanism to keep logs and records of maintenance and documentation.
- Duties and responsibilities of those based in the supply of water systems to ensure information on risks is provided to all end-users.
- Mitigation of legionella shall be implemented in all equipment and associated components of the water-based systems, including but not limited to pipes, pumps, feed tanks, valves, heat exchangers, etc.
- The LMP must comply with the requirements outlined in the following documents:
 - Health and Safety Executive, Legionnaires' disease; The control of legionella in water systems. Approved Code of Practice and Guidance on Regulations, 4th edition, 2013.
 - Health and Safety Executive, Legionnaires' disease; Part 1: The control of legionella bacteria in evaporative cooling systems, 2014.
 - Health and Safety Executive, Legionnaires' disease; Part 2: The control of legionella bacteria in hot and cold water systems, 2014.
 - Health and Safety Executive, Legionnaires' disease; Part 3: The control of legionella bacteria in other risk systems, 2014.
 - Section 8.6 Operations and Maintenance, SBC 601 Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia, 2018.
- Testing must be performed by specialized laboratories accredited by Saudi Accreditation Committee (SAC), and the General Authority of Meteorology and Environmental Protection (GAMEP).

Drinking Fountains:

- Drinking fountains filter water sourced from the mains water supply. The use of such systems ensures high quality, filtered drinking water, reducing the demand for plastic water bottles, most of which can be found polluting the environment and damaging ecosystems.
- Compliant drinking fountains shall be able to provide water at both cold and hot temperatures. Additionally, drinking fountains shall be equipped with manual or automated control to prevent water waste, in accordance with Section 702.4 of the SBC 1001.
- In order to promote access to clean drinking water for all building occupants, water fountains should be located in an area where a majority of building occupants on the floor are able to use it. In the case of multiple tenants on one floor, it is recommended that the water fountains are installed in the common pantry.
- The maintenance procedure for drinking fountains shall be included in the Mostadam Guide developed for **EI-01 Mostadam Guide**. It should contain the following at a minimum:
 - Cleaning schedule for any drip trays.
 - Cleaning schedule for surfaces around the drinking fountain.
 - Cleaning and filter replacement schedule and log sheets.
 - Procedure of periodic testing of water samples from all installed drinking fountains.

Credit Tool

N/A

Reference Documents

1. SBC 601, Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia, Section 8.6 Operations and Maintenance, 2018.
2. SBC 1001, Drinking Fountain Controls, Section 702.4, 2018.
3. Health and Safety Executive, Legionnaires' disease; The control of legionella in water systems, Approved Code of Practice and Guidance on Regulations, 4th edition, 2013.
4. Health and Safety Executive, Legionnaires' disease; Part 1: The control of legionella bacteria in evaporative cooling systems, 2014.
5. Health and Safety Executive, Legionnaires' disease; Part 2: The control of legionella bacteria in hot and cold water systems, 2014.
6. Health and Safety Executive, Legionnaires' disease; Part 3: The control of legionella bacteria in other risk systems, 2014.

HC-05 Smoke Control

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1

Aim

Minimizing the exposure of building occupants and visitors to smoke and boost their health and well-being.

Requirements

#	Requirement	Points Available
1	<u>Schools</u> - Smoking is prohibited throughout the school buildings and associated grounds within the project boundary. - Install permanent 'No Smoking' signs at all building entrances and in common areas including car parks.	1
	<u>Healthcare</u> - Smoking is prohibited across the healthcare facility and all associated grounds within the project boundary. - Install permanent 'No Smoking' signs near all the building entrances and in common areas.	
	<u>Other Educational Institutions and all building typologies</u> - Smoking is prohibited throughout the buildings and public areas except within designated smoking areas. - Install permanent signage clearly stating if the facility is smoke free and smoking is allowed in designated smoking areas only. - Establish outdoor smoke-free zones, located at a minimum distance of 10m from building entrances and public areas, outdoor air intakes, operable windows and seating areas. - Designated Smoking Areas have weather-stripped doors and adequate ventilation. Refer to Supporting Guidance for details.	
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	<u>For Schools and Healthcare</u> - No Smoking policy implementation and enforcement plan must be developed and implemented in compliance with the Executive Regulation. - Commitment letter from Owner that a 'No Smoking policy' will be implemented during building operation. - Drawings indicating the location of 'No Smoking' signage throughout the campus. <u>Other Educational institutions and all building typologies</u> - No Smoking policy implementation and enforcement plan must be developed and implemented in compliance with the Executive Regulation. - Drawings to indicate the location of indoor Designated Smoking Area(s), door specifications and schedules indicating weather-stripping requirements. - Site plan indicating the 10m smoke free zones around all entrances, outdoor air intakes, operable windows and outdoor seating areas, any external Designated Smoking Area(s) highlighting distance from building entrances and outdoor air intakes. - Site plan indicating the location of signage for all "No smoking areas" and "Designated Smoking Areas", and location of receptacles for disposal of cigarette ashes and butts.

Construction Stage Evidence

#	Evidence per Requirement
1	<u>For Schools and Healthcare</u> - As-built drawings indicating the location of 'No Smoking' signage throughout the campus. - Date-stamped photographs of permanently installed 'No Smoking' signage. <u>Other Education Institutions and all building typologies</u> - No Smoking policy implementation and enforcement plan must be developed and implemented in compliance with the Executive Regulation.

	• As-built drawings to confirm the location of indoor Designated Smoking Area(s). • As-built MEP drawings confirming the installation of exhausts and ventilation as per the requirements of this credit. • Purchase orders for weather-stripping materials. • Date-stamped photographs confirming the installation of signage and installation of weather-stripped doors. • As-built site plan confirming the 10m smoke free zones around all entrances, outdoor air intakes, operable windows and outdoor seating areas, and external Designated Smoking Area(s) highlighting distance from building entrances and outdoor air intakes. • As-built site plan indicating the location of signage for all “No smoking areas” and all “Designated Smoking Areas”, and location of receptacles for disposal of cigarette ashes and butts. • Date-stamped photographs confirming the installation of required signage.
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Supporting Guidance

‘Smoking’ includes the use of tobacco and its products, such as cigarettes, cigars, tobacco leaves, tobacco molasses or any other product containing tobacco, either through cigarettes, cigars, pipes, snus, hookah, or chewing tobacco, or any other form, including vaping.

Smoke-free zones: These areas are those where smoking is explicitly prohibited, including schools and hospitals.

Designated smoking areas: Smoking areas are spaces provided and furnished for smoking in buildings where smoking is otherwise prohibited. These areas are equipped with ashtrays, receptacles for cigarette butts, exhaust and ventilation.

In order for a space to be considered as a designated smoking area, it must satisfy all requirements for air-conditioning and ventilation specifications as stipulated in Section 7- Executive Regulations document (cited in Reference Documents), including the following conditions:

- It must be isolated from surrounding areas.
- Smoking areas must not be located in non-smoker corridors.
- The doors must be self-closing, weather-stripped and the height of the space must not be less than 3m.
- Any false ceilings in the space must be made out of easily cleanable aluminum sheets.
- The floor must be non-flammable and easily cleanable. The use of moquette and vinyl is not permitted.
- The indoor air pressure shall be negative, i.e. it should be less than the neighboring areas between 5-7 Pascal, equivalent to 0.02-0.03 in WG.
- The inlet air flow rate should be at least 25 l/s per person, and designed for maximum occupancy density.
- The ventilation and air conditioning system for the designated smoking area should be separate from systems for other areas. Air should be mechanically expelled directly outside the premises and should not be recycled in the ventilation and recycling system.

- The ventilation system should be able to refresh the air at least ten times the air volume in the premises per hour.
- The designated smoking area should not contain any additional facilities such as telephones or any forms of recreation or entertainment such as a television.
- All designated smoking areas should be provided with waste receptacles for disposal of cigarette ash and butts.
- All signage for smoke-free areas should be in Arabic and English, supplemented by graphics including the international 'No Smoking' symbol.
- All signage for designated smoking areas should be in Arabic and English, clearly labelled in both Arabic and English: "Restricted Ares, No persons below 18 years of age allowed".

Weather stripping:

Weather-stripping is the process of sealing air leaks around movable building components such as doors or openable windows. Designated smoking areas must have doors weather-stripped on all sides.

When weather-stripping doors:

- Choose the appropriate door sweeps and thresholds for the bottom of the doors.
- Weather-strip the entire door jamb.
- Apply one continuous strip along each side.
- Make sure the weather-stripping meets tightly at the corners.
- Use a thickness that causes the weather-stripping to press tightly between the door and the door jamb when the door closes without making it difficult to shut.

Credit Tool

N/A

Reference Documents

1. Article 7, The Executive Regulations of Anti-Smoking Law issued by Royal Decree No. (M/56), dated 28/07/1436H.
2. WHO Framework Convention on Tobacco Control, 2005.

HC-06 Outdoor Space

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To provide an outdoor space which gives building occupants and visitors a connection to nature, a sense of wellbeing as well as encourage an active lifestyle.

Requirements

#	Requirement	Points Available
1	Provide outdoor space(s) within the project boundary that is adequately sized to accommodate, at a minimum 25% of the design occupancy of the building. The space(s) must have a seating area, landscaping or vegetation and adequate shading.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	-	1	-	1
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	-	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	- Architectural drawings including plans and elevations showing the location and size (m²) of the outdoor space(s), the seating area, landscaping or vegetation and adequate shading. - Calculations demonstrating that there is sufficient space for a minimum 25% of design occupancy of the building.

Construction Stage Evidence

#	Evidence per Requirement
1	- As-built architectural drawing including plans and elevations showing the location and size (m²) of the outdoor space(s), the seating area, landscaping or vegetation and adequate shading. - Updated calculations verifying that outdoor space can accommodate a minimum of 25% of the design occupancy of the building.

Supporting Guidance

- Shading of outdoor space should be in compliance with **HC-01 Outdoor Thermal Comfort**.
- Examples of appropriate outdoor spaces include but are not limited to the following:
 - Courtyard
 - Terrace gardens or podiums
 - Landscape area with interactive elements
 - Playgrounds and sports fields (for Schools)
 - Open to sky areas for patient rehabilitation (for Healthcare)
 - Outdoor seating areas such as open air theatres (for Retail centers)
- Projects can either provide one outdoor space that complies with the requirements of this credit or a series of outdoor spaces that cumulatively comply with the size requirements. Each space provided must include seating, landscaping or vegetation and adequate shading.
- All building occupants, including visitors, must have access to the provided outdoor space(s).

Sizing of Outdoor Space:

Consider an 18-storey building that has a total design occupancy of 360 people. To comply with this credit, the communal outdoor space should accommodate at least 25% of the total occupancy.

$$\text{Size of Outdoor Space} = \frac{25}{100} \times 360 = 90$$

Therefore, in this example, the outdoor space should accommodate a minimum of 90 people.

The Metric Handbook: Planning and Design Data can be used determine the size of the outdoor space as it provides guidance on the minimum space requirements for people when sitting, standing and circulating.

Credit Tool

N/A

Reference Documents

- Metric Handbook: Planning and Design Data, 6th Edition.

HC-07 Daylight and Views

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To design buildings which maximize the use of natural light, minimize glare and visually connect to the outdoors to enhance health, productivity and learning.

Requirements

#	Requirement	Points Available
1	Daylight <u>Educational Institutions</u> A minimum daylight illuminance of 300 lux is achieved for at least 75% of regularly occupied area. <u>All other building typologies</u> A minimum daylight illuminance of 250 lux is achieved for at least 50% of regularly occupied area. Glazing <u>All building typologies</u> The glazing has a minimum light transmittance (t-value) of 40% and a maximum solar factor (g-value) of 35%.	1
2	Views A minimum of 75% of all regularly occupied areas should have direct line of sight to the outside through vision glazing (refer to Supporting Guidance). Glare Control Manual or automated glare-control devices are installed on all windows of regularly occupied spaces. <i>Note: Requirement #2 is not applicable to Warehouse typology.</i>	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques**	Healthcare***
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	1	2	-	3
Fit-Out	2	2	2	1	2	-	3
Full-Scope	2	2	2	1	2	3	3

*Requirement #2 is not applicable to Warehouses typology.

**Requirement #1 awards 2 points for Mosque typology.

***Requirement #2 awards 2 points for Healthcare typology at all applicable scopes.

Design Stage Evidence

#	Evidence per Requirement
1	Daylight and Glazing - Drawings including floor plans, elevations and sections highlighting the regularly occupied areas. - Simulation parameters including glazing light transmittance levels and internal surface reflectivity. - Simulation outputs from the daylight simulation software for each modelled area showing isolux contours. - Spreadsheet list of all modelled areas and the corresponding results (i.e. percentage floor area of each space that has achieved a minimum required illuminance). - Specifications listing required glazing performance.
2	Views - Drawings including floor plans, elevations and sections highlighting the location of regularly occupied spaces and marked up with sight lines for each regularly occupied space. Glare Control - Drawings highlighting all regularly occupied spaces. - Design specifications for all glare-control devices.

Construction Stage Evidence

#	Evidence per Requirement
1	Daylight and Glazing - Confirmation that no changes have been made since the design stage submission that will impact daylight levels OR - If areas have been changed, resubmit:

	○ Simulation parameters including glazing light transmittance levels and internal surface reflectivity. ○ Updated simulation outputs from the daylight simulation software for each modelled area showing isolux contours. ○ Spreadsheet list of all modelled areas and the corresponding results (i.e. percentage floor area of each space that has achieved a minimum of 250 lux). ● As-built floor plans, elevations, and sections. ● As-built glazing performance criteria.
2	Views ● As-built floor plans and elevations highlighting the location of regularly occupied space and marked up with sight lines for each regularly occupied space. ● Date-stamped photographs of quality of view (refer to Supporting Guidance for information). Glare Control ● As-built drawings highlighting all regularly occupied spaces. ● Manufacturer's technical data sheets of all installed glare-control devices. ● Date-stamped photographs of installed devices.

Supporting Guidance

Daylight:

- Design features which impact indoor illumination levels include:
 - Building orientation
 - Window-to-wall area ratio
 - Use of atria, clerestories, courtyards and solar tubes/solar pipes
 - Natural external shade sources such as trees and mountains
 - Proximity to nearby buildings
 - Indoor glare-control: window blinds, shades, curtains, louvers, screens and awnings
 - Diffused and/or translucent glazing systems

The surrounding areas will impact the daylight provided and therefore should be considered when determining the layout design.

- Daylight simulation software must be used to calculate the internal daylight illuminance levels. To obtain accurate sunlight exposure, glare-control devices must not be included in the simulation parameters. Below is an example of a daylight simulation for an office building. This simulation shows how the internal daylight illuminance levels differ across spaces, depending on space dimensions and window size.

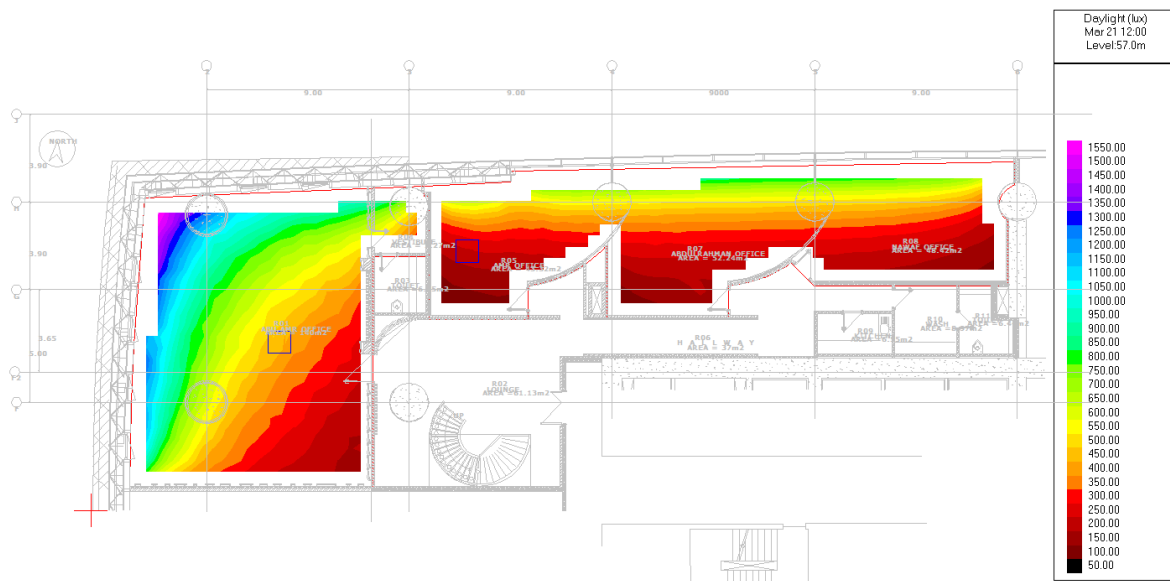


Figure HC-07.1 Example of daylight simulation

- Calculation control parameters must be based on the higher settings used for the calculation of values rather than for visualization purposes e.g. the number of inter-reflections must be set to a minimum of 7.
- If using solar tubes/solar pipes, use the transmission factors provided by the manufacturer. If these are not available, the following transmission factors should be used:
 - 1m pipe length = 0.5
 - 2m pipe length = 0.25
- Lux levels must be calculated based on a CIE standard clear sky at 10am, 12pm and 2pm on the equinox and summer solstice. Artificial light must be excluded from the calculations.
- Lux levels must be calculated 0.75 meters above the floor.
- The simulation guidelines provided in SBC 1001 Section 808.3.2 should be followed.

Views:

- A quality exterior view is a view to any of the following:
 - Vegetation or fauna
 - Sky
 - Movement, such as a busy street
 - Objects a minimum of 7m from the glazing
- Identifying the surrounding areas will help determine the layout design in order to locate regularly occupied spaces at the best location where quality external views can be provided.

Glare Control:

- Translucent or diffused glazing systems do not require glare-control devices.
- Glare-control devices must be operable by occupants to control unpredicted glare.
- Automated glare-control devices can be connected to the building automation system.
- Acceptable and unacceptable glare-control devices are listed in Table HC-07.1.

Table HC-07.1 Glare control devices

Acceptable Devices	Unacceptable Devices
Window blinds	Fixed exterior overhangs
Curtains	Fixed fins
Shades	Fixed Louvers
Movable exterior louvers	Mashrabiya
Movable awnings	Dark tinted glazing
Movable screens	Fritted glazing

- A “regularly occupied space” is a space inside the building where at least one person will spend a minimum of one continuous hour per day, performing activities including work or study.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 808.3.2 Daylight Performance Path.
2. IES- Lighting Measurements (LM) 83-12.
3. IES- The Lighting Handbook, 10th Edition.

HC-08 Indoor Lighting

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

Design buildings to enhance the visual comfort and productivity of building occupants through provision of high-quality lighting and lighting controls.

Requirements

#	Requirement	Points Available
1	Visual Comfort 100% of luminaires used (excluding emergency lights) have a minimum Color Rendering Index (CRI) of 80. 100% of luminaires used in regularly occupied spaces are shielded to limit glare (see Supporting Guidance for more information). 100% of luminaires more than 53° above the center of view or degrees above horizontal have a luminance less than or equal to 8,000 cd/m².	1
2	Choice of Lighting Solutions 100% of artificial lighting needs shall be met using fluorescent lighting which incorporates high frequency electronic ballasts. 100% of wayfinding signage shall be illuminated using LED lighting. Lighting Controls 100% of open plan spaces, hallways and corridors have occupancy sensors that control lighting upon detecting the presence of people. 100% of rooms intended for individual occupancy, conference rooms and meeting rooms have automated lighting controls. 100% of conference rooms, meeting rooms and spaces of similar purpose shall be equipped with occupancy sensors. <i>Note: For Offices and Educational Institutions, all lighting controls shall be equipped with occupancy sensors unless there is a reason associated to occupant safety that prevents this.</i>	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	- Extract from specifications highlighting CRI requirements, shielded luminaires and restriction in luminance for luminaires more than 53° above the center of view. - Luminaire schedule.
2	- Extracts from specifications highlighting requirements for high frequency fluorescent lighting - Luminaire schedule. - Extract from specifications highlighting requirements for LED lighting for wayfinding signage. - Drawings highlighting the relevant spaces and the locations of occupancy sensors and lighting controls.

Construction Stage Evidence

#	Evidence per Requirement
1	- Purchase receipts and technical datasheets highlighting CRI of the installed light sources, shielded luminaires and luminaires more than 53° above the center of view. - Representative date-stamped photographs of shielded luminaires.
2	- Purchase receipts and technical data sheets for all installed lighting systems, including those for wayfinding signage, and occupancy sensors. - As-built drawings highlighting the relevant spaces and the locations of occupancy sensors and lighting controls. - Date-stamped photographs of occupancy sensors and lighting controls.

Supporting Guidance

Occupancy sensors:

Occupancy sensors are indoor motion detecting devices used to detect the presence of activity to automatically control lights and lighting systems. They are typically used to provide automatic control, save energy and comply with building codes, where applicable.

Occupancy sensor types can include the following:

1. Passive Infrared (PIR) sensors
2. Microwave sensors
3. Ultrasonic sensors
4. Tomographic motion sensors
5. Environment sensors
6. Keycard light slots (especially used for hospitality energy management).

Color Rendering Index (CRI)

The Color Rendering Index is a measure of how accurately a light source displays hues, when compared to a reference light source. The scale runs from 0 to 100 where the higher the number, the better the color rendering ability.

- The required angle of shielding depends on the luminance values as seen in the table below.

Table HC-08.1 Angle of shielding required for interior lights

Luminance Value	Angle of Shielding
< 20,000 cd/m ²	No shielding required
20,000 cd/m ² to 50,000 cd/m ²	15°
50,000 cd/m ² to 500,000 cd/m ²	20°
>500,000 cd/m ²	30°

- When a luminaire is placed more than 53° above the center of view or placed directly above the space it can be a cause of visual discomfort and glare for people working in those areas.
- High frequency electronic ballasts create negligible flickering that is not discernible to the human eye, and very low levels of noise. This contributes to enhanced comfort levels for building occupants.

Regularly occupied spaces are those areas one or more individuals spend time on an ongoing basis, more than one hour per day on an average, using the building facilities to perform focused activities. For example in educational institutions, classrooms, lecture halls and laboratories are considered to be regularly occupied spaces.

These spaces exclude hallways, bathrooms, storage rooms, laundry rooms or garages.

Credit Tool

N/A

Reference Documents

1. IES- The Lighting Handbook, 10th edition.
2. International WELL Building Institute (<https://standard.wellcertified.com/light>).

HC-09 Acoustics

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To reduce noise disturbance and improve occupant wellbeing by promoting low ambient sound levels in internal spaces.

Requirements

#	Requirement	Points Available
1	All occupied spaces meet the requirements of internal ambient noise levels (dBA) as applicable to the building typology. Refer to Supporting Guidance for details.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	- CV of qualified Acoustic Engineer and confirmation of their appointment for testing and assessment. - Narrative by Acoustic Engineer which describes: - Calculations and/or assessment of internal noise sources caused by building services. - Calculations and/or assessment of external noise sources. - How sound level requirements will be achieved. - Design drawings which indicate noise control features such as wall thickness and material.

Construction Stage Evidence

#	Evidence per Requirement
1	- CV of qualified Acoustic Engineer and confirmation of their appointment for testing and assessment. - Field test reports (in accordance with ASTM E336) by the Acoustic Engineer confirming the noise levels in relevant areas meet the requirements.

Supporting Guidance

Noise Calculations:

- For field testing, only external noises and building system noises should be considered. All windows and external and internal doors should be closed during testing.
- Occupant noise and noise from equipment or appliances must be excluded from measurements and calculations.
- For building system background noise, field test reports for typologies including hospitality and offices must be conducted in at least 50% of the total rooms inside the structure.
- For all building typologies: if the structure has a mechanical/electrical generator adjacent to the building envelope, testing should be conducted near the generator to ensure that interior sound levels do not exceed required decibel limits.
- Demonstrate that internal ambient noise levels are designed to not exceed the values as provided in Table HC-08.1

Table HC-08.1 Internal ambient noise levels

Occupancy Type	Room	Noise Criteria Limit dB(A) _{Leq}
Assembly A-1	Concert, Recital Halls	30
	Theatres	40
Assembly A-3	Mosques	35
	Libraries, Museums	40
	Courtroom	35
Assembly A-4	Gymnasiums, arenas with seating areas	45
Business B	Office- enclosed greater than 300 square feet	35
	Office-enclosed less than or equal to 300 square feet	40
Educational E	Classrooms	35
	Large lecture rooms with speech amplification	35
	Large lecture rooms without speech amplification	30
Institutional I-2; Healthcare	Patient Rooms	35
	Wards	40
	Operating and procedure rooms	40
	Corridors and lobbies	45

Residential R-1 and R-2; Hospitality	Individual rooms or suites	35
	Meeting/banquet rooms	35
	Corridors and lobbies	45
	Service areas	45
Retail & Restaurants	Retail stores	50
	Restaurants	45
Schools	Classrooms or core learning spaces	35
	Ancillary learning spaces	40

Acoustic Engineer:

The Acoustic Engineer must possess the following qualifications:

- A degree in Acoustics or equivalent certification in sound testing and acoustics.
- A minimum of three years of relevant experience in the building construction industry and expertise in providing recommendations for optimal acoustic performance and implementing mitigation measures.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 807 Acoustics.
2. ASTM E492-09 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.
3. ASTM E336-17a Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
4. ANSI S12.60-2002 Acoustic Performance Criteria, Design Requirements, and Guidelines for Schools.
5. FGI-ASHE Guidelines for Design and Construction of Healthcare Facilities, 2010.
6. ASHRAE 2011, HVAC Applications Handbook, Chapter 48, Noise and Vibration Control.

HC-10 Indoor Air Quality

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	2

Aim

To enhance the indoor air quality for building occupants and visitors by minimizing the impact of construction activities, and conducting air quality testing to confirm acceptable indoor air quality.

Requirements

#	Requirement	Points Available
1	Indoor Air Quality (IAQ) Management Plan Develop and implement an IAQ Management Plan during construction stage and undertake building flush-out prior to occupancy as per the Supporting Guidance.	1
2	Indoor Air Quality (IAQ) Testing A specialist contractor conducts IAQ testing for occupied areas after the end of construction, prior to occupancy. Air contaminants should not exceed the maximum concentration levels specified in the Supporting Guidance.	2
	Total	3

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	3	3	3	3	3	-	3
Fit-Out	3	3	3	3	3	-	3
Full-Scope	3	3	3	3	3	3	3

Design Stage Evidence

#	Evidence per Requirement
1	Specifications and/or contract documents specifying the requirement for the Contractor to develop and implement an IAQ Management Plan and building flush-out plan.
2	Project specifications confirming the requirement of indoor air quality testing by a specialist IAQ testing agency at the end of construction.

Construction Stage Evidence

#	Evidence per Requirement
1	• IAQ Management Plan with all control measures implemented during construction to minimize air pollution, and building flush out evidence. • Completed IAQ Checklist of all regular inspections performed onsite during construction stage with supporting date-stamped photographic evidence. • Report of flush-out activity confirming duration and total outdoor air supplied to the building.
2	• IAQ test report confirming the methodology of air sampling and air testing, number of samples taken, concentration of air contaminants and remedial measures undertaken to address any non-compliant measurements (e.g. flush-out and re-testing). • Company profile of the specialized IAQ testing agency confirming qualifications and previous experience.

Supporting Guidance

IAQ Management Plan

Construction activities associated with generation of dust, odor, and other contaminants are considered sources of air pollutants which can impact the quality of indoor air. Several aspects of construction activities can contribute in polluting indoor air which have a direct impact on construction workers and occupants of the building.

The IAQ Management Plan must include control measures as per SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition-2007, for the following at a minimum:

- HVAC Protection
- Source Control
- Moisture & Mold Control
- Pathway Interruption
- Housekeeping
- Scheduling

The Plan must enlist the project team members responsible for implementing the recommended control measures and to verify these by means of a project specific IAQ Checklist. This checklist is to be filled on a periodic basis as established by the project team.

Building Flush-Out

Prior to occupancy, perform a building flush-out by supplying outdoor air which equals 2 Air Changes per Hour (ACH) to all spaces. Fresh air rates must meet or exceed those defined in credit **HC-03 ventilation**.

Building flush-out can only be done once testing and balancing of HVAC system is completed, and all interior finishes and furniture are installed. Building flush-out activity shall maintain a fresh air rate that does not result in exceeding air temperature and humidity for building's normal operations as per the basis of the building design.

Indoor Air Quality Testing:

- a) The maximum acceptable limits for air contaminants are as follows:

Table HC-10.1 Air contaminant limits

Contaminant	Maximum Concentration
Formaldehydes	27 micrograms per m ³
PM _{2.5} Particulates	15 micrograms per m ³
PM ₁₀ Particulates	150 micrograms per m ³
Total Volatile Organic Compounds (TVOC)	500 micrograms per m ³

- b) Testing protocols for the above contaminants must be compliant with ASTM D5197, ASTM D5466, ASTM D6196, ASTM D6345, and ISO 7708.
- c) Air sample testing shall be conducted as follows:
- All interior finishes must be installed including doors, paints, carpets and acoustic panels.
 - Air samples must be collected between 1 and 2 meters from the floor and over a minimum 4-hour period.
 - The number of sampling points must be at least 1 per 2,500m² of floor area, or for each continuous floor area.
- d) Specialist IAQ testing agency must have at least three years of experience in indoor air quality testing of building projects of a similar type and scale in the GCC.

Credit Tool

N/A

Reference Documents

1. SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition-2007.
2. ASHRAE Standard 189.1-2014 Standard for the Design of High-Performance Green Buildings.
3. ASTM D5197-16 Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air.
4. ASTM D5466-15 Standard Test Method for Determination of Volatile Organic Compounds in Atmospheres.
5. ASTM D6196-15e1 Standard Practice for Choosing Sorbents, Sampling Parameters and Thermal Desorption Analytical Conditions for Monitoring Volatile Organic Chemicals in Air.
6. ISO 7708 Air Quality - Particle Size Fraction Definitions for Health-related Sampling.

HC-11 VOCs and Low-Emitting Materials

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To reduce the concentration of volatile organic compounds (VOCs) in the indoor environment, contributing to better indoor air quality and increased occupant welfare.

Requirements

#	Requirement	Points Available								
1	Adhesives and Sealants A minimum of 95% (by weight) of all adhesives and sealants used in the building interior (i.e. inside the weatherproofing system) must not exceed the VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168. VOC limits for adhesives and sealants are tabulated in the Supporting Guidance section. Paints and Coatings A minimum of 95% (by weight) of all paints and coatings used in the building interior (i.e. inside the weatherproofing system) must not exceed the VOC limits of the South Coast Air Quality Management District (SCAQMD) Rule 1113, Green Seal GS-03 & GS-11. VOC limits for paints and coatings are tabulated in the Supporting Guidance section.	1								
2	Formaldehyde Reduction <u>Composite Wood:</u> All internal composite wood materials must have maximum formaldehyde emissions as follows: <table><tr><th><u>Product</u></th><th><u>Formaldehyde Limit (ppm)</u></th></tr><tr><td>Hardwood plywood</td><td>0.05</td></tr><tr><td>Particle board</td><td>0.09</td></tr><tr><td>Medium-density Fiberboard (MDF)</td><td>0.11</td></tr></table> Basic testing for formaldehyde emissions of products must be conducted in accordance with ASTM E1333.	<u>Product</u>	<u>Formaldehyde Limit (ppm)</u>	Hardwood plywood	0.05	Particle board	0.09	Medium-density Fiberboard (MDF)	0.11	1
<u>Product</u>	<u>Formaldehyde Limit (ppm)</u>									
Hardwood plywood	0.05									
Particle board	0.09									
Medium-density Fiberboard (MDF)	0.11									

	<u>Suspended Ceiling Systems:</u> - All internal suspended ceiling systems must have a maximum formaldehyde limit of 13.5 ppb (or 16.5 µg/m³). - Ceiling systems such as ceramic/concrete tiles, organic-free mineral based systems, gypsum plaster, concrete, and metal are deemed to automatically comply with the maximum formaldehyde emissions credit requirements.	
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques*	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	4	2

*Requirements #1 & #2 awards 2 points each to Mosques typology.

Design Stage Evidence

#	Evidence per Requirement
1	Architectural specifications confirming the maximum allowable VOC content for adhesives, sealants, paints and coatings.
2	- Interior finishes schedule highlighting products likely to contain formaldehyde. - Specifications stating the maximum allowable formaldehyde content for internal wood finishes and suspended ceilings.

Construction Stage Evidence

#	Evidence per Requirement
1	- Purchase orders for all interior adhesives, sealants, paints and coatings used in the project. - Technical datasheets for all interior adhesives, sealants, paints and coatings with VOC content highlighted.
2	- As-built interior finishes schedule highlighting products containing formaldehyde. - Purchase orders for all interior wood finishes and suspended ceilings used in the project. - Technical datasheets for all interior wood finishes and suspended ceilings with compliant levels of formaldehyde highlighted.

Supporting Guidance

Low VOC Materials:

Volatile organic compounds (VOCs) are a class of chemicals that readily vaporize at typical indoor temperature and pressure conditions. Exposure to VOCs can have an adverse impact on the indoor air quality and occupant health.

VOCs can be in many indoor sources including paints, coatings, adhesives and sealants. While short term exposure does not usually result in health concerns, long term exposure can have severe health impacts. Health concerns include the following:

- Eye, nose and throat irritation.
- Headaches.
- Loss of coordination and fatigue.
- Damage to the central nervous system.
- Damage to the lungs, kidneys and liver.

Using materials and products with low concentration of VOCs can improve indoor air quality and positively contribute towards improved health of the occupants.

Adhesives and Sealants:

The percentage of compliant adhesives and sealants is calculated as follows:

$$\% \text{ Compliant adhesives and sealants} = \frac{\text{Weight of adhesives and sealants not exceeding VOC limits}}{\text{Total weight of all adhesives and sealants}}$$

To comply with the credit requirement, 95% of all adhesives and sealants must be within the VOC limits specified by SCAQMD Rule 1168 (refer to Table HC-11.1).

Table HC-11.1 VOC limits for adhesives and sealants

Maximum VOC Limits – grams per liter (g/L), less water			
Architectural Applications		Specialty Applications	
Indoor carpet adhesives	50	PVC welding	510
Carpet pad adhesives	50	CPVC welding	490
Wood flooring adhesives	100	ABS welding	325
Rubber floor adhesives	60	Plastic cement welding	250
Subfloor adhesives	50	Adhesive primer for plastic	550
Ceramic tile adhesives	65	Contact adhesive	80
Drywall and panel adhesives	50	Special purpose contact adhesive	250
Cove base adhesives	50	Structural wood member adhesive	140

Multipurpose construction adhesives	70	Top and trim adhesive	250
Structural glazing adhesives	100		
Substrate specific applications		Sealants	
Metal to metal	30	Architectural	250
Plastic foams	50	Non-membrane roof	300
Porous materials (except wood)	50	Roadway	250
Wood	30	Singly-ply roof membrane	450
Fiberglass	80	Other	420
		Sealant Primers	
		Architectural non-porous	250
		Architectural porous	775
		Other	750

Paints and Coatings:

The percentage of compliant paints and coatings is calculated as follows:

$$\% \text{ Compliant paints and coatings} = \frac{\text{Weight of paints and coatings not exceeding VOC limits}}{\text{Total weight of all paints and coatings}}$$

To comply with the credit requirement, 95% of all paints and coatings must be within the VOC limits specified by SCAQMD Rule 1168 (refer to Table HC-11.2).

Table HC-11.2 VOC limits for paints and coatings

Maximum VOC Limits – grams per liter (g/L), less water	
Anti-corrosive/anti-rust paint	250
Clear wood finish: lacquer	550
Clear wood finish: sanding sealer	350
Clear wood finish: varnish	350
Clear Brushing lacquer	680
Pigmented lacquer	550
Floor coating	100
Interior flat paint/coating/primer	50
Interior non-flat paint/coating/primer	150
Sealers and under-coaters	200
Shellac: clear	730
Shellac: pigmented	550
Stain	250

Concrete curing compounds	350
Japans/faux finishing coatings	350
Low solids coatings	120
Magnesite cement coatings	450
Wood preservatives	350
Waterproofing concrete/masonry sealers	400
Waterproofing sealers	250

VOC Content Information:

The VOC content of a product is found in the Material Safety Data Sheet (MSDS) or Technical Safety Datasheet (TSD), both of which can be obtained from the manufacturer. Consider the following example of a section of the material safety datasheet for interior flat paint.

Table HC-11.3 Sample of a section of a MSD for interior flat paint

Physical and Chemical Properties	
Solubility	Miscible with water
Boiling Point/Range (°C)	100
pH	9
Total VOC (g/liter)	45

As the total VOC is less than 50, this product would contribute towards this credit.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 806 Material Emissions and Pollutant Control.
2. South Coast Air Quality Management District (SCAQMD) Rule 1168 Adhesive and Sealant Applications.
3. South Coast Air Quality Management District (SCAQMD) Rule 1113 Architectural Coatings.
4. GC-3 Green Seal Environmental Criteria for Anti-Corrosive Paints.
5. GS-11 Green Seal Standard for Paints and Coatings.
6. ASTM Standard E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

HC-12 Active Lifestyle

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To provide building occupants with opportunities for regular physical activity and exercise.

Requirements

#	Requirement	Points Available
1	A stairway must be an appealing option for accessing at least the first four floors of the building.	1
2	Building occupants have convenient access to either a gym or a pool for lap swimming.	1
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out*	1	1	1	1	1	-	1
Full-Scope	2	2	2	2	2	-	2

*Requirement #2 is not applicable to all building typologies at fit-out scope.

Design Stage Evidence

#	Evidence per Requirement
1	Detailed design drawings and specifications, clearly labelled to confirm compliance with each of the required stairway characteristics.
2	- Detailed design drawings and specifications, clearly labelled to confirm compliance with the minimum requirements for the gym or lap pool. - Confirmation that the building occupants' leases will include free access to the gym or lap pool, signed by the building owner. - If applicable, a description of how private, separate hours for women and children only, will be programmed and enforced, signed by the building owner.

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings, date-stamped photographs and purchase receipts, clearly labelled to confirm compliance with each of the required stairway characteristics.
2	• As-built drawings, date-stamped photographs, and purchase receipts clearly labelled to confirm compliance with the minimum requirements for the gym or lap pool. • Confirmation that building occupants' leases will include free access to the gym or lap pool, signed by the building owner. • If applicable, a description of how private, separate hours for women and children only will be programmed and enforced, signed by the building owner.

Supporting Guidance

- A qualifying stairway must have the following characteristics:
 - Stairs must be open at the lobby level, and either directly visible from the main building entrance or closer to the entrance than the lifts.
 - Access to the stairs must be visible from the corridor of each storey. If there are security doors, there must be at least 1 m² of transparent glazing.
 - Steps must be at least 1.4 meters wide.
 - Lighting must be at least 215 lux on the walking surface, with a minimum Color Rendering Index (CRI) of 80.
 - Stairs must be enhanced with at least one of the following elements: a skylight, an external view window, plants, an artistic work or music.
 - The location of the stairway must be in a more convenient location than lifts in order for building users to see it and be encouraged to use it.

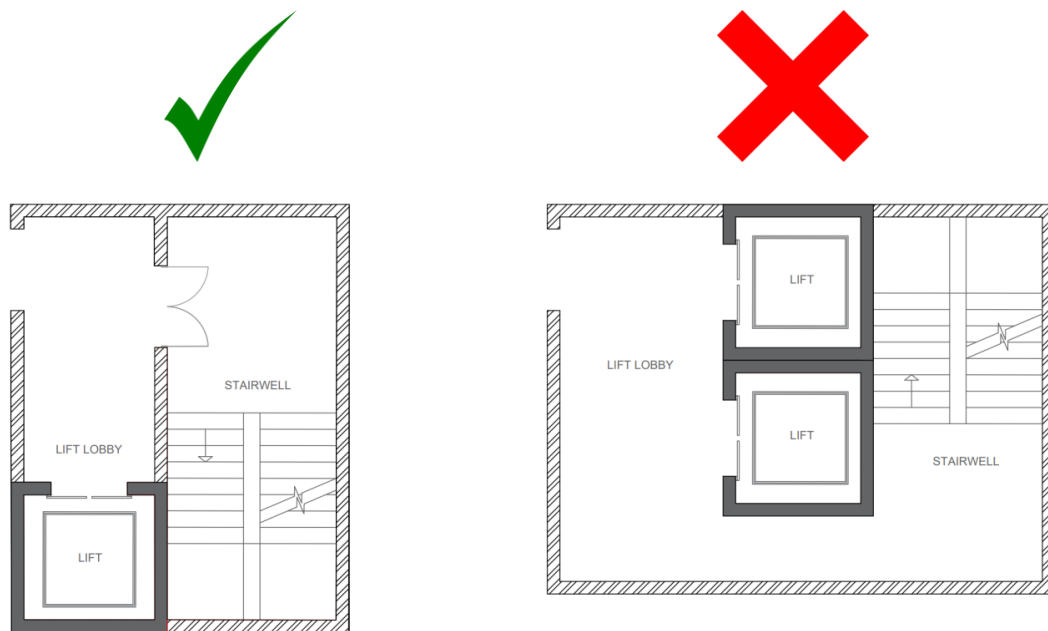


Figure HC-12.1 Acceptable stairway layout design (L) and unacceptable stairway layout design (R)

- The layout, on the left-hand side of Figure HC-12.1, is an example of a layout that promotes the use of stairways. The door to the stairway precedes the lift, thereby ensuring that users are aware of the stairways and they can be encouraged to use it.
- The layout, on the right-hand side of Figure HC-12.1, is an example of a layout that does not promote the use of stairways. The access to the stairway is beyond the lifts and users may not be aware of the stairway.
- Stairs permanently enclosed by fire doors do not qualify. However, magnetic door holds are permitted if they remain operationally open in the absence of a fire alarm.
- The gym or pool must be within the project boundary and can be within the building. Facilities outside the project boundary are not applicable for this credit but may qualify as amenities under credit **TC-03 Access to Amenities**.
- Building occupants should have free of charge access to the gym and/or swimming pool.
- A qualifying gym must include the following:
 - One item of cardiovascular exercise equipment (such as treadmill, stationary bicycle, elliptical machine, or rowing machine) for every 100 building occupants.
 - One item of strengthening exercise equipment (such as bench-press, squat-rack, or pull-up bar) for every 100 building occupants.
- A qualifying pool for lap swimming must have the following characteristics:
 - A length of at least 25 meters.
 - Be either indoors or screened for women's privacy.
 - Outdoor swimming pools should be provided with covers and with shading for the areas adjacent to the pool.
- Communal swimming pool facilities and gyms must either have separate areas for women of equivalent size and quality, or a clear protocol for enforcing separate hours for women only.

Credit Tools

N/A

Reference Documents

1. Gehl Institute (<https://gehlinstitution.org/>).
2. New York City Departments of Design and Construction, Health and Mental Hygiene, Transportation, City Planning: Active Design Guidelines, Promoting Physical Activity and Health in Design.

HC-13 Access for All

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To ensure occupants and visitors of varied physical abilities have easy access to all building facilities.

Requirements

#	Requirement	Points Available
1	The design of the building complies with the requirements listed in Supporting Guidance.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques**	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell*	2	2	2	-	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	-	1	2	1

*Requirement #1 awards 2 points to all building typologies at core and shell scope.

**Requirement #1 awards 2 points to Mosques typology.

Design Stage Evidence

#	Evidence per Requirement
1	- Completed checklist of the accessible design criteria, with narratives explaining how the project aims to achieve each criterion, signed by the project's Architect. The narratives should clearly reference relevant supporting documents. - Labelled design drawings and specifications to support the checklist.

Construction Stage Evidence

#	Evidence per Requirement
1	Updated checklist of the accessible design criteria, with narratives explaining how the project has achieved each at construction, signed by the project's Contractor. The narratives should clearly reference relevant supporting documents.

- | | |
|--|--|
| | <ul style="list-style-type: none"> • Labelled date-stamped photographs, as-built design drawings, and purchase receipts to support the checklist. |
|--|--|

Supporting Guidance

Universal design:

Universal or inclusive design aims to provide accessible facilities for people of all abilities. It is important to identify and acknowledge barriers to inclusion as early as possible in the design process so that thoughtful design can overcome them. While the needs of the elderly, wheelchair users and mobility impaired people are important, it is also necessary to understand the barriers experienced by people with learning difficulties, mental ill health, visual impairments and hearing impairments.

Criteria outlined in The Lifetime Homes standard must be referenced by Project teams for hospitality and healthcare projects specifically.

All other building typologies must follow guidelines for universal design as per ADA Standards for Accessible Design including but not limited to the following criteria.

1. Parking (width or widening capability)
2. Approach to dwelling from parking (distance, gradients and widths)
3. Approach to all entrances
4. Entrances
5. Communal stairs and lifts
6. Internal doorways and hallways
7. Circulation Space
8. Entrance level living space
9. Potential for entrance level bed-space
10. Entrance level WC and shower drainage
11. WC and bathroom walls
12. Stairs and potential through-floor lift in dwelling
13. Potential for fitting of hoists and bedroom / bathroom
14. Bathrooms
15. Glazing and window handle heights
16. Location of service controls
17. Signage and wayfinding



Figure HC-13.1 Examples of tactile and braille signage

Examples of key accessibility issues and inclusive design in the early stage of planning are:

- Equitable approach to a building, via the same entrances, e.g. designated parking, clear pedestrian routes separate from vehicles and cyclists, no steps or obstacles, short distances from parking and public transport, clear signage, optimum lighting and contrast.
- Equitable use of the same paths in horizontal and vertical circulation, e.g. optimum maneuvering space, ramps with appropriate slope and horizontal landings.
- Equitable use of the same equipment and facilities, e.g. easy to understand and operate, adequate maneuvering space and operating height, information via two senses.
- Equitable use of the same rooms, e.g. ample circulation space and different seating possibilities, acoustics and hearing enhancement systems, optimum lighting and visual contrast.
- Equitable use of toilet and sanitary facilities, e.g. signage, adequate maneuvering space, transfer options, well-placed equipment, and easy operation.
- Equitable exit and evacuation routes, concepts for emergency planning, e.g. no steps or obstacles, fire protected lifts/elevators, signage, lighting, visual contrast, fire safety, protection and evacuation, accessible evacuation routes.
- Important information via two senses or more, e.g. visual indicators, audible alerts and tactile indicators (e.g. tactile walking surface indicators).
- Vertical access through lifts to be as per the technical requirements of ISO 4190-1 Lift Installation-Part I: Class I, II, III and VI lifts
 - Class I, General purpose lifts,
 - Class III, Healthcare lifts, including hospitals and nursing homes,
 - Class VI, Intensive use lifts for high-rise buildings.

Credit Tool

N/A

Reference Documents

1. The Lifetime Homes Design Guide.
2. Approved Document M: Access to and Use of Buildings, Volume 2: Buildings other than Dwellings.

3. ADA Standards for Accessible Design 2010, Department of Justice.
4. ISO 21542:2011 Building Construction- Accessibility and Usability of the Built Environment.

HC-14 Car Park Pollutant Control

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To improve the air quality in enclosed car parks through optimum ventilation design and continuous measurement of pollutants.

Requirements

#	Requirement	Points Available
1	- Design of ventilation system includes continuous measurement and monitoring of pollutant concentrations (CO and NO₂) in enclosed car parks. - Installation of an air quality monitoring and alert system that increases the supply of fresh air when needed, and smoke extract system that is employed when sensors trigger an alert. The systems installed must be connected to the Building Management System (BMS). <i>For projects with no enclosed car parks, this point is automatically awarded.</i>	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	1	1	1	-	1	-	1
Core & Shell*	2	2	2	-	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	1	1	-	1	-	1

*Requirement #1 awards 2 points to all building typologies at core & shell scope.

Design Stage Evidence

#	Evidence per Requirement
1	- Drawings indicating the proposed location of air quality measurement and monitoring system, and equipment including air quality sensors, fresh air intakes, outdoor air outlets, smoke extract system and alert system. - Extract from specifications for the proposed air quality measurement and monitoring system, and smoke extract system if installed.

	BMS point schedule integrated with the ventilation and audible alert system.
--	--

Construction Stage Evidence

#	Evidence per Requirement
1	- As-built drawings confirming the installation of air quality measurement and monitoring system, and equipment including air quality sensors, fresh air intakes, outdoor air outlets, smoke extract system and alert system. - Manufacturer's technical datasheets for the installed air quality measurement and monitoring system, and smoke extract system if installed. - Date-stamped photographs of the air quality measurement and monitoring system, and all installed equipment. - Commissioning report (refer to PMM-01 Systems Commissioning) highlighting the integration with BMS, commissioning certificate of the sensors and audio alert system.

Supporting Guidance

Carbon monoxide (CO) and nitrogen dioxide (NO₂) emitted from vehicles are the most common air pollutants inside enclosed car parks. CO blocks the absorption of oxygen by the blood while NO₂ affects the lungs, leading to long term damage. When concentrations approach unacceptable levels, the concentration of CO and NO₂ must be reduced to acceptable limits through ventilation or extraction.

The air quality alert system and smoke extraction system must be automated through with the Building Management System (BMS) to trigger an alarm when the installed sensors detect unacceptable level of pollutants and automatically increase air flow through ventilation vents and activate the smoke extract system. Refer to Table HC-14.01 for acceptable limits of pollutants.

Air Quality Monitoring:

Air quality should be monitored within the breathing zone, i.e. 1m-1.8m above the finished floor level and not less than 0.1m distance from the walls and HVAC equipment. Continuous measuring and monitoring of air pollutant levels must be implemented according to the requirements given in Table HC-14.01.

Table HC-14.01 Pollutant concentrations in car parks

Air Pollutant	Average Time	Maximum allowable concentration
Carbon Monoxide	15 minutes	100 mg/m ³
Nitrogen Dioxide	1 hour	200 µg/m ³

Any and all outdoor air intakes for the building, required as part of the ventilation system must be located such that the shortest distance from the intake to any specific potential outdoor contaminant source is equal to or greater than the separation distance listed in Table HC-14.02. Any exhaust louvres or exhaust ducts associated with the car park air pollutants must be located away from boiler exhaust and external parking spaces for idling vehicles, and exceed the figures in HC-14.02.

Table HC-14.02 Minimum separation distance from outdoor air intakes

Area	Minimum Distance
Significantly contaminated exhaust	5m
Noxious or dangerous exhaust	10m
Vents, chimneys, and flues from appliance and equipment	5m
Garage entry, automobile loading area, or drive-in queue	5m
Truck loading area or dock, bus parking/idling area	7.5

Air Quality Monitoring Equipment:

Air Quality Monitoring Equipment consists of ambient pollution sensors and an alert system that provides alarms or notifications when the quality of air has depreciated to unacceptable levels. The additional ventilation supply provided for car parking space when concentrations are exceeded must be automated through the BMS and trigger audio alerts so action can be taken.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 501 Mechanical, Chapter 4 Ventilation.
2. ASHRAE Standard 62.1.2007 Ventilation for Acceptable Indoor Air Quality.

HC-15 Safety and Security

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To ensure that the planning and building design contributes to a safe and secure environment for occupants and visitors.

Requirements

#	Requirement	Points Available
1	Develop and implement a Safety and Security Strategy that includes consideration of the following: - Building assessment and identification of risk factors. - Mitigation strategy and details of methods applied as per the Supporting Guidance. The Safety and Security Strategy is developed by a Competent Professional and implemented by the Contractor.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	3	2	-	2
Fit-Out	-	-	-	-	-	-	-
Full-Scope	2	2	2	3	2	2	2

*Requirement #1 awards 3 points to Warehouses typology at all applicable scopes.

Design Stage Evidence

#	Evidence per Requirement
1	- Safety and Security Strategy signed by the Competent Professional must include narratives for risk assessment of the building, inherent and built-in safety measures, and risk mitigation approach as described in the Supporting Guidance. - Design drawings and specifications demonstrating the incorporation of the Safety and Security Strategy into the design of the building. - CV of the appointed Competent Professional.

Construction Stage Evidence

#	Evidence per Requirement
1	• Updated Safety and Security Strategy signed by the Security Consultant including narratives for risk assessment of the building, inherent and built-in safety measures, and risk mitigation approach as described in the Supporting Guidance. • As-built drawings, product datasheets, and date-stamped photographs confirming the implementation of the Safety and Security Strategy.

Supporting Guidance

Safety and Security Strategy:

Risks to the safety and security of building occupants are to be identified by a Competent Professional and a mitigation strategy developed, considering the building typology. The Competent Professional must document how the methods outlined below have been implemented in the spatial planning and design of the building to reduce opportunities for crime and to promote positive behavior.

The Safety and Security Strategy must include strategies implemented through all of the following methods.

Electronic methods:

- Electronic access and intrusion detection.
- Electronic surveillance to monitor premises and unauthorized intrusion detection.
- Alarms and electronic monitoring control.
- Security system connected to the automated Building Management System (BMS), if present, to trigger alarms.

Architectural methods: Architectural design and layout, site planning and landscaping, signage, and circulation control can include principles of Crime Prevention through Environmental Design (CPTED) such as the following-

a. Natural Access Control

- Balcony railings should never be made of a solid, opaque material or be more than 42 in. high.
- Define parking lot entrances with curbs, landscaping, and/or architectural design; block dead-end areas with a fence or gate, monitored by a guard.
- Public entrances should be clearly defined through signage or walkways.
- Common building entrances should have locks that automatically lock when the door closes.
- Limit access to the building to no more than two points.

b. Natural Surveillance

- All four building facades should have windows. Site buildings so that the windows and doors of one area are visible from those of other areas.

- Assign parking spaces to occupants near the building. Designate special parking spaces for visitors.
- Parking areas and pedestrian walkways should be well illuminated.
- Recreation areas should be visible from a multitude of windows and doors.
- Waste skips should not create blind spots or hiding places.
- Shrubs or hedges should be no more than 3 ft. high for clear visibility and tree canopies should not be lower than 8 ft. 6 in.

c. Territorial Reinforcement

- Define property lines with landscaping or post-and-pillar fencing, but keep shrubs and fences low to allow visibility from the street.
- Accentuate building entrances with architectural elements and lighting and/or landscape features.
- Doorknobs should be installed 40 inches away from window panes.
- Common doorways should have windows and be key-controlled by occupants.

d. Maintenance

- Maintaining buildings to a high standard deters crime. This includes keeping connected landscape areas clean to facilitate their use and respond promptly to issues such as vandalism and graffiti.

Organizational methods:

- Manpower and security team.
- Develop and implement emergency evacuation plans.
- Practice responding to crisis on a regular basis with drills.
- Security patrolling after day lit hours.

Competent Professional:

The Competent Professional must have at least three years of experience in the safety and security planning of building projects of a similar type and scale in the GCC.

Credit Tool

N/A

Reference Documents

1. Crime Prevention Through Environmental Design: Guidelines for Queensland, Part A: Essential Features of Safer Places, October 2007.
2. Crime Prevention Through Environmental Design: Guidelines for Queensland, Part B: Implementation Guide, October 2007.
3. Crime Prevention Through Environmental Design Guidebook, National Crime Prevention Council, Singapore, October 2003.

HC-16 Indoor Vegetation

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1

Aim

To integrate indoor vegetation in interior design to improve the health and well-being of occupants, boost productivity while improving indoor air quality.

Requirements

#	Requirement	Points Available
1	- Develop and implement a strategy incorporating features of indoor vegetation in the interior space of the building (refer to Supporting Guidance for details). - Incorporate living green walls with low maintenance vegetation in the indoor spaces.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	-	-	-	-	-	-	-
Fit-Out	2	2	2	-	2	-	2
Full-Scope	2	2	2	-	2	-	2

Design Stage Evidence

#	Evidence per Requirement
1	- Narrative outlining the indoor vegetation strategy incorporated in design, including potted plants, plant beds and/or green walls, along with maintenance requirements. - Drawings (floor plans, elevations, sections) and architectural renderings highlighting all strategies implemented for indoor vegetation and/or systems. - Planting schedule proposed for the interior space with water requirements and maintenance plan.

Construction Stage Evidence

#	Evidence per Requirement
1	• Updated narrative outlining the indoor vegetation strategy incorporated in design and if any deviations have been noted. • As-built drawings (floor plans, elevations, sections) highlighting all strategies implemented for indoor vegetation and/or systems. • Date-stamped photographic evidence of all indoor vegetation and/or systems. • Updated planting schedule proposed for the interior space, water requirements and maintenance plan.

Supporting Guidance

Incorporating indoor vegetation into the built environment has been proven to improve physical health, performance, productivity and reduce stress while reducing the occurrence of dust and mold. Project teams shall integrate direct experiences to introduce natural surroundings to the indoor spaces through the use of indoor vegetation.

Indoor Vegetation Strategy

Indoor vegetation must incorporate one or more elements from the following, at a minimum:

- a) Potted plants or wall-mounted planters.
- b) Hanging plants.
- c) Plant/flower beds or foliage.
- d) Green walls.

Indoor vegetation strategy must include the following.

- Narrative outlining the use of vegetation in the interior space, especially at key areas including reception, conference rooms, workstations, waiting areas, lobbies, lounges and communal seating areas.
- Indoor vegetation plant layout and design must be influenced by the exploration of space type and its function. For example, for an office space: large potted plants for sizeable occupant spaces such as lobbies, smaller potted plants or hanging plants in open plan spaces.
- The plants utilized must be documented as having a beneficial effect on indoor air quality. For example: Spathiphyllum (Peace Lily), Epipremnum aureum (Devil's Ivy), Dracaena reflexa (Red-Edged Dracaena), Sansevieria trifasciata (Snake Plant) and Rhipis excelsa (Lady Palm).
- Maintenance requirements including watering, nutrients, and other aspects to maintain healthy plants during operations.
- Additional green strategies used, for example using recycled material or reclaimed wood for the construction of frames for planted beds and frames.
- Description of irrigation system for green roofs, if applicable.

Green walls

- Install a green wall, covering a wall area equal or greater than 2% of the floor area, or covering the largest of the available walls, whichever is greater.

- Green walls may be hydroponic (soil-less) or substrate (soil-based). Selection of vegetation to be planted must be based on water requirements and maintenance needs, and detailed in the Indoor Vegetation Strategy.
- Selection of native species include but are not limited to those identified by any of the following:
 - Approved city, province or regional lists.
 - Saudi Standards, Metrology and Quality Organization (SASO).
 - Classified as locally occurring or the origin is noted from the region (as per documents listed under Reference Documents).
 - Selected plant species should be reviewed against the Saudi Building Code 1001 classification and all documents listed in the Reference Documents section.



Figure HC-16.01 Green Wall

Irrigation and drainage requirements for Green walls:

- Provide a built-in automatic irrigation system which is connected to the building's plumbing system and employs drip irrigation.
- These systems link an Irrigation Control Box (ICB) directly into the building's plumbing system. Using horizontal irrigation tubing, drip irrigation systems are self-watering, and can be set to release based on a timed schedule.
- The irrigation system should be fitted with an electronic timer and drip tubes with regulator and filter.
- All irrigation systems must be planned and installed by a Certified Professional accredited by a WaterSense labeled program or an equivalent national or international program.

Credit Tool

N/A

Reference Documents

1. Interior Landscape Plants for Indoor Air Pollution Abatement, NASA Office of Commercial Programme- Technology Utilization Division & ALCA, 1989
(<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19930073077.pdf>).
2. Landscape Plants for Arriyadh Region- A Reference Manual, High Commission for the Development of Arriyadh, 2014.
3. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 2 Definitions.
4. Saudi Building Code (SBC) 1001 Green Buildings, Section 404 Landscape Irrigation and Outdoor Fountains.
5. Saudi Standards, Metrology and Quality Organization (SASO).
6. WaterSense Irrigation Program (<https://www.epa.gov/watersense>).

Materials and Waste

10 Materials and Waste

Vision 2030 aims to develop the waste management sector by increasing its efficiency and establishing comprehensive recycling projects, through the National Transformation Program (NTP) and Integrated Waste Management Program. These initiatives will increase the diversion of waste from landfill and support the waste industry within KSA. They will also have an impact on municipal solid waste management as well as construction waste management and could provide opportunities for the use of recycled materials in construction.

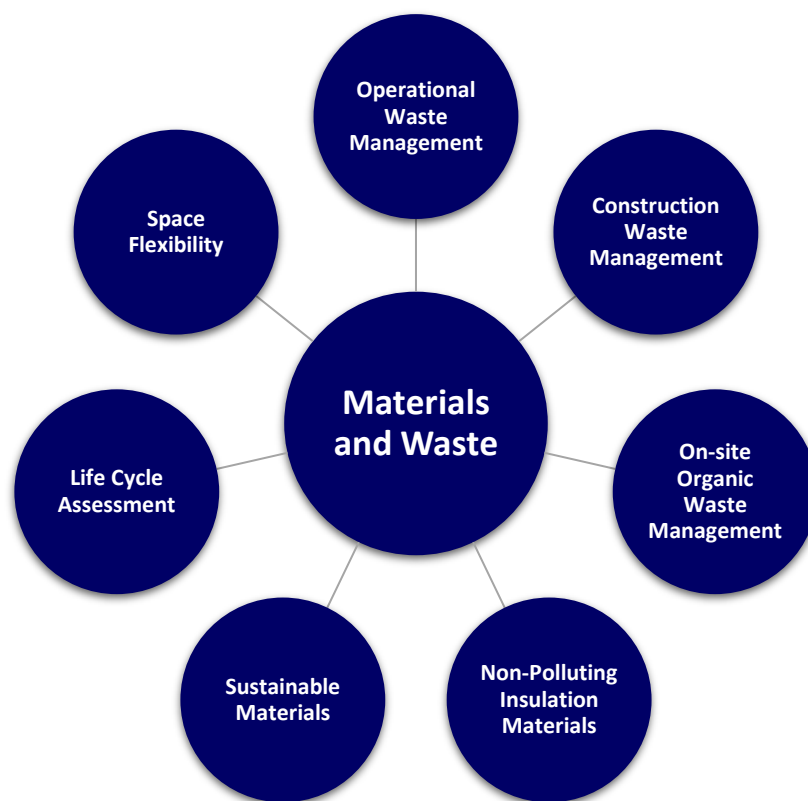


Figure 15 Materials and Waste credits

MW-01 Operational Waste Management

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1

Aim

To reduce the generation of operational waste and encourage users to divert waste from landfill.

Requirements

#	Requirement	Points Available
1	Develop an Operational Waste Diversion Strategy which diverts at least 50% of operational waste (by weight or volume) from landfill via recycling or reuse. For each building, provide clearly labelled segregated waste bins throughout the site, including tenant and common areas (e.g. lobbies, corridors, gyms and pools) for a minimum of the following three waste streams: 1. Recyclable Waste (e.g. paper, cardboard, glass, plastic, metals) 2. General Waste 3. Food scraps and Organic waste Provide a communal storage area for the following waste streams to be stored separately per category: 1. Large bulky items 2. Electronic items or e-waste 3. Batteries	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	• Operational Waste Diversion Strategy which includes strategy implemented to address waste reduction, storage, collection, transportation, and treatment. • Drawings indicating location and size of the storage and disposal facilities, and vehicle access areas designed to ensure adequate space for maneuvering delivery and waste removal vehicles.

Construction Stage Evidence

#	Evidence per Requirement
1	• Updated Operational Waste Diversion Strategy reflecting any changes if implemented. • As-built drawings and date-stamped photographs indicating the location and size of the storage and disposal facility, and vehicle access areas designed to ensure adequate space for maneuvering delivery and waste removal vehicles.

Supporting Guidance

Operational Waste Diversion Strategy (OWDS):

The contents of the OWDS must include the following at a minimum:

- Site location, description of spaces, occupant numbers and typical waste generation expected.
- Identify the building typology and waste streams that are expected to be generated during building operation. Refer to Figure MW-01.1 for some examples of waste streams.

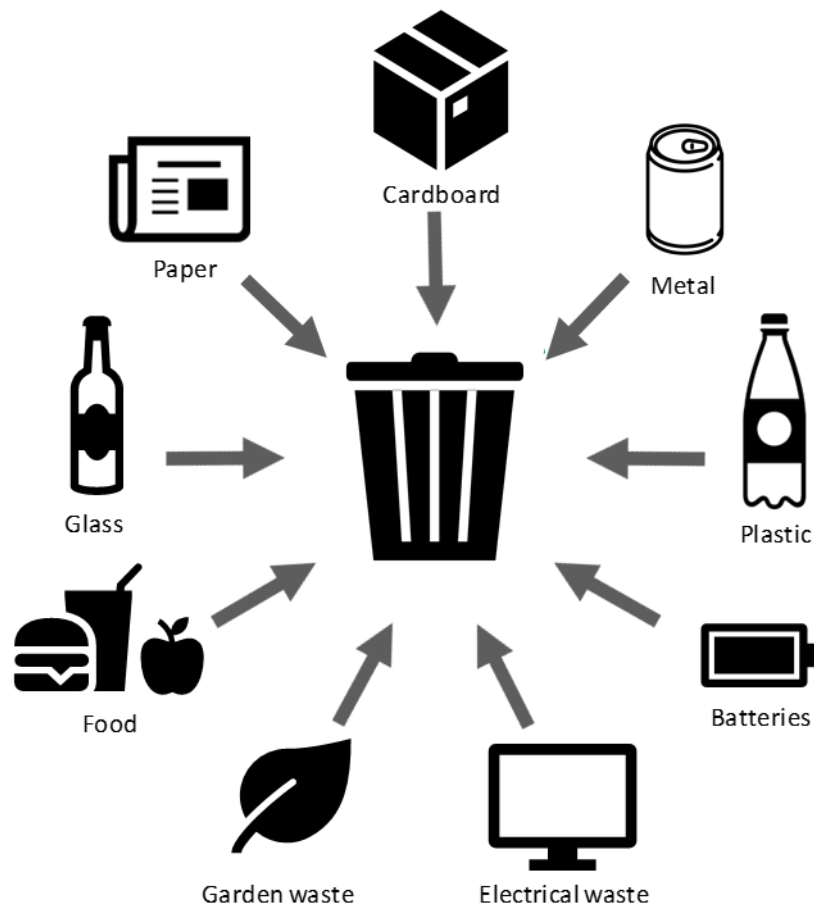


Figure MW-01.1 Waste types

- Waste collection and storage areas with provision of clearly labelled (in Arabic and other appropriate languages) and color coded containers. Examples of label images and colors are provided in Figure MW-01.2. Update labels as recycling waste streams become available.
- Provision of a secure central storage room/s adequate for the amount of waste generated during operation and the collection rates, with bins' storage sizes generally between 120L and 500L.
- Storage rooms should be suitably sized for all waste streams, with adequate provision of ventilation.
- Commitment to engage licensed waste operators to remove general, recyclable, and organic waste during building operations.
- Hazardous materials (if present) should be separately stored in a conditioned space with direct exhaust and separate ventilation, with provision for safe collection and disposal.
- For On-site organic waste treatment, quantities may be included in the overall waste diversion rate. Refer to credit **MW-03 On-site Organic Waste Management** for the detailed implementation requirements.

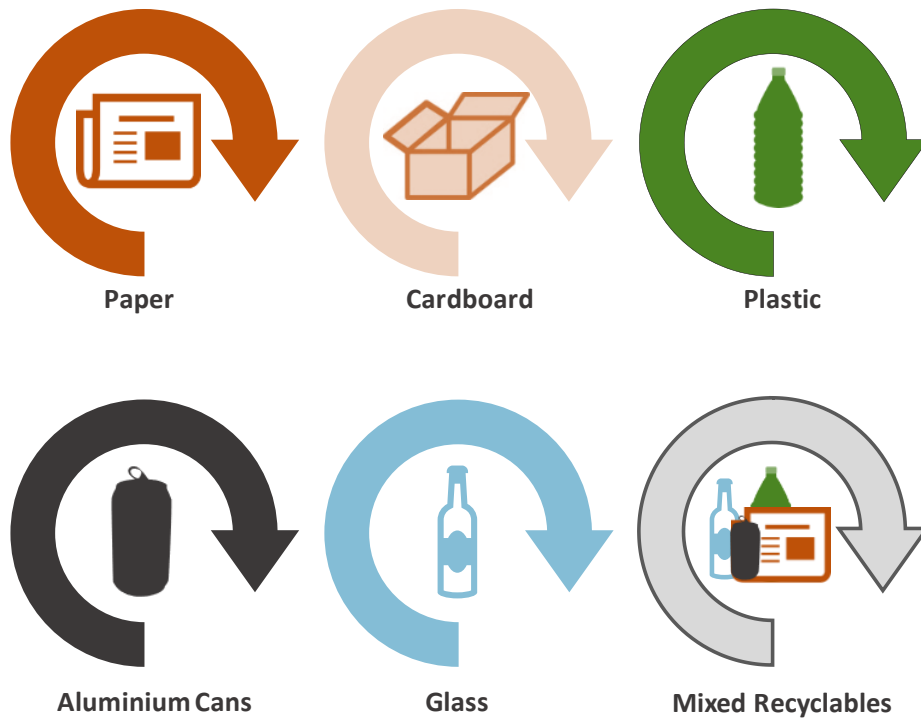


Figure MW-01.2 Examples of container label images and colors

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 504 Waste Management and Recycling.
2. European Commission Directive 2008/98/EC Waste Framework Directive.

MW-02 Construction Waste Management

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To reduce the long-term environmental impacts associated with disposal of construction and demolition waste by recovering, reusing and recycling materials.

Requirements

#	Requirement	Points Available
1	Upon appointment, and prior to the start of any site construction activities, the Main Contractor develops a Construction and Demolition Waste Management Plan (CDWMP). The Main Contractor and any sub-contractors will be responsible for implementing the CDWMP. Refer to the Supporting Guidance for the detailed requirements of the CDWMP.	2
2	In addition to #1, the Contractor implements monthly monitoring of the CDWMP and diverts a minimum of 30% of the total amount of non-hazardous waste (by weight or volume) from landfill by recycling, reuse, salvage, donation, or manufacturer's reclamation. This figure excludes any excavation waste and land-clearing debris.	
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only*	2	2	2	2	2	-	2
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	Extract from the project tender specifications confirming the requirement for the Contractor to develop and implement a CDWMP.

2	Extract from the project tender specifications confirming the requirement to divert a minimum of 30% of construction waste from landfill.
---	---

Construction Stage Evidence

#	Evidence per Requirement
1	Project-specific Construction and Demolition Waste Management Plan.
2	- Monthly waste reports, including: - Calculations confirming the amount of waste generated, reused, recycled, and sent to landfill. - Waste receipts from the appointed waste haulers. - Construction Waste Management Tool.

Supporting Guidance

The percentage of waste that is diverted from landfill is calculated as follows (the figures should not include any hazardous waste):

$$\% \text{ Waste diverted from landfill} = \frac{\text{Amount of waste recycled, reused, salvaged, donated or reclaimed (tons or m3)}}{\text{Total amount of waste generated (tons or m3)}}$$

Construction and Demolition Waste Management Plan (CWDMP):

For the development and implementation of an effective CWDMP, the construction team must have a full understanding of the overall site procedures and works (such as cutting on-site or pre-fabricating off-site). This understanding is crucial for projecting the expected waste generated from the site. Project duration, scope of construction, specified building materials, number of site workers, and availability of waste treatment facilities are examples of factors that need to be taken into consideration when developing the CWDMP.

Waste calculations can be based on either weight or volume but must be consistent throughout. The CDWMP must contain the following:

- Anticipated type and amount of waste to be generated from site activities, throughout the entire duration of construction.
- Onsite waste streams and the associated storage requirements such as designated waste skips (size, number, color-coding/labeling etc.).
- Anticipated end-destination of each waste type (to be reused, salvaged, sent to recycling facility, sent to landfill etc.).
- The resulting waste diversion goal for the project (percentage of waste to be recycled/salvaged/reused, compared to the total construction and demolition waste generated).
- All waste movement from the site must--- be accompanied by waste removal tickets that shall provide the following information as a minimum: date/time, waste removal company, name of

driver, amount of waste removed, type of waste and name and address of company/facility where the waste will be disposed.

- Certification or license of the waste disposal company.

Construction Waste Management Measures:

The principles of the waste hierarchy can be used to minimize waste generation onsite and the overall environmental impact.

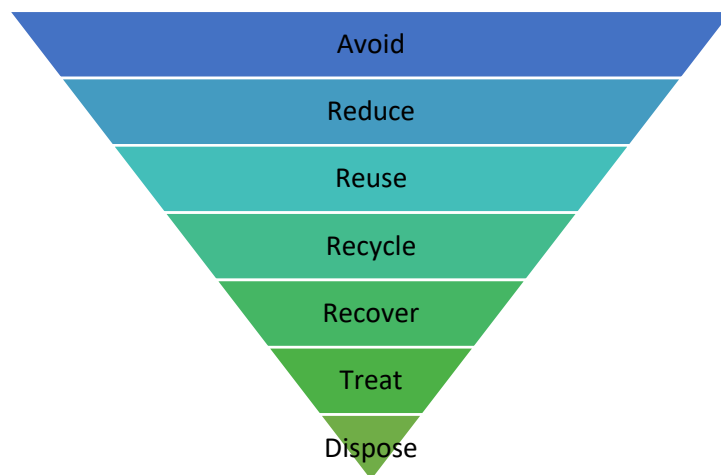


Figure MW-02.1 Waste Hierarchy

The following measures can be implemented to reduce waste:

- Ensure only the necessary quantities of materials are procured to avoid having excess materials.
- Avoid double packaging for materials. This may be achieved by approaching suppliers and agreeing to minimize packaging at the source.
- Avoid receiving individual items as this will result in extra packaging and generation of additional waste.
- Avoid the use of disposable materials at site offices such as plastic plates and cups. At the construction site, it is better to use re-usable material such as pallets and shuttering.
- Avoid using temporary support systems when possible, as these are usually discarded as waste at the end of the project. Aim to reuse these systems on other projects, if not the same.
- Ensure material storage areas are safe, secure and weatherproof to minimize damage.

The following measures can be used to reuse waste:

- Double-sided printing and promoting the use of soft copies.
- Reuse packaging material as an alternative storage solution onsite.
- Reuse metal and wood waste to form storage containers or support material.
- Crush concrete cube samples to reuse them as small size cover blocks.

There are a number of actions the construction team can take to ensure diversion of waste from landfill including the following:

- Waste segregation skips shall be clearly labeled and installed in an area easily accessible to workers. This will ensure that the generated waste will be disposed of directly into the relevant waste skips enabling proper waste segregation.
- For large scale projects where several activities take place simultaneously and there is limited access to waste skips at the activity source, it is recommended that a dedicated site waste management team is engaged, to manage waste collection and segregation.
- All workers need to undergo waste management training through site induction and regular toolbox talks as they are opportunities to raise awareness of good waste management practices. This training will depend on site layout, type of waste generated by construction activities, waste segregation facilities on site, and recycling facilities available in the surrounding area that can be used by the project.

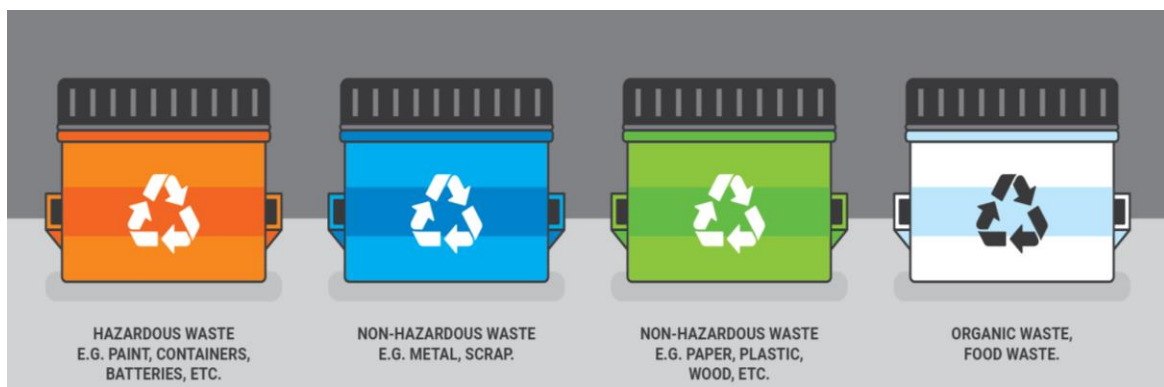


Figure MW-02.2 Examples of Waste Segregation Skips

Credit Tool

Waste Tool

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 503 Construction Waste Management.
2. European Commission Directive 2008/98/EC Waste Framework Directive.

MW-03 On-site Organic Waste Management

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To encourage the reuse of nutrients and reduce the environmental impact of waste transfer and landfill.

Requirements

#	Requirement	Points Available
1	Organic waste generated by building operations, including landscape area, is collected and treated on-site.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	- Strategy for organic waste collection and disposal of food scraps and landscape waste. - Drawings indicating location and size of the storage and disposal facilities. - Extracts from specifications for the storage of organic waste and technical requirements of treatment facilities.

Construction Stage Evidence

#	Evidence per Requirement
1	- Updated Strategy for organic waste collection and disposal of food scraps and landscape waste. - As-built drawings indicating location and size of the storage and disposal facilities. - Extracts from specifications for the storage of organic waste storage technical requirements of treatment facilities.

Supporting Guidance

Organic Waste

Organic waste is waste that is biodegradable and comes from either a plant or animal source. Typical organic waste sources include food scraps, waste food, landscape waste and a limited proportion of biodegradable packaging such as paper.

Fig MW-03.1 shows the waste segregation skips for organic waste.



Figure MW-03.1 Examples of Organic waste segregation

Onsite Organic Waste Treatment:

Organic waste can be managed by the following processes:

- Composting
- Anaerobic digestion
- Microorganisms digestion

Organic Waste Diversion:

The following should be addressed as a part of the Organic Waste Diversion Procedure during construction phase.

- Procedure
 - Identify sources of organic waste and estimate generation quantities for the project during construction phase.
 - Investigate the need and suitability of on-site waste treatment solution that can manage anticipated organic waste generation from operations of the building.
 - This section must clearly describe all the applicable and regulatory health and safety requirements and methods to be undertaken for cleaning and odor minimization.
- Collection Bins
 - Provision of clearly labelled (in Arabic or other appropriate languages) and color coded organic waste storage bins located on the site, such as near kitchen or pantry, landscaped areas, and other spaces where organic waste is expected to be generated.

- Provide central storage facility as per estimated waste generation and collection rates, with bins between 30L and 120L.
- Central storage facility should be accessible by waste hauler vehicles.
- Waste bins or skips to be emptied at least three times a week to prevent odor and related health hazards.
- Storage
 - Ensure the area is well ventilated to avoid excess odor, and is secure to avoid inappropriate access.
 - Main storage area must have mechanical cooling and have provision of water for cleaning and be connected to the foul drainage system.
- Training
 - Provide training at least once a month to the HSE team and individuals responsible for organic waste management, monitoring and onsite composting.
 - Training on waste segregation and management can be a part of Toolbox Talks that are provided to all site personnel on a bi-weekly basis.
 - Include training content and attendance registry template within an appendix.

Credit Tool

N/A

Reference Documents

1. Presidency of Meteorology and Environment, General Environmental Regulations and Rules for Implementation.
2. Ministry of Municipal and Rural Affairs (for landfill regulations and solid waste guidelines).

MW-04 Non-Polluting Insulation Materials

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1

Aim

To encourage the use of insulation materials with a low impact on the environment and human health.

Requirements

#	Requirement	Points Available
1	All insulation (thermal and acoustic) must meet the following requirements: - Be manufactured without the use of chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs). - Have an Ozone Depletion Potential of zero (ODP = 0) and a Global Warming Potential of less than five (GWP ≤ 5). Compliance is required for any blowing agent used to manufacture the insulation product or to spray it in place. - Have 13.5 parts per billion (ppb) or less of added formaldehyde. - Be non-toxic and not release toxic fumes during combustion.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques*	Healthcare
Shell Only	1	1	1	1	1	-	1
Core & Shell	1	1	1	2	1	-	1
Fit-Out	1	1	1	2	1	-	1
Full-Scope	1	1	1	2	1	2	1

*Requirement #1 awards 2 points to Warehouses and Mosques typologies at all applicable scopes, except for shell only.

Design Stage Evidence

#	Evidence per Requirement
1	- Summary sheet listing all uses of thermal and acoustic insulation in the project. - For all insulation uses, extracts from specifications confirming compliance with each of the credit requirements.

Construction Stage Evidence

#	Evidence per Requirement
1	- Updated summary sheet listing all uses of thermal and acoustic insulation in the project. - Purchase orders for all insulation products installed in the project. - Material safety datasheets, technical datasheets and/or third-party test reports for all insulation products confirming compliance with each of the credit requirements.

Supporting Guidance

Ozone Depletion Potential (ODP):

The ODP of a chemical compound is the relative value that indicates the potential of a substance to destroy the ozone layer compared with the potential of chlorofluorocarbon-11 (CFC-11), which is assigned a reference value of 1. Thus, a substance with ODP of 2 is twice as harmful as CFC-11.

Global Warming Potential (GWP):

GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO₂). A higher measure of GWP implies that the given gas warms the Earth more as compared to CO₂, over this particular timeframe, and is therefore more harmful in nature.

Blowing Agents:

Certain types of insulation incorporate “blowing agents” which are high-performing insulating gases blown to fill the voids within the insulation cellular structure. This results in an overall higher thermal performance of the final insulation materials. Blowing agents may be harmless such as carbon dioxide or sodium bicarbonate, or may be associated with ozone layer depletion and high impacts on global warming, such as CFCs and HCFCs. To assess a blowing agent’s impacts on the environment, its Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) are determined.

Information regarding CFC, HCFC, formaldehyde, toxicity, ODP and GWP can be found in material safety datasheets or technical datasheets. If this information is not available, results from a third-party laboratory can be used.

Table MW-04.1 Section of a sample material safety datasheet for thermal insulation

Ingredients
This product is manufactured without the use of CFCs and HCFCs.
This product does not contain any added formaldehyde
Fire Fighting Measures
Primary combustion products are carbon monoxide, carbon dioxide, ammonia and water
Ecological Information

The product has an Ozone Depletion Potential of Zero
The product has a Global Warming Potential of Zero

Only insulation material procured for onsite installation is to be considered in compliance with this credit. Insulation material that is a part of a product's composition, or is assembled within electronic equipment manufactured offsite are excluded.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 806.6 Insulation.
2. The Montreal Protocol on Substances that Deplete the Ozone Layer.

MW-05 Sustainable Materials

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1
Requirement #2	No	1
Requirement #3	No	1

Aim

To recognize and encourage the use of recycled materials and products with certified sustainability characteristics, thereby reducing the demand for virgin materials, optimizing material efficiency in construction and limiting the negative environmental impact of material extraction.

Requirements

#	Requirement	Points Available
1	Recycled Steel At least 50% of all reinforcing or stressing steel (by weight) used within the project boundary has a minimum of 80% post-consumer or pre-consumer recycled content.	1
2	Recycled Aggregates At least 15% of all aggregates used on site (by volume) are recycled aggregates.	1
3	Certified Timber At least 50% of all timber and composite wood products (by cost) used as temporary construction timber, permanently installed products and furniture should be certified with Chain of Custody (CoC) certification.	1
	Total	3

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	3	3	3	3	3	-	3
Core & Shell	3	3	3	3	3	-	3
Fit-Out	3	3	3	3	3	-	3
Full-Scope	3	3	3	3	3	3	3

Design Stage Evidence

#	Evidence per Requirement
1	• Calculations by weight demonstrating compliance with the minimum percentage of recycled content. • Extracts from specifications detailing the requirement of recycled content for steel.
2	• Calculations by volume demonstrating compliance with the minimum percentage of recycled aggregates. • Extracts from specifications detailing the percentage of recycled aggregates.
3	• Calculations by cost demonstrating compliance with the minimum percentage of certified timber products. • Extracts from specifications detailing the percentage of certified timber products.

Construction Stage Evidence

#	Evidence per Requirement
1	• Updated calculations by weight demonstrating compliance with the minimum percentage of recycled content. • Material technical datasheets confirming the recycled content of steel (pre-consumer or post-consumer). • Purchase orders for all reinforcing or stressing steel installed in the project.
2	• Updated calculations by volume demonstrating compliance with the minimum percentage of recycled aggregates. • Purchase orders of the recycled aggregates used in the project, confirming their source.
3	• Updated calculations by cost demonstrating compliance with the minimum percentage of certified timber products. • Purchase orders for all timber products used on the project. • Chain-of-Custody certificate for each certified timber product.

Supporting Guidance

Recycled Materials:

Utilizing recycled materials are better for the environment as they reduce demand for virgin resources and increase diversion from landfill. Subsequently, this reduces stress on waste management infrastructure.

Recycled Aggregates:

Recycled aggregates are those obtained from crushing concrete or asphalt (typically after demolishing a concrete structure) to reclaim the aggregate. The aggregate may be used as a base in paved roads/curbs or building foundations.

Post-consumer Recycled Content:

Post-consumer recycled content is defined as waste material generated by households or by commercial, industrial or institutional facilities in their role as end-users of a product, which can no longer be used for its initial purpose. It includes waste recovered and recycled from construction and demolition activities.

Pre-consumer Recycled Content:

Pre-consumer recycled content is defined as material that is diverted from the waste stream during the manufacturing process. It does not include the reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Recycled content information can be found in the environmental section of technical datasheets that can be obtained from the manufacturer.

Table MW-05.1 Sample of environmental section of technical datasheet for steel bars

Recycled Content			
Material Name	Manufacturer	Recycled Content	
Deformed Steel Bars	Company Name	Pre-Consumer Content	Post-Consumer Content
		3.73%	96.27%

Certified Timber Wood products certified under any one the following Chain of Custody (CoC) certifications contribute towards compliance with this requirement:

- Forest Stewardship Council (FSC)
- Program for the Endorsement of Forest Certification (PEFC)

Chain-of-Custody (CoC) Certificates

Chain of custody (CoC) certification assesses the whole supply chain and ensures that sustainability best practices have been applied from harvesting the timber, to manufacturing and distributing the timber products. This certification can be used to trace the origins of the wood and ensures that the wood has been harvested legally without threatening areas of high ecological value and violating traditional or civil rights.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Section 505.1 Material Selection and Properties.
2. ISO 14021: Environmental Labels and Declarations.

3. Forest Stewardship Council (FSC) www.fsc.org
4. Program for the Endorsement of Forest Certification www.pefc.org

MW-06 Life Cycle Assessment

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To reduce the environmental impact from projects by assessing building materials and products over the life cycle of the building.

Requirements

#	Requirement	Points Available
1	- For new buildings, conduct life cycle assessment (LCA) to assess potential environmental impacts of building elements and materials through their service life. - Demonstrate a reduction in material use through the service life of the building.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only*	1	1	1	1	1	-	1
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

*Requirement #1 awards 1 points to all building typologies for Shell only scope.

Design Stage Evidence

#	Evidence per Requirement
1	- Life Cycle Assessment Report written by a Competent Professional which includes: - A narrative describing the scope of LCA, impact evaluation summary, comparative analysis of product and materials, and recommendations by the Architect/Project team based on the results at design stage. - LCA of building elements, including substructure, superstructure and landscape, as applicable carried out at design stage demonstrating environmental impacts as per indicators listed in Supporting Guidance, using a compliant tool.

Construction Stage Evidence

#	Evidence per Requirement
1	- Updated Life Cycle Assessment Report by a Competent Professional that includes: - Updated narrative describing the impact evaluation summary, comparative analysis of products and materials, implementation of recommended measures for selection of materials at construction stage. - Demonstrate resultant material selection through purchase receipts and material submittals. - Any modifications from the proposed design that relate to the LCA study.

Supporting Guidance

Life cycle assessment is a technique to assess environmental impacts associated with all stages of a product's whole life cycle, i.e. from cradle-to-grave. It includes energy and water consumption, equipment in addition to all stages in the assessment – raw material supply, manufacture of construction products, the construction process stage, use stage, demolition and when the materials are disposed of or recycled, as illustrated in Figure MW-06.01.

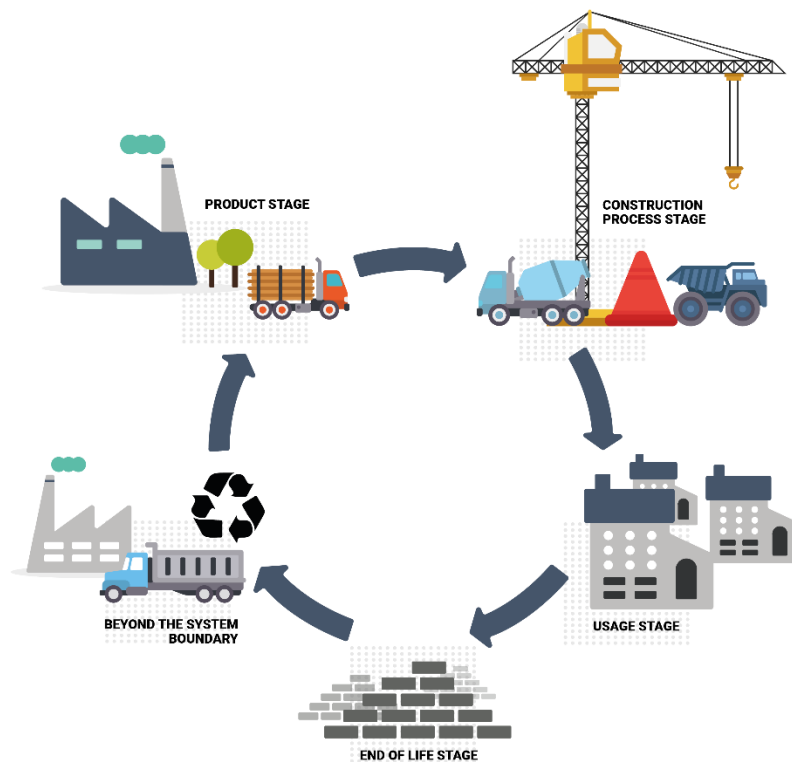


Figure MW-06.1 Life cycle stages of a product

Life Cycle Assessment Report:

The Life Cycle Assessment report is to be based on a detailed study using relevant data of all materials, products, assemblies and components anticipated to be used (design stage) or used (construction stage) in the building. The report must cover, at a minimum, the following:

- Description of building typology and scope of LCA.
- Gross floor area of the building.
- Expected building energy and water use during the construction and operation stage, per annum
- Assumptions such as lifespan or service life of the building.
- Summary of impact assessment, including outputs of building LCA.
- Description of data and product information (Environmental Product Declarations, drawings and layouts, specifications, finish schedules and purchase receipts) for each material, component, assembly or equipment used, and transportation to the construction site. Conclusion and interpretation of results and how this informed the final material or product selection.
- Scope of assessment should incorporate the building envelope and structural elements of the building as listed in Table MW-06.01.

Table MW-06.1 LCA requirements

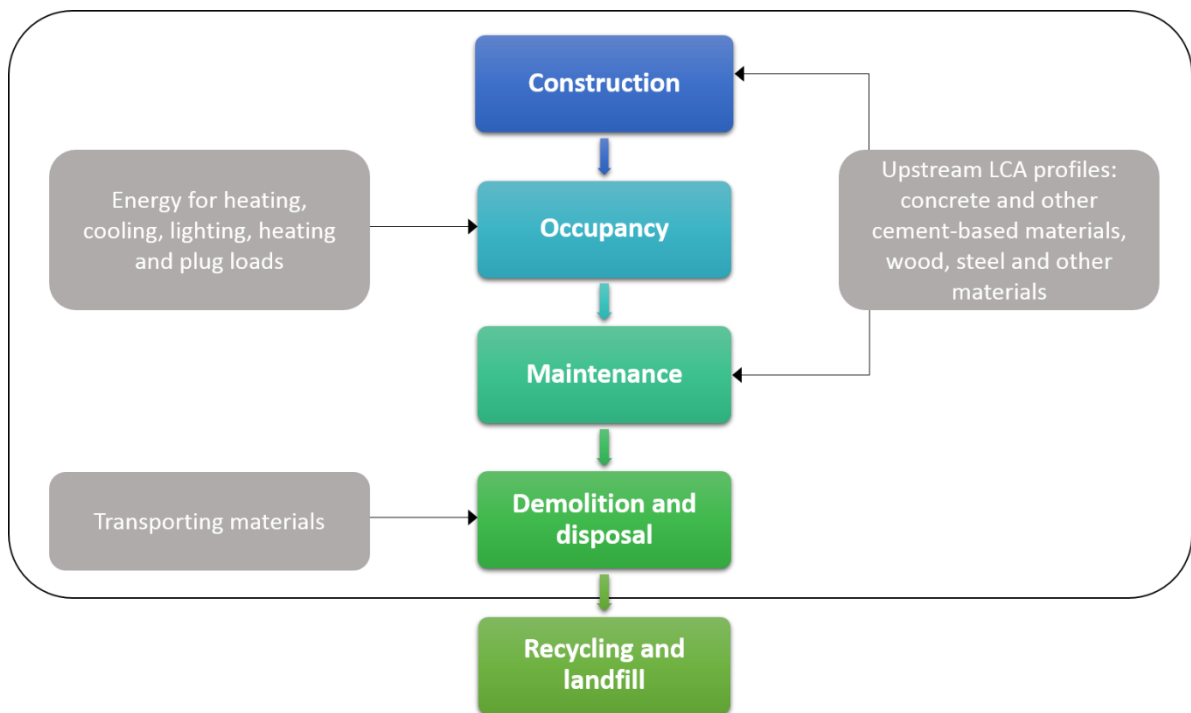
Component	Element	Sub-element
Substructure	Substructure	Foundation
		Foundation systems
		Excavation
		Retaining walls
		Lowest floor construction
	Hard landscaping or External works	Roads and pavements
Superstructure or Building Envelope	Structural framework	Concrete frame
		Steel frame
		Other frame systems
	Flooring	Floors
	Roof Assembly	Roof structure
		Roof cladding or covering
		Skylights or atria
		Other roof systems
	Stairways and ramps	Stairways
		Ramps
	External wall assembly	Above-grade walls
		Below grade walls
	Windows and doors	External doors
		Windows and overhangs

	Internal walls and partitions	Internal walls
		Permanent partitions
	Installations and systems	HVAC system
		Central cooling and air conditioning
Building Services		

System Boundary:

The system boundary of the LCA must be determined prior to assessment to account for environmental impacts associated with different life cycle stages of a building. Figure MW-06.2 presents an example of a system boundary defined for conducting an LCA of a typical building, where recycling and landfilling are not included within the system boundary as impacts because these two activities have not been accounted in the LCA.

Figure MW-06.2 System boundary for a typical building



Competent Professional:

A Competent Professional is an individual who has achieved the following:

- Educational background in the construction field, e.g. architecture, civil engineering.
- Trained on the compliant LCA tool.
- Carried out LCA for a minimum of three projects of a similar scale in the GCC region in the last two years.

The Competent Professional does not need to be an independent third party and may be a part of the Project team.

LCA Tool:

Project teams must carry out a cradle-to-grave assessment with an IMPACT compliant or ICC-ES LCA tool with calculations for product manufacture, construction and disposal over a 60-year service life as per the following impact categories as a minimum:

- Global Warming Potential (GWP)
- Acidification Potential
- Eutrophication Potential
- Fossil Fuel Depletion
- Ozone Depletion
- Human Toxicity

Credit Tool

N/A

Reference Documents

1. Saudi Green Building Code 1001, 505.3 Whole Building Life Cycle Assessment.
2. ASTM E2921 - 16a Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes, Standards, and Rating Systems.
3. ISO 14044-2006 Environmental management Life cycle assessment- Requirements and Guidelines.
4. ISO 14040- 2006 Environmental management Life cycle assessment- Principles and Framework.
5. EN 15643-2:2011 Sustainability of construction works- Assessment of the environmental performance of buildings: Calculation method.
6. EN 15804:2012 Sustainability for construction works- Environmental product declarations: Core rules for the product category of construction products.

MW-07 Space Flexibility

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To design multi-purpose spaces, particularly to adapt to future renovations or extensions while saving in construction material and overall cost.

Requirements

#	Requirement	Points Available
1	75% of non-structural elements (by area) of the building has any two of the following design flexibility strategies: • Demountable walls or moving partitions, • Modular or unfinished flooring and ceiling, • HVAC, Electrical, and Plumbing systems have the capability to adapt to spaces flexibility with minimal level of change. • Moveable or modular furniture.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses*	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	2	1	-	1
Full-Scope	1	1	1	1	1	-	1

*Requirement #1 awards 2 points to Warehouses typology at fit-out scope.

Design Stage Evidence

#	Evidence per Requirement
1	• Design Flexibility Strategy- Short report listing the chosen options with detailed narratives describing the implementation in the building. • Detailed design drawings highlighting applicable elements of flexible design. • Area calculations confirming compliance with credit requirements for the targeted non-structural elements.

	• Extracts from specifications confirming design flexibility characteristics of the targeted non-structural elements of the building.
--	---

Construction Stage Evidence

#	Evidence per Requirement
1	• As-built drawings confirming elements of design meeting credit requirements. • Updated area calculations confirming compliance with credit requirements for the targeted non-structural elements. • Manufacturer's data sheet of the installed non-structural elements highlighting flexibility in design as per credit requirements. • Date-stamped photographic evidence of installed non-structural elements as applicable.

Supporting Guidance

- a) All structural elements of the building are excluded from the area calculations.
- b) HVAC, electrical, and plumbing systems should be designed in a way to be flexible for changes in the space layout. Changes in these systems need to be limited only to replacement of fittings and fixtures, and any configuration in controls or building management system (BMS).

Credit Tool

N/A

Reference Documents

N/A

Education and Innovation

11 Education and Innovation

In order to cultivate a long-lasting culture of sustainability and create value for well-operated and sustainable buildings, Mostadam ensures that occupants of Mostadam-certified commercial buildings are aware of how these spaces are being operated sustainably. Additionally, guidance on being sustainable is provided to occupants, thus providing them with knowledge on sustainability that can be carried into other aspects of their life.

Projects are rewarded for providing occupants with the opportunity to engage with the facility management team and provide feedback on the building's operations. Such engagement further contributes to the cultivation of a culture of sustainability, as occupants are active contributors towards ensuring sustainable operation of the building. This category also gives owners and project teams a certain degree of freedom to exceed existing requirements under all criteria or to pursue sustainable ideas that are not currently covered by the rating system, thus further pushing the frontier of sustainability in KSA.

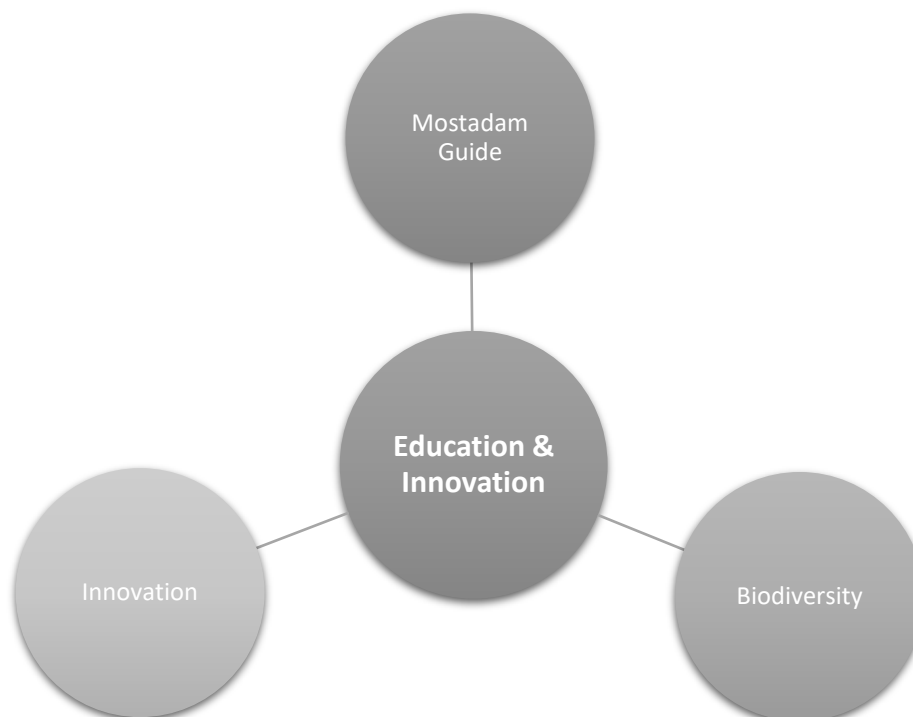


Figure 16 Education and Innovation credits

El-01 Mostadam Guide

Credit Requirements	Keystone	Points Allocated
Requirement #1	Yes	1

Aim

To promote the efficient operation of the Mostadam rated building by providing information which enables building occupants to play an integral part in the building's sustainable performance.

Requirements

#	Requirement	Points Available
1	Develop a Mostadam Guide in English and Arabic which communicates the building's sustainable credentials to the owners/occupants and provides guidance on how to operate more sustainably. <u>Shell only and Core and Shell Projects</u> Develop a Fit-out Policy to provide guidance on the minimum sustainability requirements of the fit-out.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	1	1	1	1	1	-	1
Core & Shell	1	1	1	1	1	-	1
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

Design Stage Evidence

#	Evidence per Requirement
1	- Mostadam Guide that describes the building's targeted credits and the role of the occupants in ensuring the continuous sustainable performance of the building (refer to the Supporting Guidance section for the required contents of the Mostadam Guide). <u>Shell only and Core and Shell Projects</u> - Fit-out Policy (English & Arabic)

Construction Stage Evidence

#	Evidence per Requirement
1	- Updated Mostadam Guide that describes the building's targeted credits and the role of the occupants in ensuring the continuous sustainable performance of the building (refer to the Supporting Guidance for the required contents of the Mostadam Guide). - Arabic translation of the final Mostadam Guide. <u>Shell only and Core and Shell Office Projects</u> - Updated Fit-out Policy (English & Arabic)

Supporting Guidance

The Mostadam Guide must contain the following sections as a minimum:

Table EI-01.1 Contents of Mostadam Guide

No.	Section	Description
0	Introduction	- Narrative describing how the project is aligned with Saudi Vision 2030. - Summary of the sustainability features of the building and the positive impact of sustainability on the environment. - Summary of the role of the occupants in ensuring the continuous sustainable performance of the building. - Narrative describing the positive impacts on occupant well-being and building longevity that are achieved as a result of proper maintenance and commissioning of the building and its systems. - Brief introduction to the O+E scheme of Mostadam for Commercial Buildings.
1	Site Sustainability	- Description of the awarded Site Sustainability credits and how they were achieved. - Guidance on the management and maintenance of the landscaped areas including soil enhancement and protection, irrigation and the protection of natural assets.
2	Transportation and Connectivity	- Description of the awarded Transportation and Connectivity credits and how they were achieved. - A comprehensive transportation and mobility guideline for the occupants including information on the local transport options (refer to the U.S. EPA website for guidance) and any other established commuting services (e.g. carpool).

		• A summary list of all amenities that are accessible by building occupants through an easy and safe walking distance.
3	Region and Culture	• Description of the awarded Region and Culture credits and how they were achieved. • The economic, social and environmental benefits of supporting local businesses and establishments.
4	Energy	• Description of the awarded Energy credits and how they were achieved. • The energy efficiency commitments of the building and the role of the occupants in meeting them. • For energy metering, user support and information on the level of sub-metering installed, including remote access abilities and guidance on how to utilize the data to reduce consumption levels. • Instruction that energy consumption data is to be shared with <i>Sustainable Building</i> and that all data will be treated as confidential. • Manuals for all installed appliances. • Specifications for the energy consuming features installed and guidance on future replacement. • HVAC maintenance requirements e.g. air-conditioning filter replacement, preventive maintenance for installed features • Operation and Maintenance (O&M) manuals for any solar hot water or PV systems installed, including the methods for cleaning the systems and how to cover them if the occupants will be away for a period of time.
5	Water	• Description of the awarded Water credits and how they were achieved. • The water efficiency commitments of the building and the role of the occupants in meeting them. • For water metering, user support and information on the level of sub-metering installed, including remote access abilities and guidance on how to utilize the data to reduce consumption levels. • Instruction that water consumption data is to be shared with <i>Sustainable Building</i> and that all data will be treated as confidential. • Manuals for all installed appliances.

		• Specifications for the water consuming features installed and guidance on future replacement.
6	Health and Comfort	• Description of the awarded Health and Comfort credits and how they were achieved. • The benefits of providing a comfortable indoor environment such as increased productivity of building occupants and improved wellbeing • The elimination of indoor pollutants and VOCs and its positive impact on health and wellbeing. • The benefits of exercise in preventing disorders caused by sedentary lifestyle such as diabetes, obesity, cardiovascular disease, osteoporosis and depression. • A brief description of all safety and security measures adopted in the building design.
7	Materials and Waste	• Description of the awarded Materials and Waste credits and how they were achieved. • A comprehensive waste and recycling guideline for the occupants including local waste and recycling policies and sorting requirements, and the location of waste recycling centers. • Benefits of using recycled and non-polluting materials.
8	Education and Innovation	• Description of the awarded Education and Innovation credits and how they were achieved.
9	Policies, Management and Maintenance	• Description of the awarded Policies, Management and Maintenance credits and how they were achieved. • Recommissioning schedule for major building systems. • Guidance on the sustainable procurement of products for interior spaces such as FSC wood, carpets, and other interior design products, and for sustainable services such as cleaning, laundry, and catering. • Lifestyle tips and guidance on how occupants can lower their energy and water consumption, with particular emphasis on how occupant behavior affects the building performance.

For Schools

Develop a narrative explaining how the contents of the Mostadam Guide can be incorporated into the school curriculum or as part of the extracurricular activities. Include the following information as a minimum:

- Brief description of the topics that can be covered.

- Examples of the types of activities and educational material that can be used. The materials covered must relate to the sustainability features of the building as well as sustainability in general

Fit-out Policy

For Shell only and Core and Shell projects, a separate fit-out policy must be developed in addition to the Mostadam Guide. This policy must contain the following requirements at a minimum:

- Narrative describing the sustainability vision for the building.
- Summary of the sustainability targets and objectives that the building would like to achieve (e.g. energy consumption reduction targets, waste diversion targets etc.).
- Fit-out process which includes the mechanism for getting approval for the fit-plans from the Owner prior to commencing work.
- Summary of all Mostadam credits targeted by the project.
- Technical requirements that support the intent of pursued credits and guidance that will help fit-out projects achieve the requirements.

Credit Tool

N/A

Reference Documents

1. Saudi Vision 2030 (www.vision2030.gov.sa).
2. Greener Living www.epa.gov/environmental-topics/greener-living

El-02 Biodiversity

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

Inspire and engage future leaders to create a positive impact on the environment and increase their awareness of sustainability in the built environment.

Requirements

#	Requirement	Points Available
1	Create and implement a Biodiversity Strategy that promotes nature and biology while encouraging students to be involved in creating a positive impact on the environment.	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	-	-	-	-	-	-	-
Fit-Out	-	-	-	-	-	-	-
Full-Scope	1	-	-	-	-	-	-

Design Stage Evidence

#	Evidence per Requirement
1	- Biodiversity Strategy describing details of the biodiversity project(s) and its plan of execution as per the Supporting Guidance. - Drawings showing dedicated location for executing the planned biodiversity project(s). - Letter of commitment confirming the execution of the biodiversity project(s) prior to start of the academic semester.

Construction Stage Evidence

#	Evidence per Requirement
1	Updated Biodiversity Strategy detailing the project(s) executed on site.

	• As-built drawings confirming location of the biodiversity project(s) within the plot. • Updated letter of commitment, signed by owner, confirming the execution of the biodiversity project(s) prior to start of the academic semester.
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Supporting Guidance

Biodiversity is a terminology for “Biological Diversity” which refers to the enormous variety of life on the planet. The balance of biodiversity is important for the survival of human beings and wildlife. Many aspects of human activities contribute to endangering biodiversity and this can result in habitat loss, climate change and pollution.

Biodiversity Strategy

Create a Biodiversity Strategy that can be implemented on project site with goals to increase awareness of nature conservation and creating a positive impact on the environment. The strategy must include the following:

- Description of the objectives of the strategy.
- Description of the proposed biodiversity project(s) that are planned to be executed on site.
- Roles and responsibilities of the management team of the educational institutions supervising the biodiversity project during operations.
- Strategy of engaging students in the project to increase their knowledge of biodiversity and nature conservation.
- Drawings highlighting intended location for the biodiversity project(s).
- Resources needed for execution of the biodiversity project(s).
- Maintenance requirements for the dedicated site and the biodiversity project(s).

Biodiversity project(s) planned for execution onsite must meet the following criteria:

- Located within the site plot is a dedicated area with controlled access.
- Promotes local habitat and wildlife which is adaptable to the surrounding environment.
- Uses native and adaptive plant species that require a minimum level of maintenance. Refer to credit **SS-04 Ecological Enhancement** for guidance.
- Promotes the use of recycled resources in setting up site for the biodiversity project.

Credit Tool

N/A

Reference Documents

N/A

El-03 Innovation

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To encourage and recognize innovative sustainability practices, particularly those which promote durability, flexibility and low maintenance.

Requirements

#	Requirement	Points Available
1	Option 1: Surpass the requirements of an eligible Mostadam credit. Option 2: Adopt an innovative design or construction solution that improves the durability or flexibility of the building or reduces maintenance requirements.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	2	2	2	2	2	-	2
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	Option 1: - Narrative specifying the selected Mostadam credit(s) and the percentage/numerical improvement achieved over and above the existing requirements. Option 2: - Innovation report containing: - Description of the innovation and its intended purpose or expected benefits. - Technical narrative explaining how the innovation is not covered by any other credit.

	○ Description of the proposed achievement (see Supporting Guidance below). ○ Methodology of calculation/data collection. ● Relevant design drawings and specifications.
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Construction Stage Evidence

#	Evidence per Requirement
1	Option 1: ● Updated narrative specifying the selected Mostadam credit and the percentage/numerical improvement achieved in addition to existing requirements. Option 2: ● Updated innovation report containing: ○ Description of the innovation and its planned purpose or achieved benefits. ○ Technical narrative explaining how the innovation is not covered by any other credit. ○ Proof of achievement (see Supporting Guidance below). ○ Data sheets with calculations/relevant information. ● As-built drawings and material/product specifications.

Supporting Guidance

Option 1:

- The numerical/percentage improvement achieved for any eligible Mostadam credit must follow the incremental sequence provided within the credit.
- If a sequence of numerical/percentage increments is not present, a 20% improvement must be achieved on the percentage or numerical requirement stated in the credit.
- The following Mostadam credits are eligible for this credit:

Table EI-03.1 Eligible credits

Category	Eligible Credits	Innovation Requirement
Site Sustainability	SS-04 Ecological Enhancement	A minimum of 96% of newly landscaped plant species are classified as native, drought tolerant or saline tolerant.
Transportation and Connectivity	TC-01 Sustainable Commuting	Install Electric Vehicle Supply Equipment (EVSE) for a minimum of 4% of the total parking spaces to be used by the project.
	TC-02 Access to Public Transportation	A pedestrian entrance is located EITHER within 160 meters safe walking distance of a bus stop and a metro or commuter rail station. The minimum day-time service frequency of both the bus stop

		and the station must be at least 30 minutes.
	TC-03 Access to Amenities	EITHER a pedestrian entrance is located within 280 meters safe walking distance of 3 additional amenities OR a pedestrian entrance is located within 350 meters safe walking distance of 4 additional amenities.
Region and Culture	RC-01 Thriving Economy	A minimum of 48% of the construction materials (by cost) used on the development are sourced from within KSA.
Energy	E-01 Energy Performance	Achieve a minimum improvement of 45% over the baseline building. (Note: only the performance option is eligible for Innovation credit points).
	E-04 Renewable Energy	EITHER Solar Water Heating: SHW panels provide 60% of the building's hot water demand including pool's heating demand along with that of any associated shower facilities. OR On-Site Electricity Generation: PV panels provide a minimum of 18% of the total annual building energy demand.
Water	W-01 Indoor Water Performance	Reduce indoor water consumption by a minimum of 50% compared to the baseline.
	W-02 Outdoor Water Performance	The irrigation system reduces potable water use by a minimum of 90% compared to the midsummer baseline.
	W-04 Alternative Water Solutions	A minimum of 60% of wastewater is treated on-site and infiltrated or used on-site for irrigation.
Health and Comfort	HC-01 Outdoor Thermal Comfort	Provide a minimum of 90% shading cover to the following where they exist within the plot: • Pedestrian walkways • Playgrounds • Car and bicycle parking
	HC-06 Daylight and Visual Comfort	A minimum daylight illuminance of 250 lux is achieved for 60% of occupied area

	HC-07 Acoustics	Internal ambient noise levels are 20% less than the relevant values in Table HC-08.1
Materials and Waste	MW-01 Operational Waste Management	A minimum of 60% of operational waste is diverted from landfill.
	MW-02 Construction Waste Management	A minimum of 36% of the total amount of non-hazardous waste (by weight or by volume) is diverted from landfill.
	MW-04 Sustainable Materials	Recycled Steel: A minimum of 60% of all reinforcing or stressing steel (by weight) used within the project boundary has a minimum of 80% post-consumer or pre-consumer recycled content. Recycled Aggregates: A minimum of 18% of all aggregates used on site (by volume) are recycled aggregates. Certified Timber A minimum of 60% of timber and composite wood products (by cost) used as temporary construction timber, permanently installed products and furniture should be certified with Chain of Custody (CoC) certification.

Option 2:

- a) The innovative solution must support one or more of the following aspects of sustainability :
- Low maintenance
 - Durable
 - Flexible e.g. easily adaptable for extensions/renovations
- b) Project teams can present their innovative solution to achieve points under this credit by providing evidence and a report which conforms to the following structure:

Measured: SMART criteria for setting the objective- Specific, Measurable, Achievable, Relevant, and Time-bound.

Analyzed: The innovative solution should produce data that can be analyzed for comparison with an existing baseline so that improvements can be identified in a quantitative manner.

Reported: The innovative solution should be reported for wider industries and stakeholders to benefit. Sufficient disclosure of technical information is required without compromising sensitive

commercial information, however *Sustainable Building* will encourage full disclosure where possible.

Replicated: The innovative practice can be replicated by other Mostadam projects where appropriate.

Improved (for future developments): *Sustainable Building* reserves the right to include any innovation submitted in future iterations of Mostadam.

Credit Tool

N/A

Reference Documents

N/A

Policies, Management and Maintenance

12 Policies, Management and Maintenance

Policies, Management and Maintenance emphasizes the development and implementation of policies whilst managing and maintaining established processes that enhance the sustainable operation of buildings. It encourages sustainable procurement, especially in KSA by establishing policies that incline towards procuring consuming products manufactured in the country rather than acquiring them from elsewhere. This in turn supports the local economy in addition to minimizing emissions and costs associated with transportation such as airfreight.

The average per capita waste generation rate in KSA is 1.5 to 1.8 Kg per day. With a total population of 29 million, this amounts to approximately 15 million tons of solid waste per year³. The Vision 2030 development plan of the KSA aims to overcome the challenge of escalated waste production rates through efficient waste management systems. This is aimed to be achieved by means of two major initiatives- National Transportation Program (NTP) and Integrated Waste Management Plan. Moreover, these enable initiating comprehensive recycling projects that aim to divert waste from landfill.

Mostadam supports this Vision and rewards projects based on building performance, sustainable procurement strategies, service and maintenance of buildings and ongoing waste management.



Figure 17 Policies, Management and Maintenance credits

³Nizami, A.S., et.al. (2015). An Argument for Developing Waste-to-Energy Technologies in Saudi Arabia. Chemical Engineering Transactions, vol 45. DOI: 10.3303/CET1545057

PMM-01 Systems Commissioning

Credit Requirements	Keystone	Points Allocated
Requirement #1 & 2	Yes	2

Aim

To ensure the installed building systems are operating efficiently and as intended.

Requirements

#	Requirement	Points Available
1	Appoint an independent Commissioning Agent (CxA) to manage the commissioning procedure (see Supporting Guidance).	2
2	Ensure all systems and controls have been installed and are operating as intended. The commissioning certificates, list of systems installed and operation and maintenance instructions (e.g. Manufacturer's O&M manuals) must be included in the Mostadam Guide (credit EI-01 Mostadam Guide).	
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1 & 2	- CV of independent Commissioning Agent (CxA) and confirmation, by owner, of their appointment for the duration of the design stage of the project. - Commissioning Plan prepared by the CxA.

Construction Stage Evidence

#	Evidence per Requirement
1 & 2	• CV of independent Commissioning Agent (CxA) and confirmation, by owner, of their appointment for the duration of the construction stage of the project. • Testing certificates for all systems and controls installed in the building. • Relevant sections of the Mostadam Guide containing commissioning certificates, list of systems installed and operation and maintenance instructions. • Commissioning Report signed by CxA with detailed results on systems verification and confirmation that systems are operating as designed.

Supporting Guidance

Commissioned Systems:

The building's systems that are covered by this credit are:

- HVAC systems: heating, ventilation, air conditioning, chillers, boilers, refrigeration and chilled water from district cooling.
- Electrical power systems: distribution, emergency and backup power.
- Lighting and lighting controls (internal and external).
- Automated controls, building management systems, building automation systems, direct digital controllers, supervisory control and data acquisition.
- Onsite water systems: hot and cold water, irrigation water, water features, swimming pools and water treatment systems.
- Metering systems.
- Onsite renewable systems and/or other alternative energy systems.
- Fire and life safety systems.

Independent Commissioning Agent (CxA):

- a) The CxA must be appointed prior to the start of the commissioning review process in the design phase.
- b) The CxA must have a minimum of five years of experience in commissioning building systems.
- c) The CxA may be an employee of the owner, design company, construction management company, project management company, or be an independent consultant and must report directly to the Owner.
- d) The CxA must not be an employee of the project's Contractor or sub-contractor.
- e) The CxA must not be involved in the design or construction process of the project in any other capacity.

Commissioning Procedure:

The independent Commissioning Agent (CxA) must oversee the inspections, testing and commissioning requirements identified in Section 611 of Saudi Building Code SBC 1001 and undertake the following:

- Review the OPR, BOD, design documents and specifications.
- Develop and maintain a project specific Commissioning Plan.

- Detail the envelope testing requirements, if applicable and include these in the Commissioning Plan (refer to credit **E-03 Envelope Commissioning**).
- Review and approve the commissioning program submitted by the Contractor against the resource schedule for testing and balancing. Once commissioning activities commence, report directly to the owner/owner's representative regarding any deviation or proposed changes that will impact commissioning duration and/or commissioning quality.
- Review and maintain records of the commissioning method statements.
- Develop the inspection and test processes.
- Witness testing and commissioning activities.
- Provide the Pre-Certificate of Occupancy report.
- Prepare and provide the Final Commissioning report.
- Chair commissioning meetings and issue minutes of commissioning meetings.

Sample Testing:

- a) For large developments pursuing grouped submission(s), the commissioning requirements can be undertaken for 50% of typical buildings/units of the same floorplan, whichever is greater.

Credit Tool

N/A

Reference Documents

1. Saudi Building Code (SBC) 1001 Green Buildings, Chapter 9 Commissioning, Inspections, Operation and Maintenance.
2. Saudi Building Code (SBC) 601 Energy-Efficient Design of Buildings Except Low-Rise Residential Buildings in Saudi Arabia.

PMM-02 Sustainable Procurement

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	1

Aim

To encourage the purchase of sustainable products and services that reduce adverse impacts on human health and the environment.

Requirements

#	Requirement	Points Available
1	Develop a Sustainable Procurement Policy (SPP) that encourages the purchase of sustainable products and services for the operation and maintenance of the building. The SPP should be included as an Appendix to the Mostadam Guide (EI-01 Mostadam Guide).	1
	Total	1

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell*	1	2	2	2	2	-	2
Fit-Out	1	1	1	1	1	-	1
Full-Scope	1	1	1	1	1	1	1

*Requirement #1 awards 2 points to all building typologies at core & shell scope except for Educational Institutions.

Design Stage Evidence

#	Evidence per Requirement
1	- Draft Sustainable Procurement Policy (SPP). Refer to the Supporting Guidance section for details on what the SPP must contain. - Signed confirmation from the building developer/owner that the SPP will be implemented during building operation stage.

Construction Stage Evidence

#	Evidence per Requirement
1	• Final version of the Sustainable Procurement Policy. • Signed confirmation from the building developer/owner that the SPP will be implemented.

Supporting Guidance

Sustainable Procurement Policy (SPP):

The SPP is to be implemented by the development owner, contractor and occupants, and will impact the purchase of products and services for the operation and maintenance of the building. Sustainable goods and services that are to be included in the SPP as a minimum are:

- Cleaning products.
- Paper products.
- Electrical equipment e.g. appliances, computers.
- Building material e.g. cement, concrete, timber; and surface finishes e.g. paints, coatings, adhesives, sealants.
- Services undertaken by facility management staff, including cleaning using sustainable methods and products.

Product Environmental Performance:

The SPP must give preference to products and services which have at least three of the following attributes:

- Durable and not for single-use only
- Non-toxic or minimally toxic
- Biodegradable
- Manufactured/assembled in KSA
- Environmental Product Declaration (EPD)
- Energy efficient
 - In the case of appliances, they must have an Energy Efficiency Label from the Saudi Standards, Metrology and Quality Organization (SASO) for a minimum level of “B”. For those appliances not currently covered by SASO, they must be Energy Star certified. Refer to credit **E-05 Energy Efficient Appliances** for further guidance.
- Minimally packaged
- Recyclable
- Made from natural materials
- Produced using renewable energy

Environmental Product Declarations:

Manufacturers typically undertake a life cycle assessment of their products to provide proof of their reduced environmental impact relative to other products in the market. This proof comes in the form of an Environmental Product Declaration (EPD) which lists the potential impact of a product by its contribution to the following environmental hazards:

- Global warming (greenhouse gases)
- Eutrophication of fresh water
- Depletion of non-renewable energy resources
- Acidification of land and sea
- Stratospheric ozone depletion
- Formation of tropospheric ozone

It is important to note that a product that provides an EPD is not a guarantee that it is environmentally friendly. However, the transparency an EPD provides is intended to influence comparison and selection of goods. All EPDs must follow either the ISO 14025 and/or EN 15804 standards for their calculation and reporting format. Refer to credit **MW-06 Life Cycle Assessment** for further details.

Supplier Environmental Performance:

The Sustainable Procurement Policy should give preference to suppliers and manufacturers which have the following:

- Environmental awards and certificates e.g. FSC, Organic and Fair Trade.
- Internal management systems which showcase consideration towards the environment e.g. ISO 14001 certification, Carbon Trust and EMAS (Eco-Management and Audit Scheme).

The following should be included in the Sustainable Procurement Policy as a minimum:

Table PMM-02.1 Sustainable Procurement Policy contents

Sustainable Procurement Policy		
#	Section Title	Content Requirements and Guidance
1	Aims & Objectives	Aims and objectives of the SPP.
2	Roles & Responsibilities	High-level overview of the various roles associated with procurement and their responsibilities.
3	Policy Scope	Description of building products and materials that are covered by the Policy.
4	Sustainable Procurement Approach	Detail the sustainability attributes that will be targeted for all applicable purchases and the documentation/evidence required. For each product and material type: • List the preferred attributes and any orders of priority for the attributes. • Provide examples of specific products and materials with the preferred attributes. • Provide examples of manufacturers and suppliers with appropriate environmental awards/certificates and internal management systems.

Credit Tool

N/A

Reference Documents

1. US Environmental Protection Agency (EPA), Sustainable Purchasing Program.
2. ISO 14025:2006 Environmental labels and declarations, Type III Environmental Declarations, Principles and Procedures.
3. BS EN 15804 Sustainability of construction works, Environmental Product Declarations, Core rules for the product category of construction products.

PMM-03 Fair Labor Practices

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To demonstrate that living accommodation for engaged labor is at par with prevalent laws and reflects basics of health and well-being.

Requirements

#	Requirement	Points Available
1	Develop and implement a Labor Subsistence Plan outlining health and well-being characteristics to be provided in the labor accommodation and the minimum requirements as per the prevalent law and requirements in the Supporting Guidance.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only*	3	3	3	3	3	-	3
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

*Requirement #1 awards 3 points to all building typologies at shell only scope.

Design Stage Evidence

#	Evidence per Requirement
1	- Extract from specifications confirming requirements of development of Labor Subsistence Plan (LSP) by Contractor. Refer to the Supporting Guidance section for details on what the LSP must contain. - Letter of commitment, signed by building owner, confirming implementation of credit requirement during design stage.

Construction Stage Evidence

#	Evidence per Requirement
1	• Implementation of the Labor Subsistence Plan by Contractor detailing all action required and undertaken during construction stage. • Date-stamped photographic evidence to demonstrate how all elements of compliance defined in the Labor Subsistence Plan have been met or exceeded. • Maintenance and Inspection logs with information of findings and actions taken to rectify and maintain compliance.

Supporting Guidance

Labor Subsistence Plan:

The Labor Subsistence Plan should demonstrate compliance with MOMRA's Health Conditions for Workers' Housing in Urban Areas – 2017. In addition, the following criteria need to be met by the accommodation facilities provided for workers of the project at a minimum:

- Bedrooms:
 - Provision of adequate accommodation for all construction workers employed on the project with suitable amenities available within safe walking distances. Each worker must be allocated a space of not less than 4m².
 - Each worker must be provided with his own sleeping area even in case of shifts.
 - At a minimum, each worker must be provided with a bed, side table, and a closet with a lock.
- Sanitary Facilities:
 - The labor accommodation must be connected to a sanitary drainage (or septic tanks) and potable water system.
 - Cold and hot water must be provided for faucets and showers.
 - One shower and one washbasin must be provided for every 5 people.
- Regular pest control measures must be performed for the full accommodation on site.
- All rooms, kitchens and dining halls should be provided with ventilation in the form of openable windows and air conditioning.
- At least 3 of the following amenities must be available as dedicated spaces:
 - Prayer rooms or mosques
 - Supermarket
 - Clinic and pharmacy
 - Recreational facilities e.g. park with shaded rest areas, and
 - Access to public transport
- Service agreement with the Facilities Management Company for maintenance of these facilities and periodic inspections scheduled to be performed annually. These inspections can include and are not limited to water tank cleaning, pest control and air conditioning system servicing.
- A worker's representative committee to address any requests, concerns and grievances of the workers regarding security, health and sanitation. Any information required to be communicated to the residents, such as house rules, availability of transportation on weekends and other forms of engagement should be done through the representative committee.

Credit Tool

N/A

Reference Documents

1. Saudi Labor Law (Royal Decree No. M/51, 23 Sha'ban 1426/27 September 2005).
2. Health Conditions for worker's housing in urban area, MOMRA, 2017.

PMM-04 Building Performance Monitoring

Credit Requirements	Keystone	Points Allocated
Requirement #1	No	2

Aim

To install real-time monitoring systems reporting energy and water consumption, thereby raising awareness and enabling occupants to use the data to reduce their consumption.

Requirements

#	Requirement	Points Available
1	Smart meters and digital feedback systems are installed which configure and display energy and water usage data on a user-friendly interface such as a display screen or a dashboard and which provide data monitoring, logging, trending and alerts.	2
	Total	2

Credit Applicability Conditions

	Educational Institutions	Offices/ Commercial/ Government	Retail/ Restaurants	Warehouses	Hospitality	Mosques	Healthcare
Shell Only	-	-	-	-	-	-	-
Core & Shell	2	2	2	2	2	-	2
Fit-Out	2	2	2	2	2	-	2
Full-Scope	2	2	2	2	2	2	2

Design Stage Evidence

#	Evidence per Requirement
1	- Mostadam Guide (refer to credit EI-01 Mostadam Guide) with a section on Smart Metering providing user support for the meters and dashboards. - Drawings showing the location of the smart meters, the connected systems and the location of the display screens or dashboards. - Specifications for the functionality of the smart meters and display screens or dashboards. - Specifications for the web-based application and images of the digital interface that occupants will experience.

Construction Stage Evidence

#	Evidence per Requirement
1	• Mostadam Guide (refer to credit EI-01 Mostadam Guide) with a section on Smart Metering providing user support for meters and dashboards. • As-built drawings showing the location of the smart meters, the connected systems and the location of the display screens or dashboards. • Purchase orders/receipts for all smart meters and display screens or dashboards. • Smart meter and dashboard manufacturers' data sheets and specifications which highlight the energy and water monitoring capabilities. • Date-stamped photographs of the installed meters and dashboards. • Confirmation that installation, testing, commissioning of the installed system has been performed. • Training records for the maintenance team on the installed system.

Supporting Guidance

The presentation of data displaying energy and water performance of a building to the operator and occupants can influence consumption. The operators and occupants can understand the systems and areas which are consuming higher energy than expected. When smart meters are used, energy information can be available in real-time.

Display Screen (Dashboard) and Web-Based Application:

- a) The display screen should be provided as follows:
 - A minimum of one display screen in the lobby area, for overall building usage.
 - One display screen inside each tenancy space located in a common area visible by all employees and/or occupants. Alternatively, regular web-based communication with occupants of tenancy area may be possible in the absence of physical digital feedback. Frequency of communication shall be monthly or less.
- b) The display screen must interface with a web-based application and allow secure access by the local utility provider, end users and *Sustainable Building*.
- c) The web-based application shall:
 - Be accessible from occupants' smart phones and tablets in addition to the display screen.
 - Maintain records for a rolling 18-month period.
 - Provide visual and optional audible alerts indicating peak demand periods and high consumption rates.
 - Provide the ability to view trend logs of consumption at a minimum of 1 hour increments.
- d) If the project is also targeting credit **E-04 Renewable Energy**, energy generation data (real-time and cumulative) must also be monitored and reported on the dashboard.

Mostadam Guide Content (refer to credit **EI-01 Mostadam Guide**):

The following contents relative to this credit must be included in the Mostadam Guide:

- a) Location of all smart meters installed in the building.
- b) User interface guide for the display screens and access guide for the web-based application.
- c) Instructions or Manual for usage by occupants and Facility Management team.

Credit Tool

N/A

Reference Documents

1. CIBSE TM39 Building Energy Metering.

Glossary

13 Glossary of Terms

Term	Definition
Aggregate	Grained material used as reinforcement in composite mixes such as concrete. Examples of aggregate: sand, gravel, crushed stone, slag and recycled concrete.
As-built drawing	Drawing which represents the final constructed building, usually prepared by the contractor.
Bathymetry survey	A surveying method used to analyze the beds of water sources such as lakes, rivers and ocean. It is typically used to identify biological features and natural habitats of a water body.
Biodegradable	Material that can be broken down naturally by microorganisms.
Blackwater	Waste water from toilets that cannot be reused in the building.
Blowing agent	A high-performing insulating gas blown to fill the voids within the cellular structure of insulation to provide a higher thermal performance of the insulation material.
Building air tightness	The property of a building which pertains to air exchange between the building and its exterior through infiltration and exfiltration. A building air tightness test is performed to measure this property.
Building envelope	The barrier/shell that separates a building's conditioned space from unconditioned space, usually comprising of the exterior façade, roof and ground floor.
Building Management System (BMS)	An automated central system used to control the operation of electrical and mechanical systems in a building.
CO ₂ sensor	A sensor which measures the CO ₂ content of the area in which it is located. This is usually located in densely occupied areas, or in the return duct of an HVAC system.
Coefficient of Performance (COP)	A measure of the efficiency of a refrigeration system. It is the ratio of the amount of cooling to the energy input.
Color Rendering Index (CRI)	The ability of a light source to depict a color in its most natural form (with the most natural form of a color being lit by daylight).
Commissioning Agent	A certified professional responsible for delivering the commissioning process.
Compost	Organic material that has been decomposed through a composter and can be used for fertilizer.
Compostable waste	Waste that can be decomposed and used as fertilizer, this usually includes food waste and landscape waste.
Condensate	In the context of HVAC, condensate is liquid water which is formed as a result of warm humid air contacting a cooling coil.

Dashboard	A digital display that communicates the performance of a building to its occupants (including but not limited to energy and water performance).
Demand Controlled Ventilation (DCV)	An automated system which controls the volume of fresh air into a space based on time schedules, CO ₂ monitoring, occupancy readers or other smart readers.
District Cooling	A cooling system whereby a central cooling plant delivers chilled water to individual buildings in a district through an insulated underground piping network. The central plant houses large, highly efficient and industrial grade equipment to produce chilled water.
Dynamic energy modeling	A computerized model of a building which calculates the momentary, peak and annual energy consumption of a building through dynamic simulation. The model incorporates the building's architectural design, mechanical, electrical and plumbing systems, anticipated building usage patterns and annual climatic data.
Electric vehicle	A vehicle with electric motors powered by rechargeable batteries.
Electronic waste	Waste that is generated through discarded electrical and electronic equipment such as laptops, mobile phones, light bulbs etc.
Environmental Product Declaration (EPD)	A standardized method of quantifying the environmental impact of a product during its lifecycle.
Flood hazard area	A legally designated flood hazard area is an area that is subject to a 1% or more chance of flooding in any given year. Flood hazard areas are designated in Flood Insurance Rate Maps.
FSC certified	Forest Stewardship Council certified. This is a method of certifying wood that has been sourced through responsible forest management.
Glare	An uncomfortable phenomenon that results from too much daylight penetrating through a glazed assembly. This could be directly through the glazing, or from daylight reflecting off an interior surface.
Global Warming Potential (GWP)	GWP is a measure of how much heat the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO ₂). The larger the GWP, the more that a gas warms the Earth compared to CO ₂ over the same timeframe.
Graywater	Waste water from non-toxic sources such as sinks and showers. This water can be reused in the building and for landscaping.
Greenhouse gas	Gases in the atmosphere that trap and hold heat from the sun due to their ability of absorbing infrared radiation from the sun. An increase in greenhouse gases in the atmosphere leads to global warming.
Hazardous material	Waste that may have toxic and harmful effects on human health and the environment if not managed with proper care.
Heat island effect	A phenomenon where urban areas and city temperatures are warmer than their surrounding suburbs.

High-albedo surface	A surface which has a high reflectivity of light.
Illuminance	A measurement of lighting level which represents the total amount of visible light incident upon a surface or imaginary plane, per unit area from all directions above the surface. The measurement unit for Illuminance is “lux”.
Landfill	An area where large quantities of waste (usually waste collected from urban areas/municipal waste) is disposed and typically buried.
Life Cycle Assessment	The assessment of a product’s environmental impact through all stages of its life from raw material extraction to its disposal or recycling (cradle to grave).
Light transmittance	The percentage of light that is transmitted through glazing.
Line of sight	A direct line from an observer’s eye to a specified point.
Luminaire uplight	Light that is directed upwards from a luminaire due to its placement and the shape of the fixture. A higher up-lighting rating causes lighting pollution in outdoor lighting.
Majlis	Directly translated from Arabic as “place of sitting”. An area typically found in buildings in the Middle East, used for social and special gatherings.
Mashrabiya	An Arabian architectural shading element with a lattice type appearance which is applied to windows.
Occupancy sensor	An electronic device which detects human presence and is usually used to control a building’s lighting and/or mechanical systems.
Ozone Depletion Potential (ODP)	The ODP of a chemical compound is a relative value that indicates the potential of a substance to destroy the ozone layer compared to the potential of chlorofluorocarbon-11 (CFC-11), which is assigned a reference value of 1. Thus, a substance with ODP of 2 is twice as harmful as CFC-11.
Pervious surface	Permeable or porous surfaces that allow for water absorption.
Post-consumer recycled material	Material that is recycled after it has been used by consumers.
Pre-consumer recycled material	Reuse of waste that is formed from a manufacturing process.
Radiative cooling	The removal of sensible heat from a space through the use of a cooled surface.
Regularly occupied space	Regularly occupied spaces are those where one or more individuals spend time on an ongoing basis, more than one hour per day on an average, using the building facilities. E.g. classrooms, lecture halls, laboratories are regularly occupied spaces in educational institutions.

	These spaces do not include hallways, bathrooms, storage rooms, laundry rooms or garages.
Renewable energy	Energy collected from resources that do not deplete or can be renewed within the human life scale. Sources such as solar, wind and geothermal heat are considered renewable.
Smart meter	An electronic device that records consumption of select end uses and communicates the information for monitoring and/or billing. Smart meters typically record on at least an hourly basis.
Solar factor	Also referred to as the g-value. This is the percentage of heat that transfers through glass (i.e. the thermal transmittance of glass)
Solar heat gain coefficient	Abbreviated as SHGC. A fractional measurement of how much solar energy is emitted through glazing either directly (solar transmittance) or indirectly (through absorption and re-radiation). The ratio is between 0 and 1. The lower the ratio, the less solar energy is admitted through the glazing.
Thermal comfort	Occupants' perception of thermal satisfaction in their environment.
Thermal mass	The ability of a material to retain heat.
Thermal zone	A space or group of spaces with similar space-conditioning requirements and heating and cooling setpoints.
Thermostat control	An electronic device that measures temperature and controls the heating or cooling system accordingly.
U-value	A measure of the rate of transfer of heat through a material (i.e. thermal transmittance).
Variable Air Volume (VAV)	A type of HVAC system where the air volume is varied to meet the setpoint temperature in a thermal zone.
Variable speed drive (VSD)	An electric motor with an adjustable speed which varies based on a control signal.
Virgin material	Raw material that has not previously been used.
Wastewater treatment	The process of treating waste water to enable it to be reused.
Water fixture	Plumbing fixtures which deliver water to the consumer such as faucets, shower heads etc.
Weather-stripping	The process of sealing air leaks around movable building components such as doors or openable windows.



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