حكومة دبي
GOVERNMENT OF DUBAI

هيئة كهرباء و مياه دبي
Dubai electricity & Water Authority

بلدية دبي
DUBAI MUNICIPALITY

Green Building Regulations and Specifications

Practice Guide

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FORWORD

Sustainable Development is about achieving the dual goal of striking a balance between economic growth and environmental protection. Through its strategic planning, legislation and projects, Dubai has always been a leader in this area - despite its limited natural resources and difficult climatic conditions.

Dubai's Strategic Plan is aligned to the historic resolution of His Highness Sheikh Mohammed bin Rashid Al Maktoum - Vice President, Prime Minister and Ruler of Dubai - on the implementation of green building specifications in all buildings and projects in the Emirate of Dubai. This culminated in the Green Building Project which is considered one the most important legislations adopted by the government to protect the environment and its natural resources as well as to preserve public health and people's welfare without adversely affecting the potential of our future generations.

We seek in Dubai to build an excellent city, clean and free of contaminants that provides the essence of success and comfort of living, for that it is imperative to continue and maintain what has been built with high quality and fulfill our duties to the international community through an active role in the global efforts to reduce the risk of climate change, global warming and greenhouse gases emissions.

All concerned authorities in our beloved Emirate have come together in unison to accomplish this Green Building Practice Guide as a real contribution to sustainable development. We, therefore, request all official bodies, the community and the private sector to adopt and implement practical methods and effective solutions in applying these regulations without harming the national economy. In so doing, we will be playing our part in following the best international practices as it pertains to sustainable development.

Finally, I wish to thank everyone at the Green Building Committee who contributed their expertise, time and efforts to bring this Guide into existence.

We, at Dubai Municipality, will continue to strive and work hard to make Dubai a fullfledged Green City, thereby achieving the wise vision of our leader, His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice President, Prime Minister and Ruler of Dubai in making Dubai "the hub of global finance, business, and tourism."

Eng. Husain Nasser Lootah
Director General of Dubai Municipality

PREFACE

It is with great pleasure that we present to you the first edition of the Dubai Green Buildings Regulations and Specifications Practice Guide - Dubai 2011. This achievement was the result of the combined efforts of Dubai Municipality in collaboration with Dubai Electricity and Water Authority through the Green Building Committee and intensive follow up of the Executive Council of the Government of Dubai.

The Green Building Committee has set the strategic objectives and developed the operational and future plans for the Green Building Project. After which the committee has identified the targets of Dubai Green Building Project after studying most of the recognized international practices in this field. It has selected the most appropriate items from them to be applied in Dubai through dialogue sessions and exchange of views and experiences and benchmarking with partnership of all concern authorities and stakeholders including the external customers. The selected items were studied in-depth to reach up to determine the most appropriate items to be applied in Emirate of Dubai. These items came after an extensive evaluation in terms of environmental impact, cost, market readiness, ease of application and availability of materials and the possibility of testing, inspection and accreditation. For this, this issue of the Green Buildings Regulations and Specifications Practice Guide attached with Green Building Materials Guide came in order to ensure the safety and ease of application and adoption of the mechanism of application of these standards.

The Practice Guide is divided into 8 main sections. The first two sections are introductory sections cover the Administration and Definitions. Section three covers mainly the environmental building planning & design in a way that caters for the end users' needs whilst being environmentally friendly. Section four addresses the issue of building livability to improve the internal building environment as well as the health and welfare of the occupants. The remaining three sections focus on the adequacy of resources as relating to energy, water, building materials, and waste management.

The first edition of this guide requires the participation of all concern parties and all segments of society to develop it after it has been tested in practice on the ground to ensure the effective implementation in the future and to promote the integration of the concept of Green City which we hope Dubai will be in the level of best Green cities in the world as inspired by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister and Ruler of Dubai.

Eng. Essa Al Haj Al Maidoor
Chairman of Green Building Committee

Green Building Committee

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Eng. Essa Al Maidour	Director General Assistant - Planning & Engineering Sector Dubai Municipality

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Content

Green Building Regulations & Specifications

100: Administration 1

101: Introduction 3
102: Link to Sustainability 4
103: Definition of Green Building 7
104: Links to Strategic Vision 7
105: Focus of the Regulations 8
106: Modelling Information 9
107: Use of Practice Guide 9
108: Implimentation System 10
109: Energy and Water Compliance Methods 11

200: Definitions 13

300: Ecology and Planning 37

301.01: Preferred Parking 39
301.02: Enabled Access 43
301.03: Bicycle Storage and Changing Rooms 46
302.01: Local Species 51
303.01: Exterior Light Pollution and Controls 55
304.01: Urban Heat Island Effect 58
304.02: Green Roofs 62
304.03: Light Colours on the Outside of Buildings 65
304.04: Orientation of Glazed Facades or External Shading 68
304.05: Hardscape 73
304.06: Shading of Public Access Areas 76
305.01: Impact of Construction, Demolition and Operational Activities 79
306.01: Environmental Impact Assessment 83

400: Building Vitality 87

401.01 Minimum Ventilation Requirements for Adequate Indoor Air Quality 89
401.02 Air Quality During Construction 92
401.03 Air Inlets and Exhausts 95
401.04 Isolation of Pollutant Sources 98
401.05 Openable Windows 101
401.06 Indoor Air Quality Compliance – New Buildings 104
401.07 Indoor Air Quality Compliance – Existing Buildings 107
401.08 Inspection and Cleaning of HVAC Equipment 111
401.09 Parking Ventilation 114
401.10 Environmental Tobacco Smoke 117
402.01 Thermal Comfort 120
403.01 Acoustical Control 123
404.01 Low Emitting Materials: Paints and Coatings 130
404.02 Low Emitting Materials: Adhesives and Sealants 133
404. 03 Carpet Systems 136
405.01 Provision of Natural Daylight 139
405.02 Views 146
406.01 Legionella Bacteria and Building Water Systems 149
406.02 Water Quality of Water Features 154

Content

500: Resource Effectiveness: Energy 160

501.01 Minimum Envelope Performance Requirements 161
501.02 Thermal Bridging 168
501.03 Air Conditioning Design Parameters 171
501.04 Air Loss from Entrances 174
501.05 Air Leakage 177
502.01 Energy Efficiency – HVAC Equipment and Systems 181
501.02 Demand Controlled Ventilation 185
502.03 Elevators and Escalators 188
502.04 Lighting Power Density - Interior 192
502.05 Lighting Power Density - Exterior 195
502.06 Lighting Controls 199
502.07 Electronic Ballasts 203
502.08 Control Systems for Heating, Ventilation and Air Conditioning (HVAC) Systems 206
502.09 Control Systems for Hotel Rooms 209
502.10 Exhaust Air Energy Recovery Systems 212
502.11 Pipe and Duct Insulation 215
502.12 Thermal Storage for District Cooling 219
502.13 Ductwork Air Leakage 221
502.14 Maintenance of Mechanical Systems 224
503.01 Commissioning of Building Services – New Buildings 228
503.02 Re-Commissioning of Building Services– Existing Buildings 231
503.03 Electricity Metering 235
503.04 Air Conditioning - Metering 239
503.05 Central Control and Monitoring System 242
504.01 On-Site Renewable Energy – Small to Medium Scale Embedded Generators 245
504.02 On-Site Renewable Energy – Outdoor Lighting 248
504.03 On-Site Renewable Energy– Solar Water Heating System 251

600: Resource Effectiveness: Water 255

601.01 Water Efficient Fittings 257
601.02 Condensate Drainage 260
601.03 Condensate Recovery 263
601.04 Water Efficient Irrigation 265
602.01 Water Metering 268
603.01 Wastewater Reuse 271
603.02 Water Consumption for Heat Rejection Including Cooling Towers 274

700: Resource Effectiveness: Materials and Waste 277

701.01 Thermal and Acoustical Insulation Materials 279
701.02 Certified Timber 283
701.03 Asbestos Containing Materials 287
701.04 Lead Containing Materials 290
701.05 Ozone Depletion Potential (ODP) Material Management 294
701.06 Recycled Content 299
701.07 Regional Materials 302
701.08 Composite Wood Products 305
702.01 Construction and Demolition Waste 308
702.02 Bulk Waste Collection 312
702.03 Waste Storage 314
702.04 Waste Collection 316
702.05 Recyclable Waste Management Facilities 320

800: Appendix: Green Building Tips 325

100

Administration

100 : A Practice Guide for Building a Sustainable Dubai

101 : Introduction

Sustainable Development

On 24 October 2007, His Highness Sheikh Mohammed bin Rashid Al Maktoum UAE Vice President, Prime Minister and Ruler of Dubai, stated:

All owners of residential and commercial buildings and properties in the Emirate of Dubai must comply with the internationally recognised environmental-friendly specifications to turn Dubai into a healthy city that meets the demands of best practice and the benchmarks of a pollution-free sustainable development.

This statement set Dubai on a "greener" and more sustainable development path. Many Governments around the world are now seeking the best ways through which a low carbon and more sustainable future can be achieved. Dubai has taken a bold step forward with these new building regulations which address the Emirate's most urgent sustainability issues of energy and water demand, carbon emissions and public health.

Dubai has chosen a Regulatory Framework instead of a Rating System through which to achieve the edict of His Highness. A rating system reviews various aspects in the building process and gives "credits" or "points" towards an award for a certain level of achievement – rating systems are valuable however rating is a voluntary system which engages only those who choose to use it. A mandatory system of regulation focuses on all buildings. Figure 1 illustrates some major differences between a Regulatory Framework and Rating Systems.

Figure 1: Regulatory Framework Compared to Rating Systems

REGULATORY FRAMEWORK	RATING SYSTEM
Mandatory Measures	Voluntary Measures
Directed and Focused	Developer/Builder's Choice
Strategic and Predictable	Selection Varies
All Buildings will have a Measure of "Greenness"	"Greenness" per Builder's Choice
Will Drive the Market	May Encourage Market

By implementing a Regulatory Framework, ALL buildings in Dubai will be required to implement sustainable practices, instead of just a few buildings which might choose a voluntary commercial system.

Dubai's Green Buildings Regulations are an addition to the current Codes & Standards, which set out mandatory minimum performance standards for buildings.

Dubai Municipality issued administrative order no. (344/2011) which indicate the implementation dates for the government, public and private buildings. Dubai's Green Building Regulations are applied voluntary to the public and private buildings in order to allow adequate time for the developers, construction professionals and the community to prepare for compliance. While Dubai's Green Building Regulations are applied mandatory to all new government buildings.

Dubai's Green Building Regulations create a link between Dubai's building regulations and the wider picture of Sustainability. The regulations have been developed to be Dubai-specific, closely related to Dubai's climate and conditions.

This document is the Practice Guide which provides guidance for each of the regulations that have been promulgated.

Overview of the Practice Guide

The Practice Guide has seven sections and one appendix. The first section of this Guide is the Administration, which provides details on the Green Building Regulations' link to sustainability and Dubai's definition of a Green Building. The Administration also includes the link to Dubai's Strategic Vision and the Focus of the Regulations. The purpose of the Practice Guide is described, along with details of how each of the guides expands on each of the regulations.

The second section of this Guide contains a Glossary of Terms used in all the Practice Guides. While the sections from third to seven contain all the Practice Guides. Each Guide includes a re-statement of each of the regulations, as well as sufficient information to provide some understanding of the reason for the regulations, their benefit and some guidance towards compliance. The Practice Guides are not intended to provide detailed design information or to be a substitute for the experience and expertise of the building designers and contractors.

The appendix is included at the end of this document which offers some energy and water conservation tips.

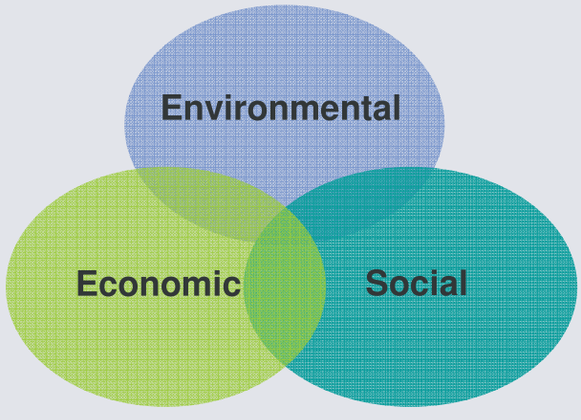
102 : Link to Sustainability

Sustainability is a complex concept which has rapidly developed in the past few years. Founded in the Brundtland Report *'Our Common Future'* the concept of Sustainable Development has served two decades of renewed effort in addressing environmental and social issues in the context of economic growth. In the context of the built environment and Climate Change, In the last 5 years, *Sustainability* has become the benchmark terminology for the response required in human-influenced activities Dubai examined the traditional definition of Sustainable Development as defined by the Brundtland Commission in 1987, which states that:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Dubai also reviewed the common principles of Sustainability which are often referred to as the "Triple Bottom Line". This is a concept that began development in 1994 as a way of going beyond just the economic aspects of any product, project or programme. It includes three aspects: Social, Environment, and Economic and is often viewed as interlocking circles as depicted in Figure 2.

Figure 2: The Three Pillars of Sustainability



It was the intent of Dubai that in developing these Green Building Regulations that they were linked to the higher principles of Sustainability. With the regulations, Dubai wishes to balance the opportunities and challenges of each aspect in the "triple bottom line" ensuring a positive outcome for all. In practice this means that the Regulations aim to deliver a built environment that delivers environmental improvement and a better quality of life for the people and visitors of Dubai at a cost that is not unacceptable and in fact supports future economic growth.

The goal is to apply sustainable principles to the tasks of building design, construction, operation, maintenance, change of use and deconstruction in Dubai. The examples described below relate to the existing Green Building Regulations that have been put in place within the environmental, economic and social context of buildings.

Environmental

Buildings have many impacts on the environment. From the materials manufactured, to the multiple facets of construction, to the longer term operational and maintenance period to the final disassembly and disposition of components, buildings have an impact on the environment.

To achieve a more sustainable built environment, Dubai has identified the following important considerations regarding these new Regulations:

- **Reduce Energy, water and carbon emissions** – Perhaps the primary focus for the Green Building Regulations is to address issues of energy and water demand to conserve limited resources, increase energy security, reduce infrastructure costs and mitigate carbon emissions.

- **Responsiveness to Dubai's climate** – This single factor is a significant issue for building construction in such areas as a building's core and shell, its mechanical components, its need for air conditioning, the materials used and even a building's orientation. As an example, sustainable buildings in Dubai should seek to reduce the heat impact with Heat Island strategies, light colours and heat rejection approaches.

- **Pollution reduction or elimination** – A building and activities related to the building should attempt to minimise or eliminate pollution and seek to protect the environment within the building site and around it. As an example, light pollution and even condensate drainage should be controlled. Pollution also affects people and the quality of indoor environments or the 'vitality' of the buildings is particularly important.

- **Minimising and conserving resources** – Natural resources create the basic needs for life and form the basis for all man-made materials. Minimising and effectively using these resources forms the principles of good stewardship in sustainability. Thus, sustainable buildings in Dubai should include programs to recycle materials, use green products, and reduce demolition and construction waste, among others.

Economic

Throughout the years of the life of a building, many economic impacts are associated with the construction and operation of a building.

An evaluation of costs and benefits is necessary to examine efficiency for the life cycle of the building's development. The ability to quantify costs helps to maximise the benefits in developing sustainable cities. These impacts are not only related to buildings, but also to the site and the surrounding environment. Economic impacts occur not only during the construction, but also before and after construction. Each building has the potential to have an economic impact on its neighbours, the local community, as well as the larger Emirate of Dubai. To achieve sustainability, Dubai has identified the following considerations to assess the economic impacts of buildings.

- **Efficiency** – Efficiency can be defined as the optimum use or productivity of any mechanical, structural or building component when no further improvements can be made. Efficiency seeks to maximize the value of materials or systems. As an example, this can lead to more efficient elevators, better control systems, and water efficient fixtures in Dubai.

- **Cost/Benefit throughout a building's lifecycle** – The entire spectrum of a building and everything related to that building must take into account both the costs and the benefits of any single item. This includes costs and benefits during the phases of: design, construction, operations, maintenance, deconstruction/demolition and disposing of a building and all component parts. In addition, sustainable buildings in Dubai are not always more expensive than other buildings. Using water efficient techniques, or maintaining mechanical systems, or ensuring that commissioning is accomplished can have positive economic impacts.

- **Balancing performance** – This economic principle applies to balancing performance with the most cost effective response based on the conditions and context of Dubai. Thus, a specified energy performance of glazing, the prevention of cooling air loss, and condensate recovery are all methods to balance performance in a building.

Social

Buildings are built for people. The health, well being and liveability of a building are important aspects to be addressed in a sustainable strategy to strive towards the goal of ensuring a positive quality of life now, and for the future generations. Furthermore, buildings impact the social fabric of any city. While the structures may vary in complexity and use, the goal of each building is to provide a positive human interaction within that building. Each user must accomplish their goals in using the building, and the users' health, safety and welfare during that period must be ensured. To achieve sustainability, Dubai has identified the following aspects as important social considerations.

- **Protect Health** – Sustainable buildings in Dubai protect the health and well being of the building's users, as well as the health and well being of the building's neighbours. Ultimately, the goal of sustainable buildings is to ensure the health of its occupants and neighbours. This level of sustainability can be achieved in Dubai through the implementation of measures such as the use of low emitting paints and coatings, ensuring adequate parking ventilation and restricting the use of asbestos containing materials.

- **Ensure Comfort and Liveability** – A positive quality of life in and around a building is important for sustainable buildings in Dubai. Buildings must be liveable and promote comfortable surroundings with both active and passive systems. Thus, in Dubai, this aspect of sustainability should include measures such as light and thermal controls, views from a building, and good acoustical control.

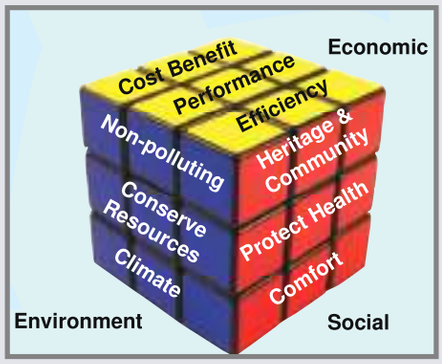
- **Heritage and Community** – The social aspect includes sensitivity to the Dubai-specific culture and heritage. It also ensures that buildings are accessible to the community and that information about that building is also available. For Dubai this includes such aspects as: incorporating indigenous plants that are less water consuming and ensuring enabled access. The social aspect also includes encouraging responsible use of resources by the community and instilling conservation ideals.

Sustainability Aspects are Interrelated

As shown in Figure 3, all aspects of sustainability are interrelated. The interdependence of these principles reflects the interdependence of the building, the systems within the building, and the site on which the building is located. Each of the regulations impacts all three areas of the triple bottom line, as well as all the various aspects described above.

Impacts occur during every phase of a building's life cycle from site development to deconstruction. The Practice Guide identifies impacts as they relate to sustainability (within the "Benefits" section of each Guide) and therefore recognises the cross-correlation of these principles and aspects. Sustainability is the pathway on which the regulations are built and they seek continuous improvement in building development for the building's entire life cycle.

Figure 3: Interrelated Sustainability Aspects



103 : Definition of a Green Building

For Dubai, Green Building is the practice of creating a built environment that is resource efficient in terms of energy, water, and materials whilst reducing building-related impacts on human health and the environment throughout the building's lifecycle, through better siting, design, construction, operation, maintenance, change of use and deconstruction.

Figure 4: Life Cycle of Buildings

A standard for Green Buildings can be set at any time but will always be progressive towards a building of zero net or positive impact on the environment, society and the economy.

104 : Links to Strategic Vision

How the Regulations Link to Dubai's Strategic Vision

The Green Building Regulations form part of a wider initiative from His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Vice President, Prime Minister and Ruler of Dubai, steer Dubai's development towards a more sustainable growth trajectory. The Green Building Regulations should be understood within the context of Dubai's Strategic Plan, as well as other initiatives on building performance standards within the UAE.

The following are the key areas of contribution from the Green Building Regulations to the vision for Dubai.

Leadership

Dubai's objective is to become the leading Arab city in the region, which is a global hub. Leadership in building performance will increase Dubai's long term sustainability goals. The Green Building Regulations demonstrate global leadership by creating a forward looking and comprehensive *mandatory* system for all buildings in Dubai. Leadership, in the context of Dubai, allows comparison with global best practice while reflecting on the uniqueness of Dubai.

Competitiveness

The Green Building Regulations enhance Dubai's competitiveness in the following areas:

- Brand and reputation, which allows benchmarking against international standards.
- Efficiency, which ensures peak and base loads of energy can be reduced. It promotes recovery and re-use of water. It ensures there are reductions in waste. Efficiency will optimise a better use of land and capital.
- Resilience, which can help anticipate and mitigate likely climate change impacts on Dubai and reduce Dubai's dependence on imported energy and resources.

Liveability

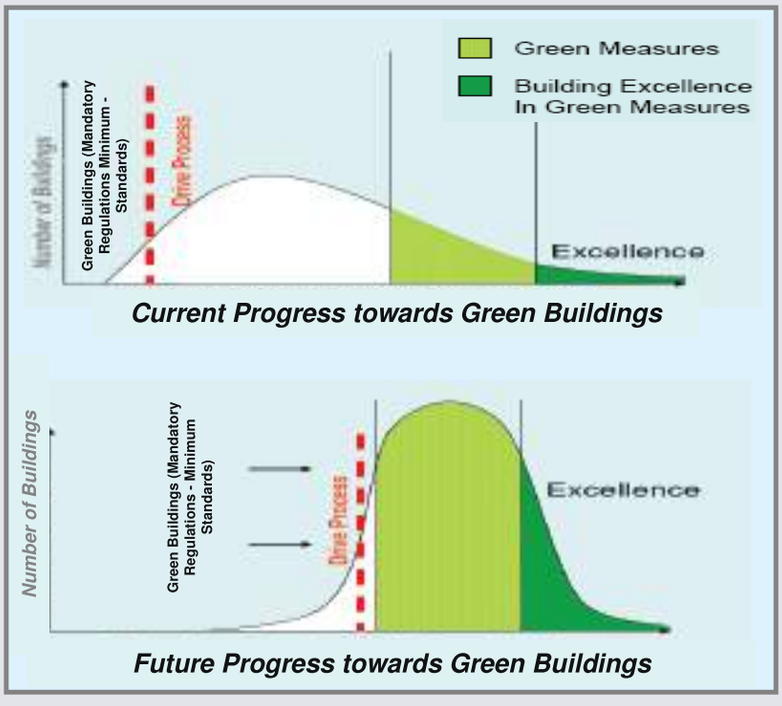
Improved outdoor and indoor environments will promote good quality of life for visitors and residents, and therefore to a high level of liveability. The quality of the urban environment is a key factor in making this achievable.

105 : Focus of the Regulations

A Regulatory Minimum Focus

The intent of the Dubai Green Building Regulations is to provide assurance that all buildings in Dubai will meet minimum sustainability standards. A variety of rating systems will continue to be used, which will increase the overall standards. In addition, there will be developers and building owners who will seek an exemplary level of building performance. However, the Green Building Regulations will be a key driver within this process, as shown in Figure 5. The "Current Progress" diagram shows the implementation of a certain level of green measures and green building excellence measures largely due to the use of rating systems. With the mandatory regulations (illustrated in the "Future Progress" diagram), both levels will increase.

Figure 5: Green Building Regulations Driving the Implementation of Green Building Measures



Focus on Design Phase

It is important to also acknowledge the importance of the design phase of the building process, which is the focus of a majority of the Dubai Green Building Regulations. The MacLeamy Curve, introduced in 2004 at the Construction Users' Roundtable, illustrates the impact of "effort" that is introduced early in the building process. There are typically two possible track lines of effort.

One of the track lines is a traditional approach with the following phases:

- Pre Design
- Schematic Design
- Design Development
- Construction Documents
- Agency Permit or Bid
- Construction and Post Construction

The second track line is an Integrated Design Process approach, with the following phases:

- Conceptualisation
- Criteria Design
- Detailed Design
- Implementation Documents
- Agency Coordination / Final Buyout
- Construction and Post Construction

A majority of the Dubai Green Building regulations will be primarily applied to the Design phase. This is especially important as the ability to alter the building's performance is greatest early in any project's lifecycle. Furthermore, the greater insights on methods to achieve the effects desired and produce maximum outcome come from the Design Phase. This is demonstrated in the "MacLeamy Curve" created by Patrick MacLeamy, CEO, Hellmuth, Obata + Kassabaum. The MacLeamy Curve demonstrates that the "effort and effect" through either the Traditional or Preferred method comes in the design phase, well before the bid and construction phase. Additionally, as the phases and time move forward, the ability to impact cost and functional capabilities decreases while the cost of design change increases.

Regulations during the Construction and Maintenance phases will also have an impact, especially on long term operational issues. Thus, it is necessary to maintain the effort necessary to enhance the entire lifecycle of a building with a "green" focus.

106 : Modelling Information

A significant amount of modelling work has been done relating to these regulations. The main purpose for undertaking a dedicated energy modelling study is to ensure that the Green Building Regulations have specific benefits quantifiable in the context of Dubai. The energy use of buildings is closely related to their size, use, the way they are operated, their construction characteristics, shape and of course the climate. The dynamic thermal modelling approach used allows the detailed consideration of all these factors to understand their sensitivity to the energy use of buildings.

107 : Use of Practice Guide

Overview

The Practice Guide is intended to provide general information on each regulation that is part of the Green Building Regulation. The guide is intended to inform professionals associated with the building industry, architects, engineers, general contractors, planners, landscapers, owners, facility managers, financial organisations related to the building industry, product manufacturers, developers, specifiers, and staff at government agencies. The guidance identified is intended to provide some understanding of the reason for the regulations, their benefit and some guidance towards compliance.

The Practice Guides are not intended to provide detailed design information or to be a substitute for the experience and expertise of the building designers and contractors. The guidelines do not relieve any professionals from ensuring that the regulations are met to their fullest extent. The Practice Guidelines included in this document are expected to be supplemented with the knowledge and professional experience of each of the users. The Practice Guidelines are organised as follows.

- Chapter 300: Ecology & Planning
- Chapter 400: Building Vitality
- Chapter 500: Resource Effectiveness: Energy
- Chapter 600: Resource Effectiveness: Water
- Chapter 700: Resource Effectiveness: Materials & Waste

Each Guideline is divided into sections, as follows.

Background

This section provides information on the overall context regarding the issue that is addressed by the regulation.

Applicability

This section identifies the building types to which the regulation applies, whether the regulation is a mandatory or voluntary requirement for each building type.

Benefit

This section reviews the impact of the regulation as it relates to sustainability principles (environmental, economic and social).

Guidance

This section provides information to guide the building team towards compliance. As the scope of the regulations is extremely varied, the guidance provided also varies depending on complexity of the issue addressed in the regulation. Depending on the topic, this section can include aspects such as:

- Expansion on regulation requirements
- Discussion on referred documents
- Examples or illustrative applications
- Descriptive approaches to achieve compliance

For most topics there are many other guidance documents from a wide variety of countries around the world. Many of these documents have significant amounts of material, diagrams, approaches, pictures and details. To aid the building team in achieving compliance, the Practice Guide refers to various documents in the regulation and/or in the Practice Guide. Any referred documents are detailed in this section.

Compliance

This section provides information on submission requirements to confirm compliance with the regulation, as well as the timing of submission (during permit application, construction, completion/commissioning, or operation.

Common Practices

This gives examples of actions being taken in other building regulations or rating systems.

References

Full details are given of any documents referred to in the Regulation or Practice Guide.

108 : Implementation System

Dubai will become a world leader by setting out the first Integrated Green Building Regulations which represent progress beyond voluntary requirements such as rating systems. By implementing these mandatory requirements Dubai's Government is establishing an international position of leadership in demonstrating a strong commitment to creating a sustainable built environment. However, a world class Green Building System is of little use if it is not enforced effectively.

Successful implementation requires that the changes to the current building permiting and approvals system be kept at a minimum and that new processes are phased and streamlined to complement that which is already in place. The intention would then be to build additional capacity over time to develop the support services and the research base from which to expand and improve the regulations at future dates.

Whilst additional requests for information and inspection criteria will be expanded, there should be no fundamental changes in the way in which building permits and completion certificates will be obtained.

New elements to be added to the current building approval and control process include:

- **Additional building regulations** that require demonstration of compliance at various stages in the building lifecycle
- **Additional inspections** both in terms of scope and frequency will take place at construction, completion and operational stages
- **New documentation** will be required as evidence of compliance much of which will be held in a *Green Building Site File.*
- The preparation of the **Green Building Declaration** to ensure strict liability of Green Issues

109 : Energy and Water Compliance Methods

In addition to the guidance provided in the Practice Guides, the following compliance methods may be used for energy and water.

Energy Compliance Method

There are two compliance routes for energy performance in buildings. The standard method is referred to as the Elemental Method; the alternative method is referred to as the Performance Method.

(i) **Elemental Method:** All buildings must comply with each of these regulations.

(ii) **Performance Method**: Alternatively, a calculation method may be employed for a building which may not comply with all the elemental requirements of those Articles listed in Table (1).

The Performance Method, using a calculation tool such as dynamic thermal modelling, must compare the annual energy consumption of the proposed building with that of a reference building which meets all the elemental requirements listed in Table (1). The reference building must be equal in shape, size and operational patterns to the proposed building.

Compliance with the Green Building regulations will be demonstrated if the annual energy consumption of the proposed building is equal to or lower than the annual energy consumption of the reference building

Table (1)
Green Buildings Regulations for Elemental Method of Energy Compliance
304.04 Orientation of Glazed Facades
501.01 Minimum Envelope Performance Requirements
502.01 Energy Efficiency– HVAC Equipment & Systems
502.04 Lighting Power Density - Interior

Water Compliance Method

There are two compliance routes for water performance in buildings. The standard method is referred to as the Elemental Method; the alternative method is referred to as the Performance Method. .

(i) **Elemental Method:** All buildings must comply with each of these regulations.

(ii) **Performance Method**: Alternatively, a calculation method may be employed for a building which may not comply with the elemental requirements for water efficient fixtures detailed in Article 601.01.

The Performance Method, using a calculation tool, must compare the annual water consumption of the proposed building with that of a reference building which meets all the elemental requirements detailed in Article 601.01. The reference building must be equal in shape, size and operational patterns to the proposed building.

Compliance with the Green Building regulations will be demonstrated if the annual water consumption of the proposed building is equal to or lower than the annual water consumption of reference building

200

Definitions

Certain terms used in the Dubai Green Building Regulations are defined in this section. Terms that are not defined shall have their ordinary accepted meaning within the context in which they are used.

Acoustical control	Controlling noise sources, transmission path, and/or receiver in order to reach an acceptable noise environment for a particular space.
Addition	An extension or increase in floor area or height of a building outside of the existing building envelope (walls and roofs).
Adequate	Sufficient to satisfy a specific requirement or meet a specific need.
Adhesive	Material used to bond one surface to another by attachment.
Air break	A piping arrangement where a drain from an appliance or fixture discharges into an airspace and then into another fixture, receptacle, or interceptor; used to prevent back siphonage or backflow.
Air contaminants	Unwanted airborne constituent that may reduce acceptability or adequacy of the air quality
Air leakage	Air that escapes from a building through a joint, coupling, junction, or the surfaces which enclose the building. The flow of uncontrolled air within a building through cracks or openings.
Air tightness (of a building)	The property of an enclosure or barrier that precludes the passage of air.
Air volume	The amount (volume) of air delivered to a space through ventilation, typically specified in litres per second or cubic metres per minute.

Air, ventilation	The share of supply air that is outdoor air, plus any recirculated air that has been filtered or otherwise treated to maintain acceptable indoor air quality.
Airborne sound insulation	Insulation against noise originating in air, such as voices, music, motor traffic and wind.
Architecture Accent Lighting	Lighting that highlights an area or object of a building to emphasise that area or object.
Asbestos	A group of impure magnesium silicate minerals which occur in fibrous form. Asbestos has been used in a variety of building construction materials for insulation and as a fire-retardant. However, long-term exposure or big amounts of asbestos can have severe health impacts, such as chest and abdominal cancers and lung diseases. Therefore the use of asbestos products has been restricted in many countries.
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers.
Balancing (air system)	To ensure that correct volumes of air are supplied by adjusting airflow rates through air distribution system devices (such as fans and diffusers) by manually adjusting the position of dampers, splitter vanes, extractors, etc. or by using automatic control devices, such as constant air volume or variable air volume boxes.
Brightness contrast ratio	The ratio of illuminance between the highest and lowest illuminance value in a room.

Building commissioning	The process of ensuring that all building systems are designed, installed, tested, and operated in conformity with design intent.
Building completion certificate	Certificate issued by Dubai Municipality, as soon as the entire construction work has been carried out, inspected and approved by Dubai Municipality.
Building envelope	The exterior elements of a building which form a barrier between the internal and exterior spaces. For an air conditioned building, the building envelope is defined as the elements of a building that separate conditioned spaces from the exterior.
Building fabric	Refers to the ceiling, walls, windows, floors and doors of a building, which play a major role in the energy efficiency of a structure.
Building Management System (BMS)	A computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment, such as ventilation, lighting, power systems, fire systems, and security systems.
Building metering	The use of meters to track the use of utilities (such as water and electricity) per building unit.
Building occupants (also building users)	Persons using the building. Full-time occupants use the building for at least 8 hours most days. Part-time occupants use the building for less than 8 hours most days. Transient occupants, such as visitors, customers, students, use the building at irregular times.
Building operator	The person who has full operational control of the place (the land or building or any part thereof), whether owner or tenant or holder or any other capacity by which he is authorized to occupy the place

Building owner	The person or institution (government or private) that owns the building and/or the land on which the building work (construction, refurbishing, demolition, or removal of a building) is to be performed or their representative.
Building permit	Permit issued by the Dubai Municipality.
Building services	All necessary services required to operate the building such as plumbing, mechanical, electrical and others
Built Up Area (Total Floor Area)	The grand total of the covered area in a building or structure measured between the outer sides of the building borders, including terraces, balconies, protrusions and any other covered parts like car parking circulation passages, air wells, unloading bays, service floors, swimming pools and any other structure on the plot.
Carpet	A fixed floor covering of natural or synthetic material that is woven onto a batting. This excludes rugs and other non-permanent woven coverings
Carpool vehicles	Shared vehicle used especially for commuting to work and often by people who each have a car but travel together to save cost, to reduce driving stress and to promote other socio-environmental benefits. Vehicles must be registered with the Dubai Road and Transport Authority (RTA).
Central Business District (CBD)	The old area of Dubai defined in Building Specifications and Regulations.

Central Control and Monitoring System (CCMS)	A computer-based control system that controls and monitors the mechanical and electrical equipment, such as ventilation, lighting, power systems, fire systems, and security systems in a building or controlling and monitoring a number of buildings.
Central plant	The main equipment within a building or series of buildings which provides cooling, ventilation, heating, water, and other services to the whole building or buildings. The central plant is typically in a central location.
Certified timber	Timber certification is a process that results in a certificate (written statement) attesting to the origin of wood raw material and its status and/or qualifications, often following validation by an independent third party. Certification is intended to allow participants to measure their forest management practices against standards and to demonstrate compliance with those standards. Timber certification generally includes two main components: certification of sustainability of forest management (which occurs in the country of origin) and product certification (which covers the supply chain of domestic and export markets).
Clorofluorocarbons (CFCs)	CFCs are odourless, colourless, non-flammable non-toxic chemicals. They vaporise easily at low temperatures making them ideal coolants in refrigerators and air conditioners. CFCs are also used in foam for seat padding and insulation. Until recently, they were used extensively in aerosol spray cans. CFCs cause stratospheric ozone depletion.
Composite wood products	Products such as plywood, panel substrates, door cores, particle board, and medium density fibreboard.

Condensation	The process through which a gas or vapour changes to liquid form. Also defined as the water which is produced in this process.
Construction activity	Includes all activities that are part of new construction, alteration, repair, maintenance, refurbishing, and any other physical changes to a building.
Construction and demolition waste	Waste generated from construction, renovation, and demolition or deconstruction of structures. Land clearing debris including soil, vegetation and rocks are typically not considered construction and demolition waste.
Contractor	Natural or considerable person registered and licensed to practise contracting profession in the Emirate of Dubai.
Control systems	Controls that allow users to change/adjust the level of lighting and air conditioning in a space.
Control zone (HVAC)	A space or group of spaces with heating or cooling requirements that is sufficiently similar so that desired conditions (e.g. temperature) can be maintained throughout by using a single controller. The zone may be part of a larger space, an individual office or a small dwelling.
Cooling coil	A coiled arrangement of tubing or pipe for the transfer of heat between a cold fluid and air.
Cooling load	The amount of cooling that a building will require to meet the conditions specified by Dubai Municipality. The cooling load will be determined by the output of the Heat Load Calculation required by Dubai Municipality.

Cooling tower	Heat removal devices used to transfer process waste heat to the atmosphere. Cooling towers may either use the evaporation of water or rely solely on air to cool the working fluid. Common applications include removing heat from the water used to cool refrigeration chillers.
Corrective maintenance	Maintenance service or procedures intended to fix equipment failure or damage. This service is carried out in response to a fault and not planned in advance.
Cycles of concentration	The level of solids in the re-circulating cooling tower water in comparison to the level of solids of the original raw make up water. If the circulating water has three times the solids concentration of the make up water, then the cycles of concentration are three (3).
Daylighting	The use of natural light from the sun or sky to provide illumination in interior spaces.
Demand Controlled Ventilation (DCV)	A ventilation system that provides for the automatic reduction of outdoor air intake below design rates, when the actual occupancy of spaces served by the system is less than design occupancy. Demand is often assessed by using the measure of the amount of carbon dioxide (CO_2) in a space to reflect occupancy levels.
Designated preferred parking spaces	Parking spaces that are closest to the main entrance of a building exclusive of spaces designated for disabled parking. Alternatively, these can be parking spaces closest to the pedestrian exit leading from the parking area.

District cooling	A district cooling system distributes thermal energy, in the form of chilled water or other media, from a central source to multiple buildings or facilities through a network of underground pipes for use in space and process cooling. The cooling (or heat rejection) is usually provided from a central, dedicated cooling plant, which eliminates the need for separate systems in individual buildings. A district cooling system consists of three primary components: the central plant (which may include the cooling equipment, power generation and thermal storage), the distribution network, and the consumer system (typically comprising of air handling units and chilled water piping in the building).
Diversity factor	Relates to the thermal characteristics of the building envelope, temperature swings and occupancy load.
Drip water delivery system (drip irrigation)	A high-efficiency irrigation method where water is delivered at low pressure through buried pipes and sub-pipes, which in turn distribute water to the soil from a network of perforated tubes or emitters.
Dual plumbed	A building or structure with two sets of pipes: one for drinking water and one for recycled or greywater.
Ductwork	Air-tight devices that carry conditioned air throughout the building. This includes terminal fixtures to distribute air.
Ductwork leakage	The outcome of air conditioning ductwork that is leaking, and therefore lets air out through cracks and gaps. Ductwork leakage will result in an increase in energy consumption of supply and return air fans.
Electrical system	Permanently installed wiring, switchgear, distribution boards, transformers, controls and other devices used in distributing electricity into and through a building.

Electrical sub-metering	The installation of separate meters to allow the measurement of electricity used in specific areas or individual items of equipment.
Electronic ballast	A piece of equipment required to control the starting and operating voltages of fluorescent lights. Electronic lighting ballasts use solid state circuitry and can greatly reduce or eliminate any flicker in the lamps.
Enabled access	Project design that incorporates accessibility for disabled people to and within a building.
Environmental tobacco smoke (ETS) (second hand smoke)	Airborne particles emitted from the burning of cigarettes, pipes, cigars, or shishas and from smoker's exhaled air.
Entrance lobby	Space immediately between the entrance-door and the interior of a building which acts as a transition area into the building.
Equivalent	Measure, standard, or reference material that has been deemed to be equal or better by Dubai Municipality.
Exhaust air	Air removed from a building space and discharged to the outside of the building through a mechanical or natural ventilation system.
Facilities operator	Party responsible for the maintenance and operation of a building or facility.
Fan systems	A system of fans used to supply or exhaust air from a building space.

Fenestration	Another name for 'glazed elements'.
Fresh air	Outside air supplied to a building space through mechanical or natural ventilation to replace air in the building that has been exhausted.
Glazed Elements	All areas in the building envelope that let in light, including windows, plastic panels, clerestories, skylights, doors that are more than one half glass, and glass block walls.
Glazing area	The area of glazed elements in the exterior walls of a building.
Global Warming Potential (GWP)	Expresses contribution of greenhouse gases released to the atmosphere in the global warming phenomenon.
Green roofs	See vegetated roofs.
Greywater (grey water, graywater)	Untreated household wastewater which has not come into contact with toilet waste. Greywater includes used water from showers, wash basins, bathtubs, laundry sinks and clothes washers.
Halons	Substances used in fire suppression systems and fire extinguishers. These substances deplete the stratospheric ozone layer.

Hardscape	The area of a project site, excluding buildings, made with hard materials, including roads, car parks, patios, courtyards and walkways.
Hazardous fumes or chemicals	Fumes/gases or chemicals that can adversely impact human health when inhaled or when they come into contact with a person's skin; also includes fumes/gases and chemicals that can create a hazardous condition (such as explosive or flammable substances).
Hazardous waste	Any waste material that can cause substantial harm to humans, properties or to the environment due to its inherent hazardous characteristics. Hazardous waste takes the form of solid, liquid, sludge, gas or any combination thereof.
Heat Island Effect (HIE)	Heat Island Effect occurs when warmer temperatures are experienced in urban/developed areas compared to adjacent undeveloped areas due to solar energy retention on constructed surfaces. Some of the surfaces that contribute to the Heat Island Effect are paved streets, sidewalks, parking lots and buildings.
Heat load calculation	Calculations which must be submitted to Dubai Municipality for approval. These calculations must be based on the design of the building to be constructed and follow the form and use the parameters required by Dubai Municipality.
Heat load calculation parameters	The design parameters used in Heat Load calculation according to Dubai Municipality requirements.
Heating, ventilation, and air conditioning (HVAC) system	The equipment, distribution systems, and terminals that provide either individually or collectively, the processes of heating, ventilating, or air conditioning to a building or a portion of a building.

Heat Rejection Equipment	Equipment which is used to disperse the heat produced in the air conditioning process. Heat rejection equipment, such as cooling towers, may be located outside of the building envelope; however it may also be a component of the air conditioning equipment, such as with window or split systems.
Heavy metals	Heavy metals include: cadmium, chromium, mercury, and arsenic.
Heritage building	A building having historical architectural elements, situated inside a Dubai historical area. No demolition or variation works shall be carried out on a Heritage building except after obtaining approval from the Competent Authority.
Hydraulic elevator	An elevator operated using liquid pressure.
Hydroclorofluoro-carbons (HCFC)	Refrigerants used in building equipment that deplete the stratospheric ozone layer, but to a lesser extent than CFCs.
Hydrofluorocarbons (HFCs)	Refrigerants that do not deplete the stratospheric ozone layer. However, some HFCs have a high Global Warming Potential.
Industrial building	An industrial building is any building directly used in manufacturing, processing, technically productive enterprises or storage. This includes workshops, factories and warehouses.
Land clearing debris	Solid waste generated solely from land-clearing activities, including brush, stumps, soil material and rocks.

Land disturbance	Any project that changes the physical conditions of land form, vegetation and hydrology, creates bare soil, or otherwise may cause erosion or sedimentation. The activities include, but are not limited to, clearing of land, removal of vegetation, stripping, grading, excavating, filling and storing of materials.
Legionella bacteria	Legionella bacteria are the causative agent of Legionnaires' disease and its lesser form, Pontiac fever. The bacteria grow in water between 20 and 45 degrees Celsius and can be spread by water droplets.
Light fixture	The component of a luminaire that houses the lamp(s), positions the lamp, shields it from view, and distributes the light. The fixture also provides for connection to the power supply, which may require the use of ballast.
Lighting Power Density (LPD)	The maximum lighting power per unit area.
Light Reflective Value (LRV)	A measure of the total quantity of useable and visible light reflected by a surface in all directions on a scale from 0% to 100%. Zero percent is assumed to be an absolute black and 100% represents an assumed perfectly reflective white. The blackest achievable wall finish has a LRV of approximately 5% and the whitest available finish approximately 85%.
Light Transmittance	The percentage of incident light that passes through the glazing elements. When this percentage increases the day light amount into the building will increase.
Line of sight	An imaginary line from the eye to a perceived object or view.

Local Species	Local plants and adapted plants to the local environment.
Low emitting and fuel efficient vehicle	A vehicle approved by Dubai Road Transport Authority (RTA) as being low emitting or fuel efficient.
Lux	The international system unit of illumination, equal to one lumen per square metre.
Mechanical system	Those systems within a building which include components of mechanical plant or machinery. These systems include, but are not limited to, the HVAC system of a building.
Mechanical ventilation (active ventilation)	Ventilation provided by mechanically powered equipment, such as fans.
Minimum Efficiency Reporting Value (MERV)	Air Filter Minimum Efficiency Reporting Value (MERV) is an expression of the filtering efficiency of an air filter that has been evaluated using the ASHRAE Standard 52.2 Test Procedure. An air filter's performance is determined by comparing airborne particle counts upstream and downstream of the air filter (or other air cleaning device) under test conditions. A higher MERV rating equates to higher air filtration efficiency.
Mixed mode ventilation	A combination of mechanical and natural ventilation.

Monitoring equipment	Equipment used to measure and record status or conditions related to a building or to verify pre-set conditions and provide control or alarm functions if conditions vary.
Natural ventilation (passive ventilation)	Ventilation provided by thermal, wind or diffusion effects through windows, doors, or other openings in the building.
Negative pressure	Pressure less than that in adjoining spaces.
Occupancy sensor	A device that detects the presence or absence of people within an area and causes lighting, equipment, or appliances to be regulated accordingly.
Occupant Lighting Controls	A means of controlling the level of lighting which is easily accessible to a building occupant. Includes on/off switches.
Office	A building in which business, clerical, or professional activities are conducted.
Opaque	All areas of a building envelope which do not transmit light. Fenestration and building service openings, such as vents and grilles, are not opaque.
Open grid pavement	Pavement surfaces composed of structural units with void areas that are filled with pervious materials, such as sand or grass turf.
Outdoor environment	The environment outside of buildings, not enclosed by walls.
Ozone Depletion Potential (ODP)	Expresses contribution to the deterioration of the stratospheric ozone layer.

Parking area – Enclosed	Area of a building which is used for parking of motor vehicles but is not an open parking area. As it does not meet the criteria for open parking areas and is considered enclosed, mechanical ventilation is required to compensate for the lack of natural ventilation.
Parking area – Open	Area of a building which is used for parking of motor vehicles and which requires uniformly distributed openings on two or more sides for natural ventilation on every level of parking. The total area of openings to the atmosphere must be at least 20% of the total perimeter wall areas for each level of parking. Although openings on a third side are not required, openings on opposing sides are preferred for cross ventilation.
Parking ventilation	Ventilation which is required to maintain a satisfactory level of air quality within a vehicle parking facility.
Perimeter zone	The interior space adjacent to the perimeter walls of a building.
Plumbing system	Permanently installed piping, pumps, valves, tanks, taps, controls and other devices used in distributing water into, within and away from a building.
Positive pressure	Pressure greater than that in adjoining spaces.
Potable water	Water that is suitable for human consumption.
Pressure differential	The difference in pressure between two points of a system, or two different spaces of a building.
Preventative maintenance	Maintenance service or procedures intended to prevent or reduce equipment failure or damage.

Primer	Material applied to a surface to improve adhesion of a subsequently applied paint or adhesive.
Public building	A building which provides access to the general public. This building typology includes healthcare facilities, educational facilities, governmental buildings, worship houses, petrol stations, shopping malls, retail outlets, post offices, banks, museums, cinema/theatres, and historical/heritage buildings.
Radiant heat/temperature	Thermal radiation is the heat that radiates from a warm object. Radiant heat may be present if there are heat sources in an environment. Examples of radiant heat sources include: the sun, fire, ovens, driers, hot surfaces and machinery, etc.
Recycling	Processing used materials into new products in order to prevent the waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution and water pollution by reducing the need for "conventional" waste disposal.
Reflectivity (solar reflectance)	Reflectivity measures how well a material bounces back solar radiation.
Refrigerants	Working fluids of refrigeration cycles, which absorb heat at low temperatures and reject heat at higher temperatures.
Refurbish (Retrofit)	The substantial alteration of a building or building services to replace or improve the quality of the building. This may occur when a new tenant occupies the building or part of the building.
Regional materials	Materials that were extracted, processed, and/or manufactured within the Gulf Cooperation Council (GCC) area. GCC member countries are: United Arab Emirates, the Kingdom of Bahrain, the Kingdom of Saudi Arabia, the Sultanate of Oman, Qatar, and Kuwait.

Regularly occupied areas (non-residential buildings)	Those areas within non-residential buildings where building users are seating or standing, as they work inside of a building or use the building space.
Relative humidity	Ratio of partial density of water vapour in the air to the saturation density of water vapour at the same temperature and the same total pressure.
Residential/ Commercial Building	This building typology includes: apartments, labour accommodations, student accommodations, offices, hotels, resorts, restaurants/ food outlets and laboratories.
Retail	Business dedicated to the sale of goods or commodities in small quantities directly to consumers.
Reuse	Any activity that lengthens the life of an item, typically consisting of returning the item to active use in the same or related capacity.
Safety factor	An allowance to cover any heating or cooling load greater than the design conditions.
Sealants	Material with adhesive properties that is used for the general purpose of filling, sealing, or waterproofing gaps or joints between two surfaces.
Secure bicycle racks or storage areas	Structures where individual bicycles can be locked and/or stored. Such structures should be inside or shaded if outdoors.
Service log book	A book where all maintenance works for a specific site or piece of equipment is recorded in detail (including dates and specific information regarding what service was performed and who carried out the work).

Shading Coefficient (SC)	A measure of the amount of heat passing through glazing compared with the heat passing through a single clear glass. It is the ratio of solar heat gain at normal incidence through glazing to that occurring through an approximately 3 millimetre (1/8th inch) thick clear, double-strength glass.
Showroom	Any space allocated for conducting a commercial business such as displaying commodities for purpose of wholesale or retail sale, and has a road front façade not less than nine (9) metres wide.
Solar Reflectance Index (SRI)	The SRI is an index that combines reflectivity and emissivity, measuring a material's ability to reject solar heat. SRI is defined so that a standard black (reflectance 0.05 and emittance 0.90) is 0 and a standard white (reflectance 0.80 and emittance 0.90) is 100. Materials with higher SRI absorb less heat and can reduce the heat island effect.
Substrate	The base material to which a process, such as painting, is applied to produce new films or layers of a different material.
Thermal bridges	Component, or assembly of components, in a building envelope, where the insulation is not continuous and through which heat is transferred at a substantially higher rate than through the surrounding envelope area; such as a metal fastener, concrete beam, slab or column.
Thermal comfort	A condition experienced by building occupants which is satisfied with the thermal environment.
Thermal insulation	Materials, or the methods and processes used to reduce heat transfer. Heat energy can be transferred by conduction, convection or radiation. The flow of heat can be delayed by addressing one or more of these mechanisms and is dependent on the physical properties of the material employed to do this.

Thermal transmittance	Also known as U-value is the rate of transfer of heat (in watts) through one square metre of a structure divided by the difference in temperature across the structure. It is expressed in watts per square metre per degree kelvin, or W/m^2K. Well-insulated parts of a building have a low thermal transmittance whereas poorly-insulated parts of a building have a high thermal transmittance.
Total planted area	The total external landscaped area of a building plot, including landscaped areas on roofs (vegetated roofs).
Total vehicle parking capacity	Total number of parking spaces within the site as specified by Dubai Municipality.
Totalising meter	Measures the flow and provides a total of the quantity which has passed through the meter. This is indicated in the form of a numeric readout.
Toxic waste	Waste containing poisonous substances. These substances may have acute effects (causing death or violent illness) or chronic effects (slowly causing irreparable harm) even in very small or trace amounts.
Treated sewage effluent (TSE)	The product of the process of removing physical, chemical and biological contaminants from wastewater. The process produces treated effluent suitable for reuse or discharge into the environment and solid waste (or sludge).
U-value	Refer to Thermal transmittance.
Urea formaldehyde	Combination of urea and formaldehyde, used in some glues. Formaldehyde is a naturally occurring VOC that is irritating to most people when found in high concentrations, and is also carcinogenic. Urea-formaldehyde may emit formaldehyde at room temperature.

Variable air volume system	An air handling system that conditions the air to a constant temperature and varies the outside airflow to ensure thermal comfort.
Vegetated roof (green roof)	A vegetated roof consists of vegetation and soil or a growing medium, planted over a waterproofing membrane on rooftops. Vegetated roofs may also include additional layers, such as a root barrier and drainage and irrigation systems. The use of vegetated roofs may have different purposes, from energy savings to stormwater management and aesthetics benefits.
Ventilation	The process of supplying air to or removing air from a space in order to control air contaminant levels, humidity, or temperature within the space.
Villa	Refer to Building Specifications and Regulations issued by Dubai Municipality
Volatile Organic Compound (VOC)	Organic chemicals that have a high vapour pressure and easily form vapours at normal temperature and pressure. The term is generally applied to organic solvents, certain paint additives, aerosol spray can propellants, fuels (such as gasoline, and kerosene), petroleum distillates, dry cleaning products and many other industrial and consumer products ranging from office supplies to building materials.
Wall Washing Light	Light fixture used for architectural or aesthetic purposes transmitting variable colour light or flash (with the possibility of modifying the speed of movement) and be programmed to operate automatically and can work to direct the light down for long distances and can be used inside or outside the building
Warehouse	A place in which goods or merchandise are stored; a storehouse.
Water feature	Features within a range of man-made fountains, ponds, cascades, waterfalls, and streams, not intended for human contact with the water. Therefore, for these regulations, the definition of water features excludes swimming pools and spas.

300

Ecology and Planning

- Access and Mobility
- Ecology and Landscaping
- Neighbourhood Pollution
- Microclimate and Outdoor Comfort
- Responsible Construction
- Environmental Impact Assessment

1.0	Preferred Parking	301.01
	For all new buildings, other than villas, which have more than 20 parking spaces, designated preferred parking must be provided for a combination of low-emitting, fuel-efficient and carpool vehicles for at least five percent (5%) of the total vehicle parking spaces required for the building by Dubai Municipality (DM) Building Regulations, Administrative Resolution No.125-2001. Preferred parking must be included in addition to any spaces designated for parking for people with special needs as required by DM Building Regulations.	**Residential/ Commercial** **Public Buildings** **Industrial**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Access and Mobility**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

High numbers of private cars and the low usage of public transport (currently only 7% of journeys) are resulting in extreme traffic congestion in Dubai. The present scale of private car ownership in Dubai is over 540 cars for every 1,000 persons and the average number of passengers in each car is only 1.3 people. Current projections of population growth indicate that the expected number of private cars in Dubai may increase to 1,500,000 cars by 2020. The large numbers and the types of vehicles used in Dubai are major contributors to the levels of air pollution in the city. Encouraging the use of fuel-efficient, low-emission and carpool vehicles will assist in reducing both air pollution levels and traffic volumes. Whilst these types of vehicles are not presently common in Dubai, providing designated parking for these vehicles will help to encourage their use.

In 2008 the Dubai Roads and Transport Authority (RTA) announced their carpooling scheme called 'Sharekni'. The scheme promotes ride sharing to reduce the number of cars on the road at a given time, aiming to decrease traffic congestion. Further information on the Sharekni Scheme may be found at http://www.sharekni.ae/.

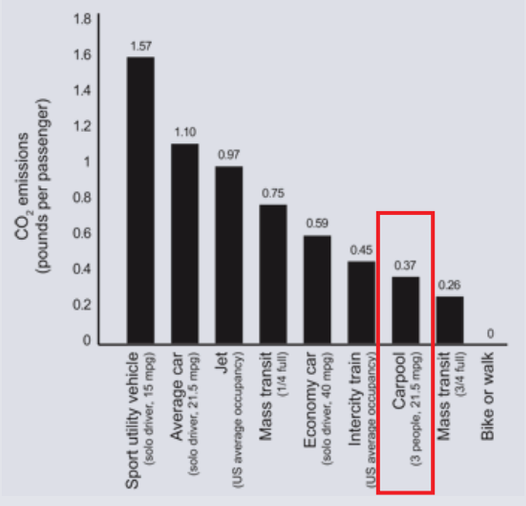
4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

This regulation promotes the use of low-emitting, fuel efficient vehicles and shared transportation such as carpooling by providing designated preferential parking for these vehicles. An increase in the use of such vehicles will potentially reduce pollution from motor vehicle sources and reduce traffic volumes, congestion and demand for additional roads infrastructure.

The regulation supports the implementation of Dubai RTA's 'Sharekni' car-share initiative.



Reduced CO_2 emissions from carpooling

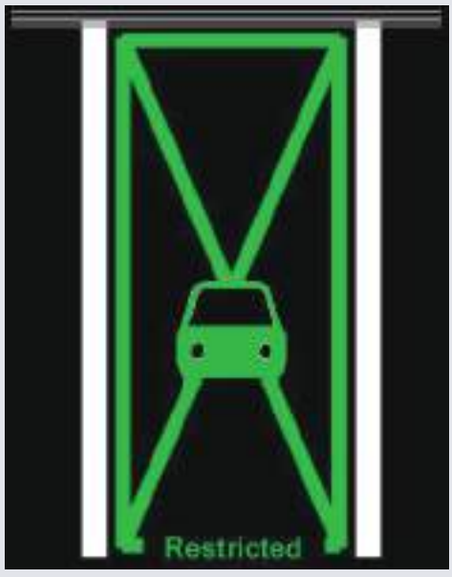
6.0 Guidance

6.1 General

The number of parking spaces required for a building is specified by Dubai Municipality Building Regulations, Administrative Resolution No.125-2001, Articles 24 and 25. If a minimum of 20 spaces is required, designated parking must be provided for a combination of low-emitting, fuel-efficient and carpool vehicles for at least 5% of the total vehicle parking capacity for the site, exclusive of spaces designated for disabled parking. When calculating the number of designated parking spaces required, if the calculated number includes a fraction, it must be rounded up to the next higher whole number.

Dubai RTA will be introducing a system for the definition and identification of low-emitting, fuel-efficient and carpool vehicles to make use of these parking spaces and will issue stickers that can be applied to identify compliant vehicles that qualify for the benefit of preferential parking. The developer is required to identify and construct designated parking in accordance with this regulation.

Parking spaces designated for the use of low-emitting, fuel-efficient and carpool vehicles must be clearly identified. A possible means of identification is shown below:



Possible means of identification

Designated preferred parking refers to parking areas that are closest to the main entrance of the building or to internal access points such as lifts or stairs. The reservation of preferred parking spaces for low-emission, fuel-efficient, and carpool vehicles must not conflict with the parking requirements for disabled people. Preference in location shall be given to disabled parking places.

It is recommended that incentive or facilitated programs for carpooling be implemented whenever possible.

6.2 Technical Data and Specifications

Permanent pavement paint signage is required to clearly identify reserved parking spaces, in addition to signage to enable drivers to locate the preferred parking spaces.

The number of parking spaces required for a building is specified by Dubai Municipality Building Regulations, Administrative Resolution No.125-2001, Articles 24 and 25.

The definition and identification of vehicles that are eligible to use these reserved parking spaces is being established by the Dubai RTA.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment Parking schedule including 'green parking allocation'
Construction	n/a
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

Some international building ratings provide credits to encourage the provision of preferred parking spaces. For example LEED provides credits for the provision of 5% preferred parking spaces and Green Star (Australia) for 10%.

9. References.

Dubai Municipality Building Regulations, Administrative Resolution No.125-2001, Articles 24 and 25.

1.0	Enabled Access	301.02
	All new buildings, other than villas, must comply with Dubai Municipality Building Regulations, Administrative Resolution No.125-2001with regard to Special Needs users. They must be enabled in their access, internal movement and ability to engage with the building functions.	**Residential/ Commercial** **Public Buildings** **Industrial**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Access and Mobility**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

There are significant numbers of people with disabilities currently living in Dubai. 'Special Needs users' may have disabilities that restrict mobility and create obstacles to them being able to access buildings. No exact numbers on the people or their disabilities are available for Dubai, however reports from 2005 estimate that about 5,500 people with Special Needs live in the UAE.

Further, the Dubai Department of Tourism and Commerce Marketing (DTCM) has called for increased efforts from public and private sector organisations to focus on creating and promoting a barrier-free environment for the disabled and elderly tourism market segment.

The importance of the issue has been recognised within the UAE for some time. UAE Federal Law No. 25, 1999 is based on the principles of the United Nations Convention on the Rights of Persons with Disabilities. It states:

> **Article 22**
> Special Needs persons should be provided with a tailored environment to ease their access to different places.

There are many international Codes of Practice available to provide guidance and technical details related to this regulation. Examples of guidance include:

> **Access Code: A Code of Practice on Access and Mobility** (United Kingdom)
>
> **29 CFR Part 36—ADA Standards for Accessible Design** (United States)

Although this is an existing UAE Federal Law and a Dubai Municipality Building Regulation addressing enabled access, this Regulation has been developed to reinforce the importance of buildings in Dubai complying with these requirements. The ability for all users to enter a building and engage in building functions without problem is an aspect of sustainable design which must be applied in Dubai. The need for suitable toilet facilities to cater for people with Special Needs is also covered by this regulation.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

The provision of enabled access to buildings for people with disabilities allows them to have access to the building's facilities or services, such as in offices, retail, or other purposes. This regulation ensures that buildings may be used by people with disabilities and that there are no obstacles to accessing and using buildings.

6.0 Guidance

6.1 General

In order to comply with this Regulation, it is recommended that at least one accessible route be provided from the exterior of a building, through the building or facility entrance and within all accessible spaces and elements within the building. Objects that overhang or protrude into the circulation path of the accessible route should be removed. A range of measures, such as ramps, railings, painting, etc, can be used to help accommodate people with disabilities.

6.2 Technical Data and Specifications

Building Design must comply with UAE Federal Law No. 25, 1999, Article 22 and DM Building Regulations Administrative Resolution No. 125-2001, Article 27; which details specific requirements for Public Buildings, Commercial Buildings and Hotels. This regulation requires that the provisions of Article 27 must be applied to all new buildings in Dubai other than Villas.

The provisions for toilet rooms must be in compliance with Articles 4.16 Water Closets, 4.17 Toilet Stalls, 4.18 Urinals and 4.19 Lavatories and Mirrors of US 28 Code of Federal Regulations (CFR), Part 36 - ADA Standards for Accessible Design or equivalent standard approved by Dubai Municipality.

A useful resource to obtain information on the requirements for Enabled Access is the 'Accesscode' website set up as an advisory code of practice reflecting current statutory requirements and best practice within the UK for the design of buildings, structures, highways and transportation.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. References.

UAE Federal Law No. 25, 1999

Dubai Municipality Building Regulation, Administrative Resolution No. 125-2001, Article 27

Access Code: A Code of Practice on Access and Mobility (UK) - An advisory code of practice reflecting current statutory requirements and best practice within the UK for the design of buildings, structures, highways and transportation. http://www.accesscode.info. (Accesscode is a joint project between five English City Councils in conjunction with the University of Salford.)

Part 36—ADA Standards for Accessible Design (USA) This document sets guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities. These guidelines are to be applied during the design, construction, and alteration of buildings and facilities. The guidelines are published by the U.S. Department of Justice to support the Americans with Disabilities Act and are available free of charge from their website http://www.ada.gov/stdspdf.htm

1.0	Bicycle Storage and Changing Rooms	301.03
	For all new buildings, other than villas, secure and covered racks or storage areas for bicycles must be provided within the building or within a shaded area located no more than thirty (30) meters from a building entrance within the plot limit. Secure racks or storage areas must be provided for a number of bicycles equal to at least fifteen percent (15%) of the number of car parking spaces required for the building as per the Dubai Municipality (DM) Building Regulations, Administrative Resolution No.125-2001. **For Student accommodation and Labor accommodation, secure racks or storage areas must be provided for bicycles for at least 15% of building occupants with the same above conditions.**	**Residential/ Commercial** **Public Buildings** **Industrial**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Access and Mobility**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

There is increasing use of bicycles in Dubai for recreation and as a means of transportation to work. The development of new residential areas close to work places in Dubai will allow some workers to consider bicycles as a viable means of transportation. Most new major developments in Dubai are being promoted as being pedestrian and bicycle-friendly.

The successful implementation of a strategy to increase the use of bicycles in Dubai depends in part on adequate infrastructure. Dubai Roads and Transport Authority (RTA) has developed the Dubai Bicycle Master Plan to provide 1300 kilometres of bicycle lanes by 2020, as part of their strategic approach to ease traffic congestion and increase road safety. The provision of bicycle storage and showers/changing rooms at destinations is important in ensuring the success of such a strategy.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels		
	Offices	✓	✓	Resorts		
	Labour Accommodation	✓	✓	Restaurants/Food Outlets		
	Student Accommodation	✓	✓	Laboratories		
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets		
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship	✓	✓	Museums	✓	✓
	Houses					
	Petrol Stations			Cinema/theatres	✓	✓
	Shopping Mall			Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

The use of bicycles as an alternative mode of transportation is an important part of long-term sustainable transportation and energy strategies. Cycling produces no emissions and does not require the use of fossil fuels. Bicycle commuting contributes to relieving traffic congestion and reducing noise pollution. Reduced traffic volumes will in turn result in reduced air pollution, reduced demand for increased infrastructure for roadways and parking lots as well as promoting an active lifestyle, and associated health benefits, amongst the population.

6.0 Guidance

6.1 General

Secure bicycle racks or storage areas must be available for individual bicycles to be locked and stored. Storage should protect bicycles from theft.

Multi-use building: For the purpose of this regulation each portion of the building which has a different usage shall use the compliance calculation for that usage type.

For residential buildings, requirements are based on either the number of apartments or number of occupants. The number of occupants shall be used for buildings such as labour accommodation, which may not have specific apartments.

The number of building users (or occupants) shall be the number declared in documentation submitted to Dubai Municipality at the permit application stage.

The exact location and design of the racks or storage will be different for each building; however it is important that the bicycles can be secured. Because of the Dubai climate, all bicycle storage areas should be under cover or shaded.

The number of bicycle storage spaces required has been selected as the minimum that are needed to encourage increased usage of bicycles. To allow for initial compliance with this regulation, the numbers are less than those required in some other countries. Wherever feasible, it is recommended that the site design link the building with existing or proposed cycle paths. Below are some recommendations regarding bicycle storage capacity from Chapter 16 of the RTA's Dubai Bicycle Master Plan (January, 2008). Note that these figures are recommendations only and cover many facilities for which bicycle storage is not regulated. It is recommended that bicycle parking be provided at all buildings listed below.

Table 15 - Recommended Non-Residential Bicycle Parking Requirements by Land Use

Land Use	Employee/Resident Bike Spaces as Percent of Auto Parking		Class	Visitor/Shopper/Student Bike Spaces as Percent of Auto Parking		Class
	Non-TOD	TOD		Non-TOD	TOD	
Art Gallery	10%	20%	2	15%	30%	3
Bank	10%	20%	2	15%	30%	3
Cafe	10%	20%	2	15%	30%	3
Hospital	10%	20%	1	10%	20%	3
Industrial	10%	20%	1 or 2	5%	10%	3
Hotel	10%	20%	1	5%	10%	3
Light Industrial	10%	20%	1 or 2	5%	10%	3
Sports Stadium	10%	20%	1	20%	40%	3
Market Place	10%	20%	2	20%	40%	3
Museum	10%	20%	1	20%	40%	3
Nursing home	10%	20%	1	10%	20%	3
Office	15%	30%	1 or 2	10%	20%	3
Restaurant	10%	20%	1 or 2	15%	30%	3
Retail show room	10%	20%	2	15%	30%	3
School	15%	30%	2	40%	80%	3
Shop	10%	20%	1	15%	30%	3
Take-away food	10%	20%	1	15%	30%	3
College/University	15%	30%	2	60%	120%	3
Park / Recreation	15%	20%	2	30%	40%	3

Showers and changing facilities are required for non-residential buildings as cyclists are less likely to make journeys by bicycle unless if there are no facilities to shower and change clothing on arrival at their destination.

There is no requirement for additional shower and changing facilities for residential buildings, as the tenants will have their own facilities.

Table 16 - Recommended Shower Requirements by Land Use

Type of Land Use	Number of Showers Required for Specified Building Floor Area	
	1 Shower for Each Gender	1 Additional Shower for Each Gender
Office Uses (business, professional)	5,000 to 15,000 sq. meters	Each 10,000 sq. m over 15,000
Retail Trade, Service Uses	10,000 to 30,000 sq. meters	Each 20,000 sq. m over 30,000
Manufacturing and Industrial Uses	5,000 sq. meters or more	N.A.

6.2 Technical Data and Specifications

Secure bicycle racks or storage areas must be available for individual bicycles to be locked and protected bicycles from theft.

In order to provide protections from the sun and dust racks or storage areas should be indoors or be shaded.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

A number of building rating schemes worldwide seek to encourage cycling as realistic transport option through the provision of bicycle storage and changing rooms. LEED awards credits for the provision of bicycle storage for 15% of residents and for 5% for occupants of non-residential buildings, plus shower facilities for 0.25% of occupants of non-residential buildings. Green Star credits bike storage for 5% of building staff and one shower for each 10 bike parks.

9. References

Dubai Bicycle Master Plan (January, 2008), Dubai Roads & Transport Authority (RTA)

1.0 Local Species

302.01

Villas
Residential/ Commercial
Public Buildings
Industrial

For all new buildings, a minimum of twenty five percent (25%) of the total planted area of a building plot, including vegetated roofs, must utilise plant and tree species indigenous or adapted to Dubai's climate and region.
For all new villas at least one palm tree must be planted.

2.0 Intent/Goal

- ☑ **Ecology and Planning – Ecology and Landscaping**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

The provision of landscaped and vegetated areas can help to provide attractive and comfortable outdoor spaces for residents and users of many types of buildings. However, Dubai's hot and arid climate makes the wise use of water resources a key element of sustainable development. Landscape irrigation constitutes a high percentage of the total water used in Dubai.

Plants vary in their water needs. Turf and several non-native plants consume a large amount of water. By using plants which are better adapted to Dubai's climate (and hence which require less water), the volume of water required for irrigation will be considerably reduced. There are large potential savings to be made in water consumption by using low water demand plants.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

The intent is to reduce the use of water by using plants which require minimal water supply. A reduction in the amount of water for landscape irrigation will result in cost savings (lower water/utility bills). In addition, this requirement will contribute to enhancing local biodiversity by encouraging the use of plant species that are indigenous to the region. The culture and heritage of Dubai are reflected in the use of native plantings.

6.0 Guidance

6.1 General

This regulation requires that a minimum of 25% of the total planted area of a building plot utilises plant and tree species appropriate for Dubai's climate. The total planted area is defined as the total external landscaped area of a building plot, including landscaped areas on roofs (vegetated roofs). Landscaped areas are those with trees, shrubs, grasses, or planted beds, including xeroscape areas, i.e. landscaping that is designed specifically to minimise water use.

This regulation recognises that, in Dubai, grass (turf) forms a large part of the planted area around buildings. In order to reduce the amount of irrigation water needed, turf areas should be limited due to its high water requirement. Turf should be used primarily for functional benefits, such as recreational areas. Landscaping design must include plant and tree species appropriate for Dubai's climate and region. These include native (indigenous) plants, desert adapted plants, foreign drought resistant plants and salt tolerant plants suitable for use in Dubai. The use of such species contributes to water savings. Planting trees is encouraged, since the shade from trees helps to lower air and soil temperatures, which in turn reduces the moisture loss of nearby plants and soil. Table 303.01(1) lists some examples of plants that can be used in water efficient landscaping in Dubai.

Table 303.01 (1) Examples of Water Efficient Plants

Scientific Name	English Name	Arabic Name	Growth Form	Indigenous/ Introduced
Acacia tortillis	Umbrella thorn	Samr, salam	Tree	Indigenous
Aerva javanica	Kapok bush	Alara', twaim, efhe, tirf	Bush	Indigenous
Cenchrus ciliarus	Foxtail grass, buffel grass, sand burr	Sabat, khadir, thumum, gharaz, drab, labaytad	Grass	Indigenous
Chloris virgata	Featherfinger grass	Khazamzam	Grass	Indigenous
Cistanche tubulosa	Desert hyacinth	Thanoon, tartooth, basul, dhamin	Parasitic flower	Indigenous
Citrillus colocynthis	Desert squash, bitter gourd	Shary, handhal, murrah, serew, hanzal, suri, hedeg	Ground cover	Indigenous
Convulvulus virgatus	Morning glory family	Hub alrisha, adlam	Bush	Indigenous
Cymbopogon commutatus	Incense grass	Alklathgar, sakhbar, hamra, idhkhir, khasaab	Grass	Indigenous
Euphorbia larica	Euphorbia	Isbaq, ibiq	Bush	Indigenous
Leptadenia pyrotechnica	Firemaker / broom bush	Markh, ma'aleet	Bush	Indigenous
Nerium oleander	Oleander	Defla, haban	Tree	Indigenous
Phoenix dactylifera	Date palm	Nakhl, amm-amm	Palm	Indigenous

Prosopis cineraria	Mimosa family	Ghaf, harb,awd,hadheeb, shibhan	Tree	Indigenous
Reseda aucheri	Mignonette family	Dhaub-nabmm, zinban	Bush	Indigenous
Stipagrostis plumosa	Plumose triple awned grass	Nussi, sabat, rahim, bathoot, tubaynee, thighaam, dawit	Grass	Indigenous
Sporobolus spicatus	Drop seed grass	Dhafrem, defera, sakham, rashad, halfa barri	Grass	Indigenous
Sueda vermiculata	Sea blite	Suweda,meliah, tuwaim, girm, hamd, tahmar	Bush	Indigenous
Tamarix nilotica/ arabica	Tamarisk	Tarfa, athl	Tree	Indigenous
Zizyphus spina cristi	Christ thorn	Sidr, ber, 'ilb, zaqa. Fruit: Nabaq, dum	Tree	Indigenous
Zygophyllum qatarense	Bean caper	Haram, rotreet, balbal, theromet	Bush	Indigenous

Native plants, desert adapted plants, foreign drought resistant plants and salt tolerant plants listed in the following publication are also acceptable choices for landscaping in Dubai:

The Comprehensive Guide to the Wild Flowers of the United Arab Emirates. Marijcke Jonbloed, Environmental Research and Wildlife Development Agency (ERWDA) Abu Dhabi. First Published April 2003.

Local landscape consultants and gardeners are also able to provide advice on the water requirements of plants and can recommend low water use varieties.

Note:

1. When calculating the area planted with local species, the area of the trunk of local trees planted in a grassed space is to be used in the calculation not the area covered by the tree's branches. This is because the grass under the tree will still need irrigation at a higher volume than local plants would require.
2. Regulation 601.04 requires that all irrigation be with non-potable water or by drip or sub-surface irrigation systems.

The following are additional recommendations for the management of a water efficient landscape.

Soil Improvement

- Routine soil cultivation and adding organic matter (such as compost) improves the soil's ability to retain moisture.
- Heavy or compacted soil around trees should be loosened and aerated by manual digging.
- Organic mulches include shredded bark or chips, wood grindings, compost, aged sawdust, or even low-growing ground cover. Organic mulches improve the organic matter content of the soil as they decay. This may be undesirable, however, for plants that require excellent drainage and dislike wetter soil conditions. Inorganic mulches, such as gravel or rock, let the most water in and are frequently used with plants susceptible to crown rot. A 5-10cm layer of mulch can help to even out temperature extremes and keep soil cooler on hot days. It also prevents soil from crusting, allowing better water penetration. By mulching around trees and planting beds, moisture is retained in the soil and weeds are discouraged.

Landscape Maintenance

- Correct maintenance keeps plants healthy and helps conserve water. For example, by weeding regularly, landscape plants do not have to compete with weeds for water.
- Fertility requirements of the plants should be considered. An adequate amount of nutrients is necessary, but over applying fertilizers may create excessive growth and increase in maintenance requirements. Excessive fertilisation may also leave plants more susceptible to insects and diseases.

6.2 Technical Data and Specifications

Plants and tree species appropriate for Dubai's climate and region are defined as native plants, desert adapted plants, foreign drought resistant plants and salt tolerant plants. Examples of suitable plants are listed in table 302.1 (1) and in;

The Comprehensive Guide to the Wild Flowers of the United Arab Emirates, by Marijcke Jonbloed (Environmental Research and Wildlife Development Agency (ERWDA) Abu Dhabi. First Published April 2003).

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓		✓	
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

This regulation has been developed specifically for Dubai and can not be compared directly to other countries. However, the approach is similar is that adopted in other regions with hot and arid climates. The percentage of vegetated area that has to be planted with indigenous species or those adapted to Dubai's climate could be increased if appropriate grass for lawns becomes available.

9. References.

The Comprehensive Guide to the Wild Flowers of the United Arab Emirates. Marijcke Jonbloed, Environmental Research and Wildlife Development Agency (ERWDA) Abu Dhabi. First Published April 2003.

1.0 Exterior Light Pollution and Controls

303.01

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new buildings, permanently installed exterior lighting must comply with the following:

1. **All exterior light fixtures on the building site, other than architectural accent lighting and Civil Aviation safety lighting, must be shielded so that all of the light emitted by the fixture, either directly or indirectly by reflection or refraction from any part of the fixture, is projected below the horizontal plane passing through the lowest part of the fixture;**
2. **Architectural accent lighting must be aimed or shielded to prevent the lighting of the night sky. Wall washing lights must spill no more than 10% of the lighting past the building façade;**
3. **Downward directed lighting must be used for lighting of signage; and**
4. **All exterior lighting must be fitted with automatic controls to ensure that lights do not operate during daylight hours.**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Neighbourhood Pollution**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Light pollution (also called photopollution and luminous pollution) arises from the loss or reflection of excess light upwards in built-up areas. This results in the occurrence of what is known as 'sky glow' which lessens the contrast between the night sky and the urban development. Sky glow has aesthetic implications in the inability to distinguish stars on otherwise clear nights. While parts of Dubai are known to have a vibrant night life and many iconic buildings are illuminated, there is a need to ensure that the use of exterior lighting is controlled to reduce the impact from over lighting. Excessive use of exterior lighting is also a waste of electricity.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	

	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

This regulation will help to reduce light pollution and night sky glow with associated benefits including allowing people to enjoy the view of the night sky. Light pollution also disrupts many of the natural cycles, such as feeding, of nocturnal wildlife. In addition, the use of sensors, timers and appropriate selection of light fittings can reduce expenditure on exterior lighting and bring increased energy efficiency. By reducing the amount of wasted lighting and using controls to ensure lights do not operate when they are not necessary, energy consumption and costs will be reduced.

6.0 Guidance

6.1 General

This regulation should be considered together with Regulation 504.02 which specifies the maximum lighting power density which can be used for exterior lighting. Exterior lighting should use the lowest possible illumination to provide adequate light for safety and security.

Unless it is required for safety or security, direct lighting must not extend past property boundaries.

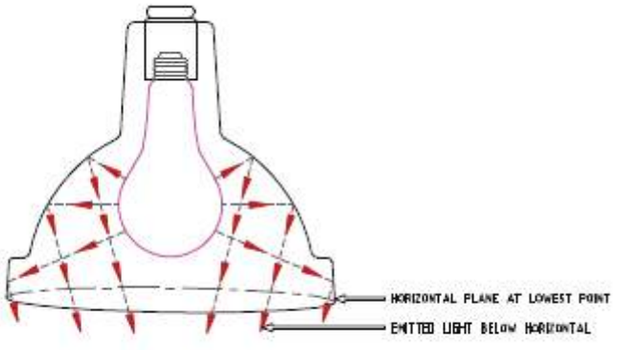


FIGURE SHOWS A PROTOTYPE OF AN OUTDOOR LIGHTING FIXTURE

In order to comply with the requirement that exterior lighting, must be shielded so that all of the light emitted by the fixture, either directly or indirectly by reflection or refraction from any part of the fixture, is projected below the horizontal plane passing through the lowest part of the fixture, a full cut-off light fixture must be used. This is a lighting fixture where no light is emitted above the horizontal and shall be shielded to direct all light towards the ground so that the lighting elements are not exposed to normal view by or do not create or constitute a hazard or nuisance to motorists, pedestrians or neighbouring residents

Daylight sensors or timers must be used to ensure that exterior lighting is not operating during daylight hours. Spotlights may only be used for special occasions and only with the written permission of Dubai Municipality.

The use of motion sensors, timers, photocells or other means of activating lighting when it is needed is encouraged to conserve energy and avoid light pollution.

6.2 Technical Data and Specifications

The maximum lighting power density allowable for outdoor lighting is specified in Regulation 504.02

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

This issue is addressed in a number of ways in building rating systems and codes in other countries. LEED specifies light levels at the boundary of building plots and restricts the percentage of lights shining upwards. BREEAM uses the 'Institution of Lighting Engineers, Guidance for Reduction of Obtrusive Light' which requires less shielding of lights and allows signs to be lit from below if there is no spill over of light. The proposed Dubai regulation is stricter.

9. References.

Guidance for Reduction of Obtrusive Light' , 'Institution of Lighting Engineers, England

1.0 Urban Heat Island Effect

304.01

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new buildings:

1. **All opaque external roofing surfaces must comply with a minimum Roof Solar Reflective Index (SRI) value according to Table 304.01(1) for a minimum of seventy five percent (75%) of the roof area:**

Table 304.01 (1) – Roof SRI Requirements

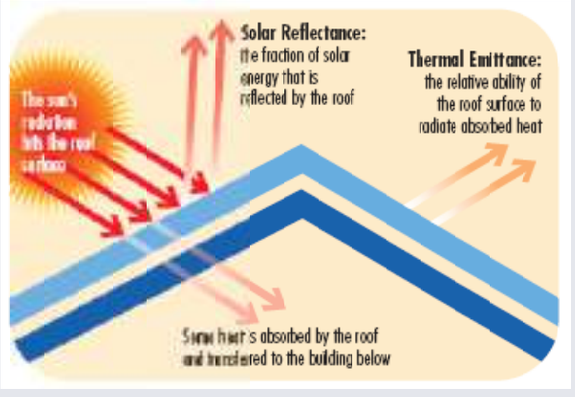
Type of Roof	Minimum Roof SRI
Steep Sloped Roofs (slopes steeper than 1:6)	≥ 29
Flat and Low Sloped Roofs	≥ 78

2. **Individual heat rejection equipment, with a power rating greater than 4.0 kilowatt (kW), and which exhausts externally, must be installed not less than 3.0 meters above the ground level of the building**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background



The Urban Heat Island (UHI) effect is the temperature difference between urban and undeveloped areas. The UHI effect occurs due to the amount of high thermal mass materials present in built up areas, such as concrete and tarmac, which are commonly used in the construction of roads, sidewalks, parking lots, buildings and roofs. These materials absorb solar radiation during the day and then re-radiate some of it, leading to temperature differences of up to 3°C between urban and the surrounding undeveloped areas.

The properties of the materials which determine how much heat is absorbed and re-radiated are their solar reflectance, heat capacity and thermal emissivity.

Solar reflectance (or reflectivity) indicates how well a material reflects solar radiation. Surfaces with a low solar reflectance are usually dark in colour and absorb a high fraction of solar radiation. The amount of energy absorption also depends on a material's specific heat capacity -- how much heat they can store. The absorbed energy is then re-radiated by the material. Thermal emittance (or emissivity) indicates the ability of a material to radiate heart that it has absorbed. Surfaces with low emissivity cannot effectively radiate energy and therefore heat up.

The SRI, defined by ASTM E 1980-01 (Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces), incorporates both reflectivity and emissivity. The combination of these factors means that light-coloured polymeric roof membranes and coatings, which are good emitters of heat, tend to perform better than metallic surfaces, which can be more reflective but which heat up because of metallic surfaces' low emissivity. Materials with higher SRIs absorb less heat and reduce the UHI effect.

In addition to the contribution of the sun to the heat island effect, the rejection of heat from air conditioning units at the ground level of buildings also contributes to increased temperatures. By requiring that such heat rejection can only be carried out at the first floor level of a building or higher the heat island effect will be reduced.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓ *				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

Note: Part B does not apply to villas

5.0 Outcome/ Benefit

Designing buildings that use materials with higher SRI values will help to reduce both absolute urban temperatures and reduce the day time temperature range. This will improve pedestrian and building occupant comfort and is likely to reduce cooling demand within some building typologies. The mounting of heat rejection equipment on higher floors will also provide increased pedestrian comfort.

6.0 Guidance

6.1 General

The thresholds and values included in this regulation have been chosen as being both representative of international best practice and applicable to Dubai's conditions. As some buildings in Dubai are being built to meet the requirements of international sustainability rating schemes, similar SRI values have been specified in this regulation.

SRI values relate to materials (not location), and the values included in this regulation are for materials that are appropriate for Dubai's hot and arid climate. SRI values apply to the values for new materials.

Roofing products are now available that meet the required SRI in nearly any standard colour. Cool roof products help to reduce heat gain indoors. The extent of heat gain reduction also depends on how well the roof or ceiling is insulated.

The following will qualify as meeting the required SRI values:

- Any roof area covered by photovoltaic panels or solar hot water collectors.

The calculation of the total roof area does not include the area required for heating, ventilation, and air conditioning (HVAC) equipment, renewable energy generating equipment, building maintenance units, walkways for access to plant equipment and storage tanks. Walkways must be provided to allow service access to any

equipment located on the roof.

Manufacturers and suppliers of proprietary roofing products should be able to provide Material Specification Data Sheets (MSDS) which detail the SRI value of their products. An indication of the SRI for some common roofing materials is given in the table below.

Roofing Materials	Typical SRI Value
Grey EPDM (enthlene propylene diene monomer)	21
Unpainted Cement Tile	25
Red Clay Tile	36
Light Gravel on Built-up Roof	37
Aluminium	56
White Ceramic Tile	90
White Coating	100
Light Beige Concrete Tile	76
Light Brown Concrete Tile	48
Pink and Grey Concrete Tile	63
Off White Concrete Tile	92

Dark hard surfaces with high heat retention increase the overall temperature of the area and should be avoided where possible. The use of dark materials around buildings leads to an increase in temperatures at ground level and is discouraged.

For buildings other than villas and small units, heat rejection from air conditioning must not be made at low levels to ensure that UHI is not increased by the hot air. This means that units such as window air conditions and the condensers of split units with a power rating of 4 kilowatts or greater cannot be mounted at ground level.

6.2 Technical Data and Specifications

Materials for opaque external roofing surfaces must have a minimum SRI as indicated in the Regulation. Material Specification Data Sheets (MSDS) provided by manufacturers should detail the SRI value of the products.

The SRI is a measure of the surface's ability to reflect solar heat, as shown by a temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. For example, a standard black surface has a temperature rise of 90°F (50°C) in full sun, and a standard white surface has a temperature rise of 14.5°F (8.1°C). Once the maximum temperature rise of a given material has been computed, the SRI can be computed by interpolating between the values for white and black.

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

A calculation method, using the solar reflectance value and thermal emittance as inputs, to determine the SRI of a product has been developed by the Lawrence Berkeley National Laboratory and can be accessed from the internet at: http://coolcolors.lbl.gov/assets/docs/SRI%20Calculator/SRI-calc10.xls

Roofing product information can also be found in the Cool Roof Rating Council website, at www.coolroofs.org

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment Prepare materials and coating specification
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

The approach taken in this regulation is similar to that suggested in some building rating systems. For example, LEED specifies the limits for Solar Reflective Index for flat and sloped roofs.

9. References.

ASTM E1980-01 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces This standard covers the calculation of the SRI of horizontal and low-sloped opaque surfaces at standard conditions. The method is intended to calculate SRI for surfaces with emissivity greater than 0.1

ASTM C 1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

ASTM E408-71(1996)e1 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques

ASTM C1371 - 04a Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

It is expected that these documents would only be used by the manufacturers of materials, it can be obtained from the ASTM website: http://www.astm.org/Standard/index.shtml

Lawrence Berkeley National Laboratory SRI calculator is available free on line at:
http://coolcolors.lbl.gov/assets/docs/SRI%20Calculator/SRI-calc10.xls

1.0	Green Roofs	304.02
	For all new buildings, the requirements of Part 1 of Regulation 304.1 are waived, if the roof of the building provided with vegetated roof (green roof) for at least thirty percent (30%) of the total roof area	Villas Residential/ Commercial Public Buildings Industrial

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Green roofs act as insulation and reduce the amount of heat absorbed by, and then re-radiated from, the building roof. They may also provide pleasant outdoor social areas. Careful consideration must be given to the irrigation requirements for a vegetated roof. For plant types suitable for Dubai's climate, refer to regulation 302.01 Local Species.

In addition to providing aesthetic benefits, green roofs provide protection of roof elements, resulting in operational lifetimes which can be twice as long as some conventional roofs. Cooling costs will be reduced as less heat as absorbed by the roof and transferred into the building.

Furthermore, green roofs provide significant acoustic insulation through the absorption, reflection and deflection of noise. The substrate of a green roof tends to block noise in the lower frequency range while plants block noise at higher frequencies. A green roof with a 12cm substrate can be expected to reduce noise transmission by 40 dB, while a 20cm substrate can reduce noise transmission by between 46 and 50 dB.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

Green roofs improve the appearance of the cityscape and encourage biodiversity. In addition, green roofs provide thermal and acoustic insulation, reducing the heat and noise transmitted through the roof. Tangible economic benefits are realised through increasing the operational lifetimes of protective roof elements as well as reducing energy costs associated with the provision of rooftop thermal insulation. Green roofs may also serve as an attractive outdoor social area.

6.0 Guidance

6.1 General

Installing a green roof requires special attention during the design, installation and subsequent maintenance phases. Green roof design must consider structural implications as they are heavier than conventional roofing systems. Waterproof membranes or layers must be installed between the roof and the soil bed of the green roof

to prevent surface runoff, or leaks, from damaging the building elements. A tough and impermeable layer is required to prevent the plants' roots from damaging of the supporting structure. Plants used must be suitable for Dubai's climatic conditions as detailed in Regulation 302.01.

Water consumption is a significant consideration when using green roofs, especially in Dubai. The use of potable water needs to be kept to a minimum or even eliminated. Properly recycled grey water or water recovered from machinery condensate can be used effectively for green roof irrigation purposes. Therefore, Consideration should be given to the use of condensate recovery to assist in the irrigation of green roofs. Irrigation must use drip or sub surface systems or use non potable water.

6.2 Technical Data and Specifications

A number of companies in Dubai have developed experience with green roofs and their use is becoming more common. These companies can provide all the technical information required.

Refer to Practice Guide 304.01 Urban Heat Island Effect for information on Solar Reflectance Index (SRI)

Roofing product information can also be found in the Cool Roof Rating Council website, at www.coolroofs.org

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment Prepare Roof floor plan
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

LEED is an example of a building rating scheme that encourages the adoption of green roofs by awarding credits for 50% vegetated roof.

9. References.

Dubai Green Building Regulations, Practice Guide 304.01

1.0 Light Colours on Outside of Buildings

304.03

For all new buildings, at least seventy five percent (75%) of the area of externally painted walls must have a minimum Light Reflective Value of forty five percent (45%).

Villas

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Passive building design and material choices that avoid absorbtion of the sun's heat to promote thermal comfort and energy conservation, are traditional methods used by early inhabitants of Dubai, who constructed their homes and buildings from light coloured and white materials.

A large amount of heat can be reflected away from a building through the use of reflective exterior surfaces. The amount of energy absorbed and retained by a building is affected by surface colour. Light colours reflect a greater proportion of the solar energy whilst darker colours retain more solar energy resulting in the heating of the object and the surrounding air.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/ Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/ Theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

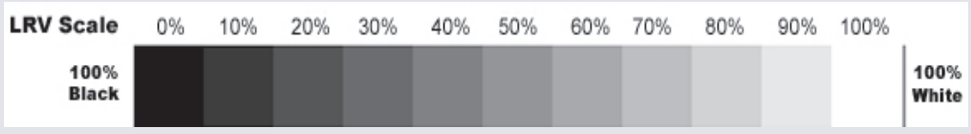
Outdoor finishes with high solar reflectance help to reduce the internal temperature of buildings, and associated cooling demand, and help reduce the overall UHI effect.

As an Arabic city, Dubai's buildings have traditionally had light coloured exterior finishes. This regulation will encourage the continuation of this traditional building characteristic while reducing energy use within the Emirate.

6.0 Guidance

6.1 General

Final surface finishes applied to external walls of buildings must have a minimum Light Reflectance Value (LRV) of 45%.The light reflectance value (LRV) of surface finishes applied to internal walls of building shall be declared by the manufacturer/ supplier based on the test results from Dubai central laboratory. LRV is a measure of the total quantity of useable and visible light reflected by a surface in all directions on a scale from 0% to 100%. Zero percent is assumed to be an absolute black and 100% represents an assumed perfectly reflective white. The blackest achievable wall finish has a LRV of approximately 5% and the whitest available finish approximately 85%.



The LRV of surface finishing materials are often stated by manufacturers on colour sample sheets or within material specification and data sheets and in laboratory test results for individual products.

The LRV value is measured when the coating is applied to a test surface. The value does not change when applied to different t surfaces.

Light reflectivity is often confused with the term light intensity. Intensity deals with the brightness or dullness of a colour, or how clear or muted a colour is. Reflectance strictly defines the lightness or darkness of a colour.

The intent of this regulation is to use paints which reflect more light and heat. Increasing the LRV will increase the solar reflectivity.

6.2 Technical Data and Specifications

Paint manufacturers will specify LRV values on colour sample sheets or within material specification and data sheets. These should be based on laboratory test results for individual products.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Prepare materials and coating specification*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

This regulation is well known worldwide and easy to apply.

9. References.

No references.

1.0	Orientation of Glazed Façades or External Shading	304.04
	For new buildings, other than villas and industrial buildings, one of the following must be achieved: **1. At least sixty percent (60%) of the total glazed surface area of the building, excluding glazed areas with back insulated panels, must have a predominantly north orientation.** **For the purpose of this regulation, a 'predominantly north orientation' means façades facing within forty five degrees (45o) of due North.** **2. South and west glazed areas, excluding glazed areas with back insulated panels, must be treated environmentally.**	**Residential/ Commercial** **Public Buildings**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

The angle of the sun as it appears in the sky when viewed from a particular location is dependent on the latitude of that location. At near-equatorial latitudes, such as in Dubai, the sun appears at higher polar angles with a more even irradiance of the south, east, and west quadrants of the sky than it would be at higher latitudes. In Dubai, the total amount of annual incident solar radiation in Dubai falling on the north facing vertical surfaces is circa 50% lower than on any other façade.

As a result of this, the direct solar heat gains (i.e. heat arising from sunlight penetration through glazing) will be significantly lower in buildings where most of the unshaded glazing has a predominantly north orientation.

Direct solar radiation through glazing substantially increases the cooling load of buildings. In densely occupied building types in Dubai such as offices and other commercial buildings, the demand for cooling tends to be high already without solar loads, due to the internal heat gains generated by lighting, equipment and the occupants themselves. Therefore, it is important to minimise any additional solar load to the cooling demand of buildings. The most effective way of reducing solar gains in buildings is by external shading. Another means of reducing solar gains, is to restrict the amount of glazing which faces the sun.

This regulation allows the choice of providing external shading or orientating the glazing.

Note that there are two compliance routes for energy performance in buildings. The standard method is referred to as the Elemental Method; the alternative method is referred to as the Performance Method. Details are given in Chapter 100 of the Green Building Regulations

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops					
	Factories					
	Warehouses					

5.0 Outcome/ Benefit

Successful implementation of this regulation will help to address energy efficiency right at the front end of the design process. It requires designers to take early consideration of building form, orientation and rationalization of the use of glass in buildings which ultimately will help reduce the demand for cooling in buildings. By reducing cooling requirements this regulation will result in energy savings.

By positioning the larger proportion of unshaded glazing areas on north facing facades which receive less amount of direct sunlight, it is estimated that a 3% reduction of the sensible cooling load and 1.5% reduction in the total energy used for cooling can be achieved compared with 40% glazed area on all walls.

By positioning horizontal shading fixtures with a Vertical Shadow Angle (VSA) of 70^{o} on a building with a glass surface area of 40% of that of the façade, the reduced direct solar radiation corresponds to a 7% reduction of the building's cooling demand.

6.0 Guidance

6.1 General

This regulation provides two alternative options to provide passive design features to a building. Either option may be selected but both are not required for compliance. It is however recommended that both means of reducing solar heat gain be considered**.**

Unprotected glazing in Dubai is not recommended and where practical it is always preferable to use external shading or reduce the amount of glazing facing the sun. External shading will remove the restriction of glazing orientation meaning glazing can be used in any orientation providing it incorporates an external shading device.

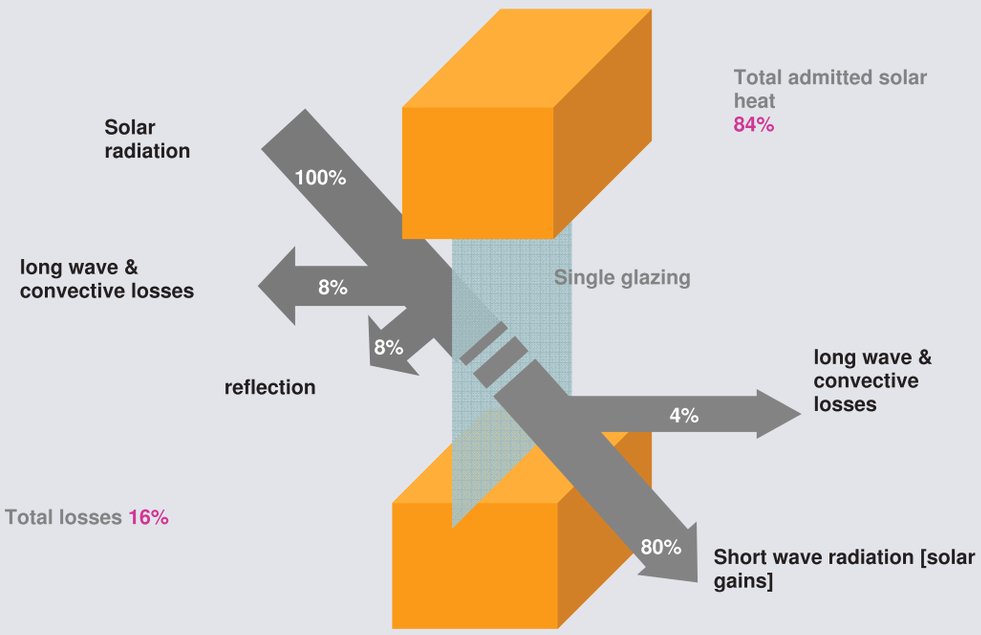
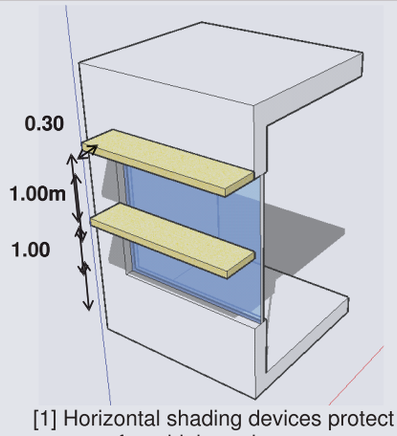


Diagram illustrating how solar radiation is distributed after reaching a vertical glazed surface.

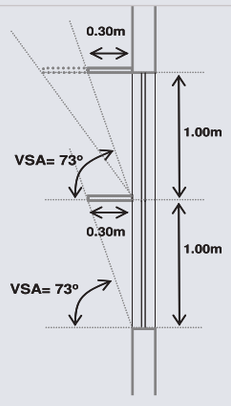
Tinted glass and internal blinds which are directly exposed to solar radiation absorb large amounts of heat which is then transferred into the building by conduction and convection. This results in additional cooling loads but the greatest negative effect is that it increases the internal surface temperature of the windows. This increases the mean radiant temperature of the room, making occupants feel uncomfortable, even when the air temperature is within comfortable levels. With external shading, direct solar radiation is intercepted before it reaches the glass.

External shading is more effective than improving the glass alone because it avoids incident radiation heating up the glass and transferring additional heat into the buildings. Where external shading can be integrated into the design in the form of balconies, canopies and other façade structures, further design efficiencies can be achieved. The smaller the Vertical and Horizontal Shadow Angles, the better the shading effect. However careful design will also have to balance effective shading with other façade design requirements such as the need for views and daylight.

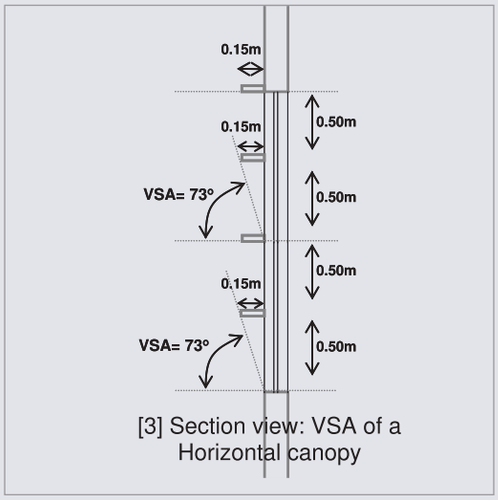
The use of external shading devices with a VSA of 70^{o} is introduced here as a minimum requirement. Further shading will increase the benefit and this can be achieved simply by decreasing the VSA for horizontal shading systems. A VSA of 70^{o} for a horizontal shading device represents an overhang of approximately 35cm deep for every 1m of glazing. However, the same VSA can be achieved by several combinations of shading design with the same effect, as illustrated below.



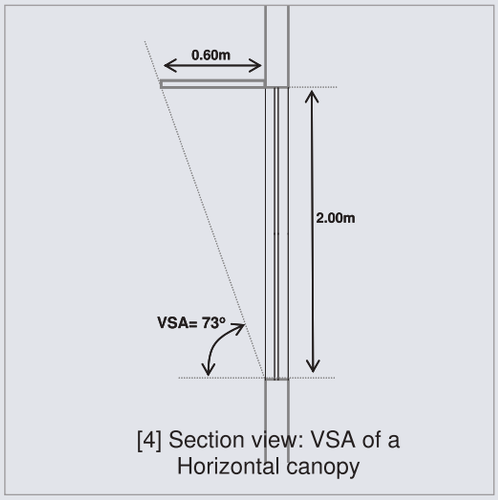
[1] Horizontal shading devices protect from high-angle sun



[2] Elevation view: VSA of a pair of horizontal fins



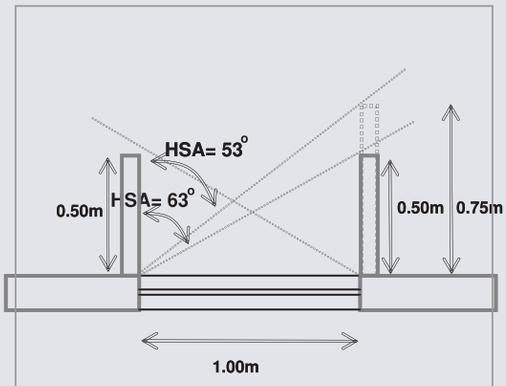
[3] Section view: VSA of a Horizontal canopy



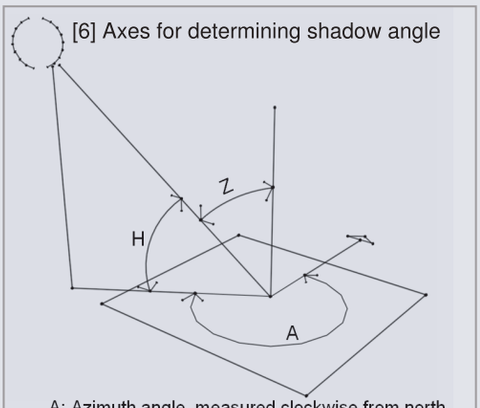
[4] Section view: VSA of a Horizontal canopy

In addition to horizontal shading systems, vertical fins can also be used to further reduce direct solar gains. These are measured using the Horizontal Shadow Angle (HSA). Vertical fins are particularly effective on East and West facades to increase solar protection from the lower sun angles of mornings and afternoons.

The smaller the HSA, the more effective the shading will be and like the VSA, the same HSA can be achieved through several design combinations.



[5] Plan view: HSA of a pair of vertical fins



[6] Axes for determining shadow angle

A: Azimuth angle, measured clockwise from north
H: Height angle, measured up from horizon
Z: Zenith angle, measured from vertical

6.2 Technical Data and Specifications

For the orientation option, calculate the total area of glazing on each façade and confirm that the north façade has at least 60% of the total area of glazing.

For the external shading option, install horizontal external shading devices with a minimum Vertical Shadow Angle (VSA) of seventy degrees (70°).

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

Similar approaches are adopted in other countries although the details vary depending upon the specific climatic conditions of the region. Some cooler countries want to maximise heat gain through windows and hence encourage larger areas of glazing in certain circumstances. Conversely, Singapore recommends that total glazed area of a building should not exceed 40% but can be increased to 50% if external glazing is used.

9. References.

No references.

1.0 Hardscape

304.05

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new buildings, fifty percent (50%) of the Hardscape of the development must:

1. **Demonstrate a Solar Reflective Index (SRI) of at least twenty nine (29), or**
2. **Use an open grid pavement system, or**
3. **Be shaded by vegetation or**
4. **Be shaded by materials with an SRI equal to or greater than those specified in Table 304.01 (1), or**

A combination of the above.

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

The Urban Heat Island (UHI) effect is the temperature difference between urban and undeveloped areas. The UHI effect occurs due to the amount of high thermal mass materials present in built up areas, such as concrete and tarmac, which are commonly used in the construction of roads, sidewalks, parking lots, buildings and roofs. These materials absorb solar radiation during the day and then re-radiate some of it, leading to temperature differences of up to 3°C between urban and the surrounding undeveloped areas.

The properties of the materials which contribute to the Urban Heat Island effect are their solar reflectance, heat capacity and thermal emissivity.

Solar reflectance (or reflectivity) indicates how well a material reflects solar radiation. Surfaces with a low solar reflectance are usually dark in colour and absorb a high fraction of incoming solar radiation. The amount of energy absorption also depends on a material's specific heat capacity – how much heat they can store. The absorbed energy is then re-radiated by the material. Thermal emittance (or emissivity) indicates the ability of a material to radiate heart that it has absorbed. Surfaces with low emissivity cannot effectively radiate energy and therefore heat up.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	Applies to	Typology Subdivisions	Applies to
Villa	Private	✓		
	Investment	✓		
Residential/Commercial	**Residential**	✓	**Commercial**	✓
	Apartments	✓	Hotels	✓
	Offices	✓	Resorts	✓
	Labour Accommodation	✓	Restaurants/Food Outlets	✓
	Student Accommodation	✓	Laboratories	✓
Public Buildings	Healthcare Facilities	✓	Retail Outlets	✓

	Educational Facilities	✓	Post Offices	✓
	Government Buildings	✓	Banks	✓
	Worship Houses	✓	Museums	✓
	Petrol Stations	✓	Cinema/theatres	✓
	Shopping Mall	✓	Historical/heritage Buildings*	✓
Industrial	Workshops	✓		
	Factories	✓		
	Warehouses	✓		
* to be discussed in more detail at later stage				

5.0 Outcome/ Benefit

Hardscaped areas with greater Solar Reflective Indices (SRIs) and shading will lower absolute urban temperatures. This will result in a reduction in energy requirements for the provision of cooling. In addition, improved pedestrian comfort will be achieved.

6.0 Guidance

6.1 General

The Solar Reflective Index (SRI) as defined by ASTM E1980 (Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces), incorporates both reflectivity and emissivity. Standard black (reflectivity 5%, emissivity 90%) has an index of 0, and standard white (reflectivity 80%, emissivity 90%) has an index of 100. Materials with higher SRI absorb less heat and reduce the UHI effect. Shading of the hardscape by permanent structures or plantings will also reduce the UHI effect, however the shading material must have a high SRI.

This regulation requires the use of materials having an SRI of 29 or higher for at least 50% of the hardscape of any building development, including paving materials and vehicle parking spaces. SRI values relate to materials, not locations and the values specified in this regulation relate to materials appropriate for Dubai's hot and arid climate.

Hardscape includes parking areas, roadways, paved courtyards and paths. Open grid pavement systems are pavement surfaces composed of structural units with void areas that are filled with pervious materials such as sand or grass turf.

The use of an open grid structure reduces the amount of material which absorbs heat and so is a suitable means of reducing the UHI effect.. Open grid paving systems have been used successfully in Europe for more than 30 years and are now available and being used in Dubai.
Trees and vegetation can be used to shade buildings and pavements and also provide some natural cooling. The planting of trees which will provide adequate shading within 36 months of building occupancy will meet the requirements of this regulation for the shaded area.

If planting is to be used to achieve compliance with this regulation, a declaration will be required from the landscape designer as to the amount of shading which will be provided to the hardscape area within 36 months.

Manufacturer suppliers of proprietary paving products should be able to provide Material Safety Data Sheets (MSDS) which detail the SRI value of their products. An indication of the SRI for some common paving materials is given in the table below.

Table 305.07(1) – Solar Reflective Indices for common paving materials

Material	SRI
New Asphalt	0
New Grey Concrete	35 - 50
New White Concrete	80 - 90

Note: To meet these requirements, the SRI value for new material should be used.

The SRI value of 29 has been chosen for this regulation as it allows the use of most types of concrete and concrete pavers but excludes asphalt. As many buildings in Dubai are presently being built to meet the requirements of international sustainability rating schemes, using materials with these SRI values is likely to also meet the requirements of various rating schemes.

6.2 Technical Data and Specifications

Materials for paving and vehicle parking spaces should be specified with SRI as indicated in the Regulation. Material Specification Data Sheets (MSDS) should detail the SRI value of the products.

Refer to Practice Guide 304.01 Urban Heat Island Effect for information on Solar Reflectance Index (SRI)

Open grid (porous pavers) pavement systems are defined as pavement that is less than 50% impervious. The system is typically composed of concrete or masonry units where at least 50% of the surface area consists of holes or openings that are filled with sand, gravel, other porous material, or vegetation.

Landscaping should utilise Local Species as detailed in 302.01.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment Site plan drawings
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices/ Solutions

The approach taken in this regulation is similar to that suggested in some building rating systems. For example, LEED credits shading or low SRI materials for 50% of hardscape.

9. References.

Dubai Green Building Regulations, Practice Guide 304.01

1.0	Shading of Public Access Areas	304.06
	For all new buildings, other than villas, all pedestrian linkages within the plot area must be shaded using materials with a Solar Reflectance Index (SRI) equal to or greater than those specified in Table 304.01 (1).	Residential/ Commercial Public Buildings Industrial

2.0 Intent/Goal

- ☑ **Ecology and Planning – Microclimate and Outdoor Comfort**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Dubai's hot and humid climate makes it uncomfortable for pedestrians to walk for any significant distance in the summer months. Therefore, this regulation aims to provide a more comfortable outdoor environment for building users moving from car parking to the building entrances and along adjacent street pavements during the summer months through the provision of shading.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

This regulation will improve conditions for pedestrians around and between buildings which will encourage spending more time outside and to reduce short distance vehicle use. The shading will also reduce the Urban Heat Island (UHI) Effect.

6.0 Guidance

6.1 General

The main pedestrian routes between parking areas and building entrances should be identified and a means of providing shading along the route identified. The shaded routes should extend into the parking areas as much as practicable but must, at least, be to the boundary of the parking area. A shaded route is required from a parking building that is located separately from the main building.

The shaded pedestrian route must lead to and from the building entrance closest to the building.

Where there is a pedestrian route on the building plot which runs alongside a public road the route is to be shaded. Shading of the public road is not required by this regulation.

6.2 Technical Data and Specifications

Where a roof structure is used to provide shading, the materials to be used will be dependent on the angle of the roof used.

Refer to Practice Guide 304.01 Urban Heat Island Effect for information on Solar Reflectance Index (SRI)

Table 304.01 (1) – Roof SRI Requirements

Type of Roof	Minimum Roof SRI
Steep Sloped Roofs (slopes steeper than 1:6)	≥ 29
Flat and Low Sloped Roofs	≥ 78

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓				
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment Site Plan drawings
Construction	Green Building Site File with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed Green Building Site File
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

The cover of pedestrian routes is commonly used to provide shelter from rain and hence the thermal properties (reflectance and emissivity) of the materials used are not a consideration. In Dubai where the intent is to provide a more pedestrian friendly route and to reduce Urban Heat Island the SRI of materials becomes important.

9. References.

Dubai Green Building Regulations, Practice Guide 304.01

1.0 Impact of Construction, Demolition and Operational Activities

305.01

Villas

Residential/ Commercial

Public Buildings

Industrial

All new buildings must comply with all related regulations, local orders and their executive orders, technical guidelines and guides applied in the emirate and the following is required:

1. **Neither the construction activity nor the operation of the building may cause land disturbances, surface runoff, soil erosion or sedimentation on any other property beyond the boundary of the plot.**
2. **Drainage must avoid pollution of watercourses and groundwater. Discharges made directly to ground, storm or marine waters must comply with the requirements of Dubai Municipality**
3. **Dust suppression techniques must ensure that dust generated by construction and demolition activities must meet the requirements of Code of Construction Safety Practice issued by Dubai Municipality.**
4. **Construction waste materials generated on site must be segregated and stored on site prior to collection. Segregation must, at a minimum, include labelled storage for inert aggregates, metals, timber, dry recyclables and hazard material.**
5. **For the disposal of hazardous waste, permit must be prepared and obtained from Dubai Municipality Environment Department . The hazardous waste must be transported in accordance with the requirements of DM Technical Guidelines and DM Code of Construction Safety Practice.**
6. **With the exclusion of drinking, toilet activities and concrete works, potable water cannot be used for construction activities on any project site**
7. **Construction and demolition noise must be no greater than that detailed in DM Technical Guidelines and DM Code of Construction Safety Practice.**
8. **Chemicals, fuels, solvents or hazardous wastes must be stored in accordance DM Technical Guidelines and DM Code of Construction Safety Practice.**
9. **Light pollution from the construction site must be minimised by ensuring that light sources are directed inwards and angled down so that no light is emitted above the horizontal plane. Lux levels should meet the DM Code of Construction Safety Practice.**

2.0 Intent/Goal

- ☑ **Ecology and Planning – Responsible Construction**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

This regulation addresses many aspects of the demolition, construction and operation of buildings which must be considered to ensure safe working conditions and to minimise impact on property, people and the environment.

With the many construction activities being undertaken in Dubai, this regulation has been drafted to detail some of the areas where special care should be taken to reduce the impact on other properties, people or the environment. Many of these issues are already addressed by existing Dubai Municipality (DM) requirements and, where appropriate, these have been detailed. Particular note should be taken of the DM publication, 'Code of Construction Safety Practice' which is available from DM in both Arabic and English. This Code details actions which should be followed to ensure safety on construction sites and should be consulted before demolition or construction starts on any site.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

Preventing erosion, sedimentation, and dust generation during construction activities will contribute to improved air quality, water quality, water habitat, and maintenance of drainage infrastructure. Preventing air and water pollution will avoid environmental damage and any potential human health impacts.

Reusing existing building materials, directly or indirectly will result in reduced construction waste volumes and also reduce environmental impacts associated with raw materials extraction, manufacturing and transportation.

Mitigating construction impacts is critical to the development of a sustainable city so that both the resident population and visitors can enjoy a high quality of life.

6.0 Guidance

6.1 General

Dubai Municipality has produced Technical Guideline No. 53 for undertaking an Environmental Impact Assessment (EIA) and Technical Guideline No. 56 to help develop an Environmental Development Plan. If either of these actions is taken the requirements of this regulation will be considered to have been met.

Construction activities must include measures to:

- Prevent the loss of soil during construction by stormwater runoff and/or wind erosion.
- Ensure that any stormwater drainage system is protected so that during any rain event, there will be no restriction to water flow. Drainage points must not be blocked by sand or other debris.
- Construction activities must prevent polluting the air with dust and particulate matter.

Where wastewater and stormwater is conveyed to a public drainage system, collection point, gutter or similar disposal method, water discharge limits, retention design and water quality must comply with DS 96 – DM Sewerage and Drainage Design Criteria and Local Order No. 61/1991 – Article 19. .

A dewatering permit must be obtained from Dubai Municipality prior to all dewatering activities. Any discharges of groundwater from construction sites must follow the conditions and requirements included in a groundwater discharge permit obtained from Dubai Municipality.

Dust control measures recommendations include:

- Soil compaction or stabilisation of all roadways using gravel or crushed concrete waste;
- Use of defined, established and restricted roadways;
- Restriction of vehicle movements to those that are strictly necessary;
- Limiting vehicle/equipment speed on site to no more than 5km/h;
- Use of suitable light water spray;
- Coordination of earthworks so as to minimise open excavation and work surfaces;
- Windrow all stockpiles and rubble so as to minimise wind surface effects;
- Minimisation of height and form of stockpiles; and
- Use of wind screens to slow surface wind movements.

While there are a number of temporary alternatives for dust control during construction, the project may opt to permanently modify the site to eliminate dust generation. Modifications could include measures such as covering exposed areas with vegetation, stone, or concrete.

There are a variety of documents that can be used as references for construction activities. These include:

- Dubai Municipality Technical Guidelines 29 and 48.
- Dubai Municipality Building Department's circular papers for construction and demolition activities C 77, C 89, C 108, C 117, C 139, C 154, C 158, C 161; and,
- Dubai Municipality's Building Department's 2008 Code of Construction's Safety Practice.

6.2 Technical Data and Specifications

Additional Dubai Municipality (DM) documents which may provide guidance on managing the impact of construction activities are listed in the references section below.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓		✓	
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

It is normal for regional building regulators to require measures to ensure that the construction of a building does not adversely affect any neighbouring sites, the local infrastructure or surrounding environment.

9. References.

- UAE Federal Law 24 – 1999, Protection and Development of the Environment
- Dubai Municipality Local Order No. 61 of 1991 on The Environment Protection Regulations in the Emirates of Dubai
- Dubai Municipality's Technical Guidelines:
    - Technical Guideline No. 12 – Requirements for Gravity Oil-water Separator
    - Technical Guideline No. 26 - Requirements and Procedures for the Disposal of Hazardous Wastes
    - Technical Guideline No. 29 - Requirements for the Discharge of Waste Gases, Fumes, and Dusts to the Atmosphere
    - Technical Guideline No. 44 - Requirements for the Reduction of Construction / Demolition Noise (Article 42, of Administrative Order No. 211/91)
    - Technical Guideline No. 48 - Safety in Handling Asbestos
    - Technical Guideline No. 50 Requirements for the Transport of Hazardous Wastes
    - Technical Guideline No. 53 - Environmental Impact Assessment Procedures
    - The objectives of Dubai's EIA process are to predict and determine significant environmental impacts; to identify and incorporate into the project, appropriate abatement and mitigation measures; and to identify and incorporate safety and health plans.
    - Technical Guideline No. 56 (Amended March 1998) Establishment of Environmental Management Systems- Implementation of ISO 14001 in Dubai
    - This guideline has been produced to help all companies in Dubai seeking to develop an environmental management system. It is also intended as a guide to the approved certification bodies as means of ensuring consistent auditing policies.
    - Technical Guideline No. 57 – Bunding of Storage Tanks and Transfer Facilities
- Dubai Municipality's Building Department:
    - Circular No. 77, Concerning the Perennial Trees within the Existing Plots of Land and Farms
    - Circular No. 93 – Ref:812/02/19931 – Rainwater Drainage Orifices
    - Circular No. 89, Concerning the regulations of Noise Pollution Prevention
    - Circular No. 108-2001, Concerning the Special Protocol Control Procedures of Ozone Depleting Substances
    - Circular No. 117, Concerning Security and Safety Stipulations
    - Circular No. 139, Concerning Application of "Activation" Project to Strengthen the Role of Consulting Offices in the Supervision and Control of Construction Sites
    - Circular No. 154, Concerning Public Hygiene Requirements at Construction Sites and the Surrounding Environment, Addressed to the Consultancy Firms, Construction Companies, and Ready-mixed Concrete Plants in Dubai
    - Circular No. 158, Concerning Public Cleansing Organization and Improvement of the Visual Image of Construction Sites
    - Circular No. 161—2008, Concerning the Implementation of Green Building Standards in Dubai
- Dubai Municipality Information Bulletin, Environmental Standards and Allowable Limits of Pollutants on Land, Water, and Air Environment. May 2003.
- Dubai Municipality's Building Department 2008 Code of Construction's Safety Practice
- DS 96 – DM Sewerage and Drainage Design Criteria.

1.0 Environmental Impact Assessment

306.01

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new buildings, an Environmental Impact Assessment (EIA) and/or a Construction Environmental Management Plan (CEMP) is required to be submitted to Environment Department of Dubai Municipality and obtain approval, if one of the following criteria is applicable

1. **If the building design has gross floor area of more than 10,000 square meter;**
2. **If the building has an occupancy of more than 1000 people;**
3. **If the building has a water usage of more than 100,000 litres/day;**
4. **If the building is located within or close to environmentally sensitive areas, such as, coastal area, creek, national park, historical park or wildlife conservation areas;**
5. **If the building is intended as industrial building;**
6. **If the building is intended as hospital or polyclinics; or**
7. **If the building has the potential to generate hazardous or toxic wastes such as laboratories, waste recycling or waste treatment.**

The Dubai Municipality Environment Department's relevant Technical Guidelines for the Environmental Impact Assessment Procedure must be followed.

2.0 Intent/Goal

- ☑ **Ecology and Planning – Environmental Impact Assessment**
- ☐ Building Vitality
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

All new buildings will have an impact on the environment of Dubai but some will have a much greater impact than others. This will depend of size, use, location and other factors.

Dubai Municipality (DM) Technical Guideline No 4 requires that all new industrial facilities submit an Environmental Impact Assessment (EIA) before gaining municipality approval. Technical Guideline No 53 details the procedures for preparing an EIA.

This regulation will require that for all new buildings application must be made to the Environmental Department of DM for them to determine whether an EIA or Construction Environmental Management Plan (CEMP) will be required for that specific building.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	Applies to:	Typology Subdivisions	Applies to:
Villa	Private	✓		
	Investment	✓		
Residential/Commercial	**Residential**	✓	**Commercial**	✓
	Apartments	✓	Hotels	✓
	Offices	✓	Resorts	✓
	Labour Accommodation	✓	Restaurants/Food Outlets	✓
	Student Accommodation	✓	Laboratories	✓

Public Buildings	Healthcare Facilities	✓	Retail Outlets	✓
	Educational Facilities	✓	Post Offices	✓
	Government Buildings	✓	Banks	✓
	Worship Houses	✓	Museums	✓
	Petrol Stations	✓	Cinema/theatres	✓
	Shopping Mall	✓	Historical/heritage Buildings*	✓
Industrial	Workshops	✓		
	Factories	✓		
	Warehouses	✓		

5.0 Outcome/ Benefit

By requiring all new building to be assessed as to their level of impact to the environment, DM will be able to ensure that projects which may have a high impact are identified and suitable assessments are carried out if required.

6.0 Guidance

6.1 General

Upon application from the building developer, the Environmental Department of DM will decide whether an EIA or CEMP is required for a new building or whether neither will be required. An EIA is required for all industrial developments and is also likely to be required if a building is may have significant environmental effects by virtue of its characteristics, location and the nature of the potential impact and whether it is in an environmentally sensitive area.

The objectives of Dubai's EIA process are to predict and determine significant environmental impacts; to identify and incorporate into the project, appropriate abatement and mitigation measures; and to identify and incorporate safety and health plans. DM Technical Guideline No 53 details the procedures for preparing an EIA.

6.2 Technical Data and Specifications

DM Technical Guideline No 53 details the information required for an Environmental Impact Summary in Table 1 and Table 2 details the information required for an Environmental Impact Report (i.e. EIA)

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *EIA submission (as per DM Environment Department's requirements)*
Construction	Environmental records as per EIA requirements
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

There is increasing understanding of the need to mitigate the impact of buildings on the environment both during construction and operation. The use of EIA's and CEMP's are commonly used to tools to control environmental impact. However, most countries have found it difficult to prepare and agree a standard checklist of conditions that determines whether or not a project requires an EIA. Most countries place the responsibility for determining this on the judgement of the relevant regulatory body, supported by guidance.

9.0 References.

Dubai Municipality (DM) Technical Guideline No 4 - Guidelines for Preparation of Environmental Impact Statements for New Industrial Premises

DM Technical Guideline No 53 - Environmental Impact Assessment Procedures.

400

Building Vitality

- Ventilation and Air Quality
- Thermal Comfort
- Acoustic Comfort
- Hazardous Materials
- Daylighting & Visual Comfort
- Water Quality

1.0 Minimum Ventilation Requirements for Adequate Indoor Air Quality

401.01

Villas

Residential/ Commercial

Public Buildings

Industrial

A All new and existing air conditioned buildings must be mechanically or mixed mode ventilated and must comply with the minimum requirements of ASHRAE Standard 62-2007.

Occupancy density for each space is determined based on its activity in accordance with the requirements of Dubai Municipality if available or using the default occupancy density values in ASHRAE 62-2007

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

To ensure a suitable indoor air quality in buildings there must be an adequate ventilation system which introduces outside air. The minimum amount of outside air which is required is detailed in the references specified. Different requirements are specified for villas and for other types of buildings.

Due to the hot temperatures and humidity in Dubai, all buildings require air conditioning and mechanical ventilation to be installed. Mixed mode systems combining natural and mechanical ventilation may be used.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓

	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories					
	Warehouses	✓				

5.0 Outcome/ Benefit

A minimum ventilation rate to maintain an adequate level of indoor air quality is critical to provide a safe environment for occupants' comfort, which minimises the potential for adverse health effects, and enhances occupants' productivity.

6.0 Guidance

6.1 General

ASHRAE Standards 62.1 and 62.2 are widely used standards for ventilation design and have been the design requirement for buildings in Dubai since 2003. The 2007 version of these standards has upgraded ventilation guidelines and must now be used for any new and existing air conditioned buildings. The building must comply with the standards listed below.

Active Ventilation (Mechanical and mixed mode Ventilation): ASHRAE 62.1-2007 Section 5-7 covers systems, equipment, procedures, construction, and system start up. Section 6 specifically establishes procedures for determining the minimum required ventilation rates for various uses. The ventilation rates will be determined using the Ventilation Rate Procedure (ASHRAE 62.1-2007 Section 6.2).

The Ventilation Rate Procedure determines the outdoor rate intake based on space type/application, occupancy level and floor area. Minimum rates are based on contaminant sources and source strengths that are typical for the listed space types.

If outdoor air quality is considered unacceptable, each ventilation system that provides outdoor air through an air supply fan shall comply with ASHRAE 62.1-2007 Section 6.2.1.

ASHRAE 62.1-2007 includes information regarding "Minimum Ventilation Rates in Breathing Zone" in Table 6.1.

Ventilation systems will be designed to be capable of providing the required ventilation rates in the breathing zone, whenever the zones served by the system are fully or partially occupied.

ASHRAE 62.2.2007 defines "Low rise residential buildings" as any residential building three stories or less than three stories. Thus, this standard is to be applied to Villas. Mechanical ventilation systems in Villas must comply with all the requirements included in ASHRAE 62.2.2007 Section 4.

6.2 Technical Data and Specifications

Buildings are required to comply with the relevant ASHRAE standards specified.

Note that the values specified are for the minimum volume of outside air required to provide a safe environment. Some research has shown that increased levels of outside air may provide a healthier environment and this regulation does not stop the use of higher volumes of air. Increased levels of ventilation may result in increased equipment and energy costs and therefore there is a balance to be struck.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓	✓			
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *MEP Drawings*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

ASHRAE 62.1 - 2007 is internationally accepted as detailing the minimum ventilation levels required. The latest version should be used.

9. References.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62.1-2007 for Ventilation for Acceptable Indoor Air Quality.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62.2-2007 for Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential

These standards define requirements for ventilation and air-cleaning system design, installation, commissioning, operation and maintenance and are available from the ASHRAE website: www.ashrae.org

1.0 Air Quality during Construction, Renovation or Decoration — 401.02

For all buildings under construction or renovation, building occupant and systems must be protected from airborne contaminants which are generated or spread during construction or renovation inside the buildings. Including toxic substances or substances harmful to the human body, such as asbestos, lead, pesticides, heavy metals, mold, dust, fumes, paint, ...etc

Unless it is required to provide ventilation during construction, the supply and return heating, ventilation, and air conditioning (HVAC) system openings must be closed and protected from contamination. All duct and other related air distribution component openings must be covered with tape, plastic, sheet metal or other methods to prevent dust or debris from collecting in the system.

If the HVAC system is used during construction or renovation, temporary return air filters must be installed with a Minimum Efficiency Reporting Value (MERV) in accordance with ASHRAE Standard 52.2-2007 or an equivalent standard.

Immediately prior to occupancy, the temporary return air filters must be removed and replaced with permanent filters having Minimum Efficiency Reporting Value (MERV) in accordance with ASHRAE Standard 52.2-2007 or an equivalent standard.

Villas

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

During construction, Renovation or Decoration, large quantities of dust and other debris are produced. If ducts and air delivery components such as air handlers, fan coil units and vents are not protected, they will become contaminated by this material. Dust and small debris can cause mechanical damage to equipment, as well as reduce the quality of the air delivered by the heating, ventilation, and air conditioning (HVAC) system at start up. If the equipment has not been protected, extensive cleaning will be required which can be both expensive and time consuming. The high levels of dust in Dubai's air can increase the problem.

Should the HVAC system be used during construction, Renovation or Decoration all air returning into the system needs to be filtered to eliminate system contamination.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓

	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

Prevention of contamination of HVAC systems is of particular importance during the construction phase when dust generation is intensified. Duct protection will reduce the costs of material, component and equipment damage. Appropriate filters help remove potentially irritating and nuisance particles that adversely affect human health.

6.0 Guidance

6.1 General

It is important that openings in ducting and air handing systems are sealed to prevent ingress of dust during construction. Openings may be covered with tape, plastic, sheet metal or other methods to eliminate dust or debris collecting in the system.

Should the HVAC system be used during construction, care must be taken to stop dust and debris from entering the system. This is to be achieved by using the level of air filtration specified in this regulation at all return air openings. It is important that these filters are checked weekly during operation and cleaned or replaced as required.

Ductwork protected during construction.

The permanent HVAC system shall only be used during construction, if necessary, to condition the building within the required temperature range for worker comfort. If the HVAC system is used during construction, return air filters with a Minimum Efficiency Reporting Value (MERV) of 8 or greater shall be used at each return air grille, based on ASHRAE 52.2-2007 or an equivalent standard.

MERV 13 rated filters (or equivalent standards) are to be fitted in the supply air system immediately prior to commissioning of the system.

Note that during construction it is the return air openings which must be covered or filtered. Prior to commissioning these filters are to be removed and only the supply air must be filtered.

Air filter MERV is an expression of the efficiency of an air filter that has been evaluated using the ASHRAE Standard 52.2 Test Procedure. An air filter's performance is determined by comparing counts of particulates (of a defined size) upstream and downstream of the air filter (or other air cleaning device) under test conditions. A higher MERV rating equates to higher air filtration efficiency.

There are alternative test methods to establish an air filter's performance. However all reliable manufacturers must be able to demonstrate performance compliant with the internationally recognised MERV rating.

The specification for filters with MERV values of 8 or 13 has been made based on the difference in operating conditions between construction and building occupancy. During construction, the particle size of dust is larger than after the building is occupied thus a coarse filter media can be used. Dubai construction conditions have been taken into account on this selection of filter values.

The table below indicates the type of filter which will typically meet the requirements.

Table 401.03(1) - Filter Types

MERV Values	8	13
Typical Air Filter Type	Pleated Filters, Extended Surface Filters, Media Panel Filters	Non-Supported Bag Filters, Rigid Box Filters, Rigid Cell / Cartridge Filters

6.2 Technical Data and Specifications

Air filters must have a Minimum Efficiency Reporting Value (MERV) based on ASHRAE 52.2-2007 or an equivalent standard.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

It is good practice to protect all equipment from contamination from dust or any other debris during construction.

9. References.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 52.2 – 2007. The standard is expected to be used by the filter manufacturer and filter certifier and not necessarily required by designers or engineers in Dubai, but can be used as a reference document.

1.0 Air Inlets and Exhausts

401.03

For all new and existing buildings:

All ventilation system outdoor air intakes, including doors and operable windows, that are part of a mixed mode ventilation system, must be located at suitable distance from potential sources of contamination to reduce the possibility of odor, smoke or other air contaminants entering the ventilation system as required by Dubai Municipality, if any, or refer to ASHRAE Standard 62.1-2007 Table (5.1)

Exhausted air must be discharged in a manner to avoid it being drawn back into the building or the building ventilation system and to ensure that it does not become a nuisance to the building occupants or other buildings occupants or pedestrians.

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Fresh air intakes into the ventilation systems of buildings, if poorly planned and positioned, may lead to pollutants, odours and excessive heat being introduced into the building causing poor health, discomfort and increasing energy consumption.

Pollutants, odours and rejected heat exhausted from a building may cause a nuisance to surrounding buildings or people in the vicinity of the building. Care must be taken in the design of exhaust vents to ensure that they are positioned so as not to cause a nuisance.

4.0 Applicability

4.1 Type

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

Prevention of contaminated air entering the ventilation system reduces the exposure of building users to poor indoor air quality and odours. Careful location of exhaust air outlets ensures that these exhausts do not cause nuisance to people or cross-contamination of neighbouring systems.

6.0 Guidance

6.1 General

Outdoor air inlets must be located away from potential sources of contamination to reduce the possibility of odours, smoke or other air contaminants entering the ventilation system.

Exhausted air must be discharged in a manner which avoids it being drawn back into the building system. Exhausted air discharge must not become a nuisance to neighbouring building systems or pedestrians.

The regulation specifies the minimum distance between the outdoor air inlets and the possible sources of contamination. The separation must be at suitable distance from potential sources of contamination as required by Dubai Municipality, if any, or refer to ASHRAE Standard 62.1-2007 Table (5.1)
.

Potential sources of pollution include, but are not confined to:

- Vents, external heat rejection equipment, chimneys or flues from combustion appliances and equipment or from commercial or domestic kitchens;
- Garbage and recycled materials storage areas;
- Vehicle exhausts;
- Cooling tower intake or exhaust; and
- Designated smoking areas inside and outside the building.

Periodic inspection and cleaning of air inlets and exhausts will contribute to good indoor air quality. Outdoor air intake louvers, bird screens, mist eliminators, and adjacent areas should be visually inspected for cleanliness and integrity once every six (06) months at a minimum. Identified debris and biological material must be removed after inspection, and any damage be repaired.

6.2 Technical Data and Specifications

separation distance should be as required by Dubai Municipality, if any, or refer to ASHRAE Standard 62.1-2007 Table (5.1)
.

The materials, installation and workmanship of all outdoor intakes shall be accordance with the requirements of SMACNA 1035 – HVAC Duct Construction Standards – Metal and Flexible, or equivalent standard approved by Dubai Municipality.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *MEP Plans*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

It is common practice to ensure during the design of the building services that there is adequate distance between the source of contaminants and the points at which fresh outside air is drawn into a building.

9. References.

Dubai Municipality requirement if any, or refer to ASHRAE Standard 62.1-2007 Table (5.1)

1.0 Isolation of Pollutant Sources — 401.04

For all new and existing buildings, where activities produce hazardous fumes or chemicals, spaces must be provided with separate air extraction systems to create negative pressure and exhaust the fumes or chemicals to ensure they do not enter adjacent rooms.

Dangerous Goods must be stored in accordance with Dubai Municipality Requirements.

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Some building uses and activities, such as building cleaning stores, laundry rooms, printing rooms, and garbage rooms, may produce hazardous fumes or chemicals If not adequately isolated, these contaminants can be introduced into the other occupied areas of the building and the ventilation system. This would result in poor indoor air quality within the building and possibly be a nuisance to the users. The design of the building should isolate and remove pollutants to prevent these problems.

When dangerous or hazardous materials must be stored in a building, suitable storage spaces must be provided in accordance with Dubai Municipality requirements.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓

	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

The proper Isolation and ventilation of hazardous fumes and chemicals within a building will help to ensure good indoor air quality. The exposure of building users to indoor air pollution can result in increased illness-related absenteeism, reduced productivity, and property damage.

6.0 Guidance

6.1 General

Areas where hazardous gases or chemical pollutants may be present must be identified and appropriate plans made to contain and exhaust any fumes. Self-closing doors should be provided, as well as floor to ceiling partitions to create an enclosed space. A separate ventilation system must be used to safely remove any fume and to produce negative pressure within the space.

If hazardous substances are to be stored, the design of the storage area must take into account the Dubai Municipality, Technical Guideline Bunding of Storage Tanks and Transfer Facilities. This specifies: the minimum requirements for the bunding of tanks and handling areas.

6.2 Technical Data and Specifications

ASHRAE 62.1 2007 gives guidance on Minimum Ventilation rates in Table 6-1for different rooms and occupational categories.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *MEP Plans*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

Many building codes require that separate air extraction systems be installed where hazardous fumes are produced.

9. References.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) 62.1-2007 - this standard defines the requirements for ventilation and air-cleaning system design, installation, commissioning, and operation and maintenance. It is available from the ASHRAE website: www.ashrae.org

1.0 Openable Windows

401.05

For all new buildings, opening windows must be provided in accordance with Dubai Municipality Building Regulations unless there is safety requirements restrict opening these windows.

Villas

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Although all buildings in Dubai are required to have mechanical ventilation and air conditioning there is the opportunity to combine both mechanical and natural ventilation for many months of the year. By using mixed mode ventilation, energy savings can be made and better indoor air quality may result. At some times of the year the natural ventilation will be sufficient in some buildings, especially villas and apartments. With a mixed ventilation system, natural and mechanical ventilation can be utilised at different times of the day, or seasons of the year, to provide a comfortable living and working environment and suitable indoor air quality.

By providing openable windows and doors in buildings, the occupants are able to exercise control over the indoors environment. Research indicates that there may be psychological and health benefits associated with naturally ventilating spaces and people having more choice as to how they control their environment.

Although this regulation only applies to habitable rooms; it is recommended that provision of openable windows and doors be considered for other building spaces.

The restriction on the opening of windows at higher levels is a safety consideration to remove the risk of objects or children falling from the windows.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	

	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome / Benefit

For at least part of the year in Dubai, openable windows or doors in buildings will allow the use of natural ventilation instead of mechanical ventilation. Natural ventilation will result in reduced energy consumption and energy savings. Openable windows will also provide improved indoor environmental quality, control by occupants over the work / living environment, as well as psychological and health benefits.

6.0 Guidance

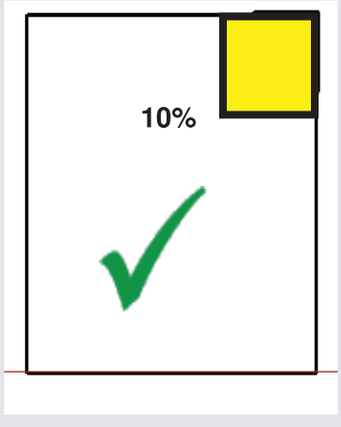
6.1 General

There is an existing Dubai Municipality requirement to provide openable windows and this regulation highlights and clarifies this requirement. It is recognised that cooling systems will be required for buildings in Dubai. However it is still important to provide natural ventilation in Dubai as the potential energy savings and improved indoor environment do make this worth while.

If a room contains more than one openable window or door, the areas of all the opening parts (doors and windows) may be added to achieve the required proportion of the floor area. The required proportion of the floor area is determined by the opening angle of the largest window in the room.

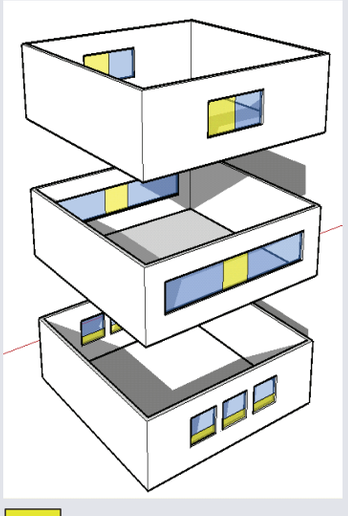
The area of opening is calculated using only those parts of the window or door which actually open.

Windows and doors must meet the thermal transfer requirements of Dubai Municipality.



% OF FLOOR AREA

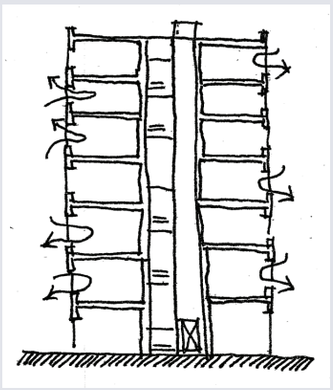
Ratio of openable area to floor area

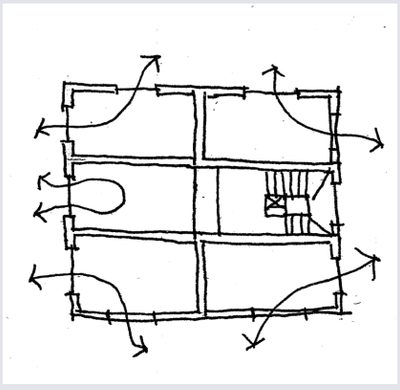


Openable area (10% of floor area)

Openable areas of windows (10% of floor area)

When designing a building, consideration should be made to create cross ventilation within or between rooms. Openings on the two sides of each room could provide cross ventilation. For single sided rooms, two openings at different heights (one close to floor and another close to ceiling) could provide vertical air movement.





6.2 Technical Data and Specifications

When applying for a building permit, the building plans must detail the floor area for each habitable room and window schedule the number and size of openable windows and doors. The ratio of openable windows to floor area must be specified and be at least 10 percent.

Habitable rooms are defined as: Any room used for sleeping, living or dining purposes, excluding other enclosed places such as closets, pantries, bath or toilet rooms, hallways, laundries, storage spaces, utility rooms, and similar spaces.

Natural Ventilation in Non-Domestic Buildings, Applications Manual AM10:1997, The Chartered Institution of Building Services Engineers, CIBSE provides guidance on the use of natural ventilation.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Window schedules and calculations*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices / Solutions

Some countries require a higher percentage opening size than 10% and some require that a ventilation path through the building must be provided to ensure air movement. While the use of open windows is likely to be less in Dubai than some other countries, this regulation requires only opening of at least 10% of the floor area.

9. References.

Natural Ventilation in Non-Domestic Buildings, Applications Manual AM10:1997, The Chartered Institution of Building Services Engineers, CIBSE

1.0 Indoor Air Quality Compliance – New Buildings

401.06

For all new buildings, suitable ventilation for the building occupants and ensure the air quality in accordance with the technical guidelines issued by Dubai Municipality.

The buildings which optionally apply the following procedures will be awarded indoor air quality certificate by Dubai municipality.

A. Indoor air quality testing must be carried out prior to occupancy. The maximum limit for indoor air contaminants included in Table 401.6(1) must not be exceeded. A report which shows compliance with these requirements must be submitted to Dubai Municipality.

Table 401.6(1) - Schedule, Duration of Sampling, and Maximum Limit for Contaminants

Sampling Schedule	Type of Samples	Maximum Acceptable	Sampling Duration
Pre-Occupancy	Formaldehyde	< 0.08 parts per million (ppm)	8- hour continuous monitoring (8 hour time-weighted average [TWA])
	Total Volatile Organic Compound (TVOC)	< 300 micrograms/m^3	
	Suspended Particulates (<10 microns)	< 150 micrograms/m^3	

B. Air Quality testing must be carried out by an air testing company or laboratory accredited by Dubai Municipality (DM), and the Compliant test results must be submitted to DM.

C. Air quality testing equipment must have initial and periodical calibration certificate as per manufacturer requirement from an external calibration facility accredited by DM or at least annual calibration certificate. The initial and periodical calibration certificates must be saved in a special register to be checked by DM in order to ensure the accuracy of the readings as condition of renewal the indoor air quality certificate.

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

There are restrictions on the use of materials with high emissions such as volatile organic compounds (VOCs) and on the protection of air conditioning equipment during construction. However, even taking these measures, it is still possible that following construction, the indoor air quality of a new or refurbished building will not meet the requirements set by Dubai Municipality.

Additionally, the introduction of some items purchased new, including wood or synthetic polymer (plastic) furniture, computers, printers, plotters, carpets, carpet padding, oil based paints, varnishes, lacquers, floor mats, runners, and monitors/televisions, can produce significant levels of VOC's in the first few months of operation.

These minimum requirements for suitable indoor air quality are presented in Table 401.06 (1).

Good indoor air quality has a positive effect on the building occupants' comfort, health, and productivity.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome / Benefit

The aim if this regulation is to eliminate indoor air quality problems resulting from construction or renovation activities and ensure a suitable level of indoor air quality. This will have a positive effect on the comfort, health and productivity of the building occupants.

6.0 Guidance

6.1 General – IAQ Building Sampling Protocols

Before a completion certificate is issued for a new or renovated building, baseline air quality testing must be conducted after completion of construction and prior to occupancy. Occupancy shall only be allowed if the testing demonstrates that contaminant maximum concentrations shown in Table 401.06 (1) are not exceeded.

- To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62-2007 , the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system prior to Indoor Air Quality testing, including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.
- Air Quality testing must be carried out by an air testing company or laboratory accredited by Dubai Municipality (DM), and the Compliant test results must be submitted to DM.
- The Number of Sampling Points , Indoor Monitoring Locations , indoor air impact survey parameters and testing reports shall be in accordance with the requirements of Dubai Municipality

.

- Compliant test results must be submitted to Dubai Municipality and signed by a representative of the accredited laboatory when applying for a Completion Certificate.
- Air Quality testing equipment is required to have initial and annual calibration certification for EACH sensor for EACH required parameter for DM IAQ compliance monitoring by an external Calibration facility approved by DM

- IAQ parameter testing is required to be performed for EACH parameter, for EACH sampling location, in accordance with the requirements of Dubai Municipality

Active direct reading electronic instruments or Passive Diffusion Tubes specifically designed for the purposes of determining indoor environmental air quality shall be used. This instrumentation must have the capability of identifying individual contaminants and all equipments or methods adopted should have appropriate detection range and limit of detection to cover the respective indoor air concentration

Outdoor samples may be needed for comparison with indoor samples for some conditions, such as temperature and relative humidity, and some contaminants, such as airborne dust.

If testing demonstrates that maximum concentrations are exceeded, additional flush-out procedures with outside air shall be implemented and the test must be conducted again until it can be verified that contaminants are within acceptable parameters. If feasible, all building finishes should be installed before the time of the testing.

6.2 Technical Data and Specifications

- In using an electronic instrument or detection tube, the equipment must be capable of detecting the contaminant within the maximum acceptable concentration giving reliable and reproducible results.
- The active electronic instrument must have a data logging function for recording the results of the sampling events. The instrument must be able to operate continuously for the period of the required sampling. The instrument will also have the capability of down loading electronic and hardcopy test result data with date and time markers.
- The instrument must be calibrated and maintained per the manufacturer's specifications, including routine maintenance.
- The user of the instrument must be able to demonstrate competency in its use, to include having been properly trained by an individual certified to use the instrument. Competency can be in the form of a recent manufacturer's training certificate.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion	✓		✓			✓
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment
Construction	n/a
Commissioning/Completion	Completed Green Building Site File including compliant AQ testing data.
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices Solutions

Some regulations and most rating systems require a specified level of indoor air quality or flush the building with large volumes of fresh air before occupation.

9.0 References.

Dubai Municipality Article 63, Administrative Resolution 30 – 2007, Dubai Municipality guidance and requirement relative to Implementation of Local Order 11 -– 2003 Article 63,

1.0 Indoor Air Quality Compliance – Existing Buildings

401.07

Residential/ Commercial

Public Buildings

Industrial

For all existing hotels, shopping mall, educational, health and government buildings, buildings which are used to provide health care, mosques and worship buildings, theatres, cinemas or any other existing buildings to be determined by DM later, suitable ventilation for the building occupants and ensure the air quality in accordance with the technical guidelines issued by Dubai Municipality.

The buildings which optionally apply the following procedures will be awarded indoor air quality certificate by Dubai municipality.

A. Indoor air testing for the contaminants listed in Table 401.7 (1) must be carried out to ensure the air quality in a building is suitable for occupation; the maximum limit for indoor air contaminants included in Table 401.7 (1) must not be exceeded.

Table 401.7 (1) - Schedule, Duration of Sampling, and Maximum Limit for Contaminants

Sampling Schedule	Type of Samples	Maximum Acceptable	Sampling Duration
Initial test completed by 31 December 2011. Further testing within 5 years of last compliant test.	Formaldehyde	< 0.08 ppm	8- hour continuous monitoring (8 hour time-weighted average [TWA])
	Total Volatile Organic Compound (TVOC)	< 300 micrograms/ m^3	
	Respirable Dust (<10 microns)	< 150 micrograms/ m^3	
	Ozone	.06 ppm (120 micrograms/ m^3)	
	Carbon Dioxide	800 ppm (1440 microgram/ m^3)	
	Carbon Monoxide	9 ppm (10 micrograms/ m^3)	
	Bacteria	500 CFU/ m^3 (Algar plate)	
	Fungi	500 CFU/ m^3 (Algar plate) 500 Spores/ m^3 (NV Cassette)	

B. Air Quality testing must be carried out by an air testing company or laboratory accredited by Dubai Municipality (DM) and the Compliant result must be submitted to the concern department in DM

C. Air quality testing equipment must have initial and periodical calibration certificates as per manufacturer requirement from an external calibration facility accredited by DM or at least annual calibration certificate. The initial and periodical calibration certificates must be saved in a special register to be checked by DM in order to ensure the accuracy of the readings as condition of renewal the indoor air quality certificate.

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

There are restrictions on the use of materials with high emissions such as volatile organic compounds (VOCs) and on the protection of air conditioning equipment during construction. Compliance with Regulation 401.06 will mean that at the time of occupation the indoor air quality of the building will be suitable for the occupants.

However during building operation the activities of the occupants and the introduction of materials with toxic fumes may result in poor air quality. If the ventilation system is not operating as designed air quality problems are likely to occur. There needs to be regular testing of indoor air quality (IAQ) to ensure that buildings provide a healthy environment for their users.

Good indoor air quality has a positive effect on the building occupants' comfort, health, and productivity.

This regulation requires that certain buildings must undertake IAQ testing no later 31 December 2011 and that testing be repeated every five years. These minimum IAQ requirements are presented in Table 401.07 (1).

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**			**Commercial**		
	Apartments		✓	Hotels		✓
	Offices		✓	Resorts		✓
	Labour Accommodation		✓	Restaurants/Food Outlets		
	Student Accommodation		✓	Laboratories		
Public Buildings	Healthcare Facilities		✓	Retail Outlets		✓
	Educational Facilities		✓	Post Offices		✓
	Government Buildings		✓	Banks		✓
	Worship Houses			Museums		✓
	Petrol Stations			Cinema/theatres		✓
	Shopping Mall		✓	Historical/heritage Buildings*		✓
Industrial	Workshops					
	Factories					
	Warehouses					

5.0 Outcome/ Benefit

This regulation's intent is to eliminate indoor air quality problems resulting during the operation of a building. This will have a positive effect on the comfort, health and productivity of the building occupants.

6.0 Guidance

6.1 General

This regulation applies to existing hotels, shopping mall, educational, health and government buildings, buildings which are used to provide health care, mosques and worship buildings, theatres, cinemas or any other existing buildings to be determined by DM later.

- To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62-2007 , the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system prior to Indoor Air Quality testing, including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.
- Air Quality testing must be carried out by an air testing company or laboratory accredited by Dubai Municipality (DM), and the Compliant test results must be submitted to DM.
- The Number of Sampling Points , Indoor Monitoring Locations , indoor air impact survey parameters and testing reports shall be in accordance with the requirements of Dubai Municipality

.

- Compliant test results must be submitted to Dubai Municipality and signed by a representative of the accredited laboatory when applying for a Completion Certificate.
- Air Quality testing equipment is required to have initial and annual calibration certification for EACH sensor for EACH required parameter for DM IAQ compliance monitoring by an external Calibration facility approved by DM
- IAQ parameter testing is required to be performed for EACH parameter, for EACH sampling location, in accordance with the requirements of Dubai Municipality

Active direct reading electronic instruments or Passive Diffusion Tubes specifically designed for the purposes of determining indoor environmental air quality shall be used. This instrumentation must have the capability of identifying individual contaminants and all equipments or methods adopted should have appropriate detection range and limit of detection to cover the respective indoor air concentration

Outdoor samples may be needed for comparison with indoor samples for some conditions, such as temperature and relative humidity, and some contaminants, such as airborne dust.

It is the responsibility of the building owner to arrange for competent and certified professionals, companies or competent staff to prepare and execute the indoor air sampling program.

6.2 Technical Data and Specifications

- In using an electronic instrument or detection tube, the equipment must be capable of detecting the contaminant within the maximum acceptable concentration giving reliable and reproducible results.
- The active electronic instrument must have a data logging function for recording the results of the sampling events. The instrument must be able to operate continuously for the period of the required sampling. The instrument will also have the capability of down loading electronic and hardcopy test result data with date and time markers.
- The instrument must be calibrated and maintained per the manufacturer's specifications, including routine maintenance.
- The user of the instrument must be able to demonstrate competency in its use, to include having been properly trained by an individual certified to use the instrument. Competency can be in the form of a recent manufacturer's training certificate.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application						
Construction						
Commissioning/Completion						
Operation		✓	✓			✓
Refurbishment						
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment
Construction	n/a
Commissioning/Completion	Completed Green Building Site File
Operation	Air quality testing results. From an accredited provider.
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practice s/ Solutions

There is growing awareness that sick buildings occur as a result of poor indoor air quality. Some countries are starting to require regular tests of indoor air quality.

9.0 References.

Dubai Municipality Article 63, Administrative Resolution 30 – 2007, Dubai Municipality guidance and requirement relative to Implementation of Local Order 11 -– 2003 Article 63,

1.0 Inspection and Cleaning of HVAC Equipment

401.08

- For all new and existing buildings, the cleanness of HVAC equipment and systems must be maintained and all its parts must be inspected and cleaned in accordance with the standard specifications approved by Dubai Municipality and in accordance with the technical guidelines issued by Dubai Municipality. While specialized maintenance companies approved by Dubai Municipality must carry out Inspection and cleaning or provide a proof that maintenance shall be done by building operator if he has a qualified personnel and equipment to do the job.

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Ventilation systems draw in outside air and also re-circulate air within buildings. Therefore. the systems including ductwork are liable to become contaminated with dust and other contaminants. This may be due to filtration equipment not working properly or due to leaks in the system. The high humidity of air in Dubai makes the possibility of bacterial contamination a significant problem.

Dust and other construction activity are liable to be drawn into the ventilation system and therefore inspections and, if required, cleaning must be undertaken to ensure that any contamination from construction is removed before the building is occupied.

During the operating of a building a suitable quality of indoor air must be maintained. Regular inspection is required.

A wide variety of people using Public Buildings which means that the risk of contamination is greater and therefore inspection of existing buildings should start immediately.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour	✓	✓	Restaurants/Food	✓	✓

	Accommodation			Outlets		
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome/ Benefit

The intent of this regulation is to ensure that all items of ventilation systems are adequately inspected and cleaned to prevent contamination of indoor air. This will help to promote the comfort, health and productivity of the building occupants.

6.0 Guidance

6.1 General

Green Building Regulation 502.14 Maintenance of Mechanical Systems requires that the mechanical services in all air conditioned buildings other than villas be installed so that adequate access is available to allow regular inspection, maintenance and cleaning of the equipment. Access doors or panels are to be constructed so that they can be opened without restriction. There shall be no air leakage through the service opening when closed. Air filters and cooling coils must be able to be inspected, cleaned and replaced without the need to remove or dismantle any building components.

Inspection and cleaning details must be recorded in the building service log book provided to the owner by the mechanical, electrical, and plumbing (MEP) engineer or installation contractor at the time of building completion. The keeping of a log book to record both programmed and corrective maintenance is to provide a history of work carried out and to allow the building owner or Dubai Municipality to check that the required level of maintenance is being implemented. For existing buildings, a new service log book must be provided if one does not already exist.

The inspection and cleaning must be carried out by a company certified by Dubai Municipality to undertake HVAC maintenance work.
The system must not be operating while inspection and cleaning are being carried out. Controls to the system must be isolated with suitable signage advising that the system is not to be started until the inspection and cleaning is complete.

It is recommended that the inspection of systems and ducts be carried out as part of regular plant maintenance.

Due to the potential for mould growth in Dubai, special care should be taken to identify any mould growth as soon as possible. The build up of dust in filters and coils can also develop much quicker than in some other countries. It is therefore important that the cleaning and maintenance schedule reflects Dubai's specific conditions.

6.2 Technical Data and Specifications

Acceptable methods of inspection and cleaning are outlined in:

- National Air Duct Cleaners Association Standard ACR 2006 – Assessment, Cleaning and Restoration of HVAC Systems;
- BSR/ASHRAE/ACCA Standard 180P - Standard Practice for Inspection and Maintenance of Commercial Building HVAC systems; and

- Heating and Ventilating Contractors Association (HVCA) TR19 Guide to Good Practice – Cleanliness of Ventilation Systems, or;
- Other standards approved by Dubai Municipality.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion						
Operation		✓	✓			
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	n/a
Commissioning/Completion	n/a
Operation	*HVAC inspection and cleaning record*
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

Many Codes of Practice recommend regular inspection and cleaning of air conditioning and ventilation systems although few countries mandate it. New Zealand mandates inspection and cleaning every 2 years through its 'Building Warrant of Fitness' requirements.

The inspection and cleaning codes referenced in this guidance are recognised as best practice.

9.0 References.

National Air Duct Cleaners Association Standard ACR 2006 – Assessment, Cleaning and Restoration of HVAC Systems;

BSR/ASHRAE/ACCA Standard 180P - Standard Practice for Inspection and Maintenance of Commercial Building HVAC systems; and

Heating and Ventilating Contractors Association (HVCA) TR19 Guide to Good Practice – Cleanliness of Ventilation Systems.

1.0	Parking Ventilation	401.09
	For all buildings with enclosed parking:	
	A. Mechanical ventilation must be provided to ensure that the Carbon Monoxide (CO) concentration in the enclosed parking area is maintained below fifty (50) parts per million (ppm) by: **- Providing a minimum of six (6) outside air changes per hour, or** **- Installing a variable volume ventilation system controlled in response to input from a minimum of one CO sensor per four hundred square meters (400 m^2) floor area of parking.**	**Residential/ Commercial**
	B. A supply of outdoor air must be provided to each parking level.	**Public Buildings**
	C. Occupied areas such as offices, shopping centres, hotels, waiting rooms, and ticket booths connected to enclosed parking, must be supplied with conditioned air under positive pressure compared with adjoining parking area **D. Ventilation systems must be capable of providing ten (10) air changes per hour for smoke clearance purposes.** **E. CO monitoring equipment must be installed with a minimum of one CO sensor per four hundred square meters (400 m^2) floor area of parking and sound alarm triggers when the CO concentration reaches or exceeds seventy five (75) ppm in, at least, five percent (5%) of the monitored locations.** **F. Where a Building Management System (BMS) or Central Control and Monitoring System (CCMS) is installed, the CO concentration must be monitored to allow real-time profiling and management of air quality.** **G. CO monitoring equipment must be checked and recalibrated every six (6) months or according to manufacturer specification by a specialized calibration companies certified by Dubai Municipality. Test results and calibration certificates must be kept onsite and be readily available for inspection by DM staff.**	**Industrial**

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

All buildings with enclosed, basement, or underground parking facilities require suitable ventilation to ensure adequate air quality for the health and safety of people using the parking areas.

Parking facilities can be open or enclosed. Open parking facilities have may have natural ventilation and not need supplemental mechanical ventilation. Enclosed parking facilities require mechanical ventilation to ensure adequate indoor air quality and the safety of users.

Indoor air quality within parking facilities can present several problems, such as high concentrations of carbon monoxide (CO), nitrogen oxides (NOx), sulphur dioxide (SO_2), volatile organic compounds (VOCs), particulate lead, and particulate matter less than 10 microns (PM_{10}). Since the motor emission rates of CO are typically substantially higher than emissions of NOx and VOCs for gasoline-powered vehicles, it is generally accepted that if CO levels are within safe levels, other emission pollutants are also within safe levels.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome / Benefit

Ventilation of parking areas is necessary to ensure health and safety of parking facility users. As a secondary benefit, ventilation will prevent the build up of gases and particulates in parking areas which may lead to degradation of coatings and painted surfaces and increase the corrosion of metal parts.

6.0 Guidance

6.1 General

An open parking area is one which is used for parking of motor vehicles and which requires uniformly distributed openings on two or more sides for natural ventilation on every level of parking. The total area of openings to the atmosphere must be at least 20% of the total perimeter wall areas for each level of parking. Although openings on a third side are not required, openings on opposing sides are preferred for cross ventilation.

An enclosed parking area of a building is one which is used for parking of motor vehicles but is not an open parking area, i.e. it does not meet the criteria for open parking areas. Mechanical ventilation of all enclosed parking areas is required to compensate for the lack of natural ventilation

The control of CO by the use of multi-speed or variable speed fans is recommended, as this will result in energy and operational cost savings. If variable speed fans are not used, the ventilation system must be designed to provide sufficient fresh air to keep the air quality suitable for the users. The minimum ventilation requirement to achieve suitable air quality is four (4) fresh air changes per hour.

The ventilation system must be capable of providing ten (10) air changes per hour for smoke clearance purposes in the event of a fire. This increased amount of air would normally be provided by the use of multi speed fans which only operate at their maximum flow for smoke clearance.

If CO control is by variable speed fans, the control and monitoring system must have an alarm function which will sound when CO concentration reaches or exceeds 100ppm. If fixed speed ventilation is used, a stand alone CO alarm system must be installed which will sound when the CO concentration reaches or exceeds 100ppm. The alarm system is required to detect any failure in the ventilation equipment.

Dubai Municipality may conduct random inspections and monitoring of air quality in parking facilities of buildings.

CO sensors must be installed within each extract system. Sensors should be used to control the ventilation fans in order to ensure that the CO concentration is maintained below the permitted level of 50ppm. To ensure that all parts of the parking area are monitored, one CO sensor must be installed for every 400 square meters of floor space.

To maintain suitable air quality there is a need to introduce fresh outside air at each level of the parking. This may require individual ducted supply.

Any occupied areas adjacent to the parking must be protected to ensure that the air quality is maintained. This requires that these areas be maintained at a pressure higher than that of the parking areas.

The CO limits of 50ppm and 100ppm set in this regulation have been developed by reviewing air quality standards set by many international regulators. These readings are instantaneous readings for CO controls as this is better for providing feedback for fan controls. If a time based reading was used, there would be a delay before any corrective action can be taken.

6.2 Technical Data and Specifications

The accuracy of the measurements of CO sensors will change overtime and hence they must be tested and recalibrated at regular intervals. This regulation requires that this checking and calibration be carried out every six (6) months. This work must be carried out by suitably approved contractors.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation		✓	✓			
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *MEP Drawings, calculations and specifications*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	*Record CO checks*
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

The CO limits of 50ppm and 100ppm set in this regulation have been developed by reviewing air quality standards set by many international regulators.

9.0 References.

No references

1.0 Environmental Tobacco Smoke

401.10

Residential/ Commercial

Public Buildings

A. **Smoking is strictly prohibited in all public in accordance with Local Order No 11 – 2003 including but not limited to shopping centres, hotels, restaurants, government buildings, hospitals, healthcare facilities, commercial buildings, common accommodation, coffee shops and amusement and entertainment or any other places determined by Dubai Municipality except for places in which smoking is permitted**

B. **Places in which smoking is permitted are determined in accordance with the conditions listed in the Manual of Regulating Smoking in Public Places issued by Dubai Municipality by administrative resolution no 92 for the year 2009 in which public places where smoking is strictly prohibited and places where smoking is permitted according to specific conditions.**

C. **Smoking designated areas must be at least twenty five (25) feet away from the building entrances of the building, doors and operable windows and ventilation system outdoor air intakes**

D. **An annual permit is issued from the Public Health and Safety Department of Dubai Municipality for all places in which smoking is permitted after providing all required documents and drawings mentioned in the guide**

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Ventilation and Air Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Dubai Municipality recognises that in order to protect public health there needs to be legislation in place to restrict smoking in public places. Parts of this legislation apply to buildings and must be considered when designing new buildings.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa						
Residential/ Commercial	**Residential**			**Commercial**		
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories		
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓

	Worship Houses			Museums	✓	✓
	Petrol Stations			Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*		
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

Users of the designated buildings will not be exposed to passive tobacco smoke which could negatively impact their health.

6.0 Guidance

6.1 General

Dubai Municipality (DM) Administrative Resolution No 92 – 2009 "Regulating Smoking in Public Places" has as an annex the 'Manual of Regulating Smoking in Public Places' which details the restrictions and requirements for smoking in public places.

Note that the DM legislation also applies to existing buildings.

Smoking is totally prohibited in the public transportation vehicles, clinics, medical centres, hospitals, entertainment centres, restaurants, cafeterias, shopping centres, hotels, official buildings, commercial buildings, companies, housing compounds, public institutions, with the exception of places for which a permit allowing smoking has been obtained from the Public Health and Safety Department of Dubai Municipality.

The manual specifies areas in buildings where smoking is prohibited, and the conditions and regulations for smoking designated areas. The requirements for ventilation and air conditioning are detailed.

6.2 Technical Data and Specifications

As detailed in the Manual of Regulating Smoking in Public Places.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion	✓		✓			
Operation		✓	✓		✓	
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Architectural Drawings*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices/ Solutions

Many countries are banning smoking in public spaces. LEED requires that buildings be totally smoke free or that smoking only be allowed in designated spaces.

9.0 References.

Dubai Municipality Local Order No 11 – 2003

Dubai Municipality Administrative Resolution No 92 – 2009 “Regulating Smoking in Public Places” including annex ‘Manual of Regulating Smoking in Public Places’

1.0 Thermal Comfort — 402.01

For all new and existing buildings, the heating, ventilating and air conditioning (HVAC) system must be capable of providing the following range of conditions for ninety five percent (95%) of the year:

	Lower Limit	Upper Limit
Dry bulb temperature	DB: 22.5 °C	DB: 25.5 °C
Relative humidity	RH: 30% (min)	RH: 60% (max)

For occupant comfort, normal occupied spaces should have an average air velocity between (0.2 – 0.3) m/s

Villas

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Thermal Comfort**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

When air conditioning systems are used in a building, parameters need to be established as to the conditions which will be suitable for most of the building users. The temperature and humidity of the interior of a building have the greatest influence on how comfortable a person feels. These are the parameters which should be used when designing air conditioning systems.

Thermal comfort is a complex issue with multiple variables, such as environmental conditions (air temperature, radiant temperature, humidity and air speed), personal factors (clothing, activity), and preference of occupants. Building design should minimise energy consumption for air conditioning while maintaining thermal comfort conditions at an acceptable level for building occupants.

It must be accepted that people have different ranges of thermal comfort however conditions must be provided that provide a comfortable environment for the majority of people.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓

Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome / Benefit

By ensuring that the air conditioning systems are designed to be able to provide the specified conditions in all buildings the occupants will be both comfortable and productive.

6.0 Guidance

6.1 General

The parameters specified in this regulation have been developed as a suitable range of temperature and humidity for the majority of building users in Dubai. The air conditioning system must be capable of meeting the specified design conditions in occupied spaces with varying load conditions (such as partial occupancy and various activity levels). The regulation does not specify how the building will be operated once it is completed and in use. It is recommended that these conditions be provided but it is accepted that occupants may wish for different conditions to be provided. This regulation simplifies the design exercise by requiring specific conditions.

This regulation is consistent with the requirements of Administrative Resolution N0 30 – 2007, Article 63, which in turn implements Local Order 11 – 2003, Chapter 9, Article 54.

ASHRAE Standard 55-2004 specifies the combinations of indoor space environment and personal factors that will produce thermal environmental conditions acceptable to 80% or more of the building's occupants and can be used as a general reference. It also discusses the type of air conditioning (active conditioning, passive conditioning, or a mix of these two) which can be utilised to achieve these conditions.

Building envelope and systems will be designed to ensure that the comfort criteria (per this regulation) under can be achieved under the expected environmental and usage conditions. Air temperature, radiant temperature, air speed, and relative humidity will be evaluated in an integrated fashion.

In Dubai, up to 60% of energy is used for air conditioning and the temperature at which at which a building operates has a large impact on the total amount of energy used.

It has been established that each 1 degree C increase in the water temperature in cooling systems translates to energy savings of 5-10% (THERMIE 1994). Therefore, building users should be encouraged to accept an environment at the higher temperature range of the thermal comfort range.

A well designed and operated air conditioning system will provide a degree of de-humidification of Dubai's humid outside air without the need for specialised equipment. There may be applications, however, where de-humidification equipment may be required. As this de-humidification is likely to use additional energy for re-heating of air, care should be taken to only install such equipment when absolutely necessary.

6.2 Technical Data and Specifications

ASHRAE Standard 55-2004 is a useful reference for understanding thermal comfort.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *MEP specifications and calculations*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices/ Solutions

Thermal comfort perceptions change significantly in different climates and therefore that standards that are proposed vary considerably around the world. However, countries that have a similar climate to that of Dubai tend to specify similar requirements. For example, Singapore. which has a similar climate to Dubai, recommends indoor temperature between 22.5 to 25.5 °C and a maximum relative humidity of 70%

9.0 References.

Administrative Resolution N0 30 – 2007, Article 63, which in turn implements Local Order 11 – 2003, Chapter 9, Article 54.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 55-2004 'Thermal Environmental Conditions for Human Occupancy' is available from the ASHRAE website: www.ashrae.org

THERMIE (1994 report). THERMIE is a project of the Directorate General for Energy of the European Commission to encourage research and technological development activities in the field of clean and efficient energy technologies as a contribution to the security of energy supplies and to sustainable development; to speed up the development and dissemination of technologies which are almost mature but whose technical and economic viability still remains largely to be disseminated; to encourage partnerships between universities, industry, users and operators of energy networks; and, to contribute towards economic and social cohesion by developing appropriate energy sources suitable for decentralised use and harnessing local resources.

1.0 Acoustical Control

403.01

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new buildings, the acoustic performance relating to Internal Noise Criteria from External Noise Sources, Internal Noise Criteria from Mechanical Services Noise, Internal Airborne Sound Insulation Guidance Values, and Internal Impact Sound Pressure Levels meet the control requirements set out in Table 403.01 (1).

Table 403.01(1) – Acoustical Control requirements

Building Type	Document Reference
Villas / Residential* Buildings	Building Regulations Approved Document E (revised 2003) (UK)
Healthcare Facilities	Health Technical Memorandum 08-01 (UK)
Educational Facilities**	Building Bulletin 93: Acoustic Design of Schools – A design Guide (UK)
Commercial Buildings	BS8233:1999 “Sound insulation and noise reduction for buildings – code of practice”. (UK)
Industrial	BS8233:1999 “Sound insulation and noise reduction for buildings – code of practice”. (UK)
Public	BS8233:1999 “Sound insulation and noise reduction for buildings – code of practice”. (UK)

*** Residential buildings include Villas, Apartments, Labour Accommodations and Student Accommodations.**

**** Educational Facilities include Nursery Schools, Primary Schools, Secondary Schools, Colleges and Universities.**

2.0 Intent/Goal

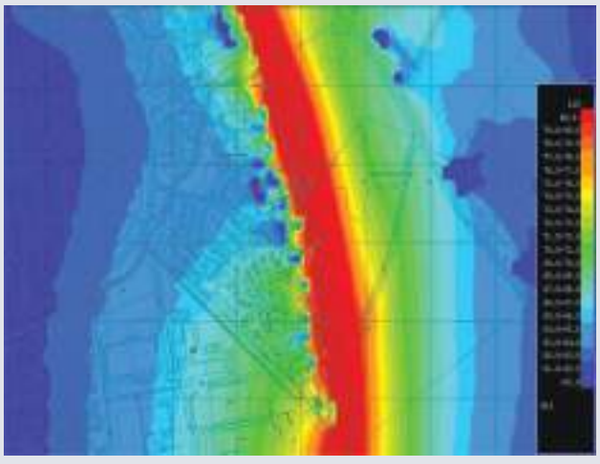
- ☐ Ecology and Planning
- ☑ **Building Vitality – Acoustical Comfort**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Noise is one of the factors which affect the comfort, well being, and productivity of building users.

Building requirements in Dubai currently address the need to control noise during construction and from equipment installed in buildings but do not specify the acoustical performance of the building elements.

There is a need to protect building users from excess noise, generated from within or outside of the building. This regulation details the acoustical performance required of building elements for specific building types and uses.



Acoustical map showing ambient noise levels

Building designs need to demonstrate that noise is being controlled through the provision of adequate airborne Sound Insulation (SI) and Noise & Vibration Control measures. These measures should prevent inappropriate levels of surrounding and/or development-related noise from being transmitted into the interior of the building and/or to the environment. In addition, internal noise transfer between various units/spaces within the development should be limited. A suitable acoustic environment shall be developed for carrying out the activities performed within each space.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/ Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings	✓	
Industrial	Workshops	✓				
	Factories	✓				
	Warehouses	✓				

5.0 Outcome / Benefit

Successful implementation of this regulation will result in a comfortable acoustical environment for the majority of building users.

6.0 Guidance

6.1 General

British Acoustical Control requirements have been adopted for this regulation because they are already commonly used and well understood by acoustical designers in this region. Other Codes of Practice or Standards may be applied if these have been approved by Dubai Municipality.

To aid in the implementation of the controls listed in Table 403.01(1), the following expanded tables are provided. These tables are compilations developed from the sources in Table 403.01(1) and should be used for guidance in acoustical design.

The complete referenced documents should be consulted when designing the acoustical performance of buildings.

The levels of acoustic performance detailed in all of the following tables (403.01(2-5)) must be achieved.

Multi-use building: For the purpose of this regulation each portion of the building which has a different usage shall use the relevant criteria.

Buildings should be designed such that ambient internal noise levels from external sources do not exceed the following criteria:

Buildings should be designed such that ambient internal noise levels from external sources do not exceed the following criteria:

Table 403.01(2) –Internal Noise Criteria from External Noise Sources (Maximum)

Location	Residential			Educational	Hospital		Commercial
	$L_{Aeq,16hr}$ (0700 - 2300)	$L_{Aeq,8hr}$ (2300 to 0700)	$L_{Amax\ (Fast)}$ (2300 to 0700)	$L_{Aeq,1\ hr}$	Day $L_{Aeq,1\ hr}$	Night $L_{Aeq,\ 1\ hr}$	NR $L_{eq,\ 1\ hr}$
Habitable Rooms	35	30	45	N/A	N/A	N/A	N/A
Non Habitable Rooms	45	40	N/A	N/A	N/A	N/A	N/A
Office (Cellular)	N/A	N/A	N/A	40	40	40	35
Office (Open Plan)	N/A	N/A	N/A	40	40	40	38
Teaching Room (Standard)	N/A	N/A	N/A	35	35	35	30
Meeting Room (Small)	N/A	N/A	N/A	40	40	40	40
Meeting Room (Large)	N/A	N/A	N/A	35	35	35	35
Board Room	N/A	N/A	N/A	30	30	30	35
Hospital Ward (Single Bed)	N/A	N/A	N/A	N/A	40	35	N/A
Hospital Ward (Multiple Bed)	N/A	N/A	N/A	N/A	45	35	N/A
Operating Theatres	N/A	N/A	N/A	N/A	40	40	N/A
Plant Room	80	75	N/A	80	80	80	75
All Other Areas	SSAA	SSAA	SSAA	SSAA	SSAA	SSAA	SSAA
N/A - Not Applicable							
SSAA - Seek Specialist Acoustical Advice							

Buildings should be designed such that ambient internal noise levels from mechanical and electrical services units do not exceed the following criteria:

Table 403.01 (3) –Internal Noise Criteria from Mechanical Electrical Sources (Maximum)

Location	Residential		Educational	Hospital		Commercial
	NR L_{eq} (0700 to 2300)	NR L_{eq} (2300 to 0700)	NR $L_{eq,1hr}$	Day NR $L_{eq,\ 1\ hr}$	Night NR $L_{eq,\ 1\ hr}$	NR $L_{eq,\ 1\ hr}$
Habitable Rooms	30	25	N/A	N/A	N/A	N/A
Non Habitable Rooms	40	35	N/A	N/A	N/A	N/A
Office (Cellular)	N/A	N/A	35	35	35	35
Office (Open Plan)	N/A	N/A	35	35	35	38
Teaching Room (Standard)	N/A	N/A	30	30	30	30
Meeting Room (Small)	N/A	N/A	35	35	35	40
Meeting Room (Large)	N/A	N/A	30	30	30	35
Board Room	N/A	N/A	25	25	25	35
Hospital Ward (Single Bed)	N/A	N/A	N/A	35	30	N/A
Hospital Ward (Multiple Bed)	N/A	N/A	N/A	40	30	N/A
Operating Theatres	N/A	N/A	N/A	35	35	N/A
Plant Room	75	70	75	75	75	75
All Other Areas	SSAA	SSAA	SSAA	SSAA	SSAA	SSAA

Buildings should be designed such that internal walls and floors achieve the following minimum in-situ performance criteria:

Office (Cellular)	N/A	40	42	40
Office (Open Plan)	N/A	40	47	40
Teaching Room (Standard)	N/A	45	42	45
Meeting Room (Small)	N/A	45	47	45
Meeting Room (Large)	N/A	50	52	50
Board Room	N/A	50	47	50
Hospital Ward (Single Bed)	N/A	N/A	47	N/A
Hospital Ward (Multiple Bed)	N/A	N/A	42	N/A
Operating Theatres	N/A	N/A	47	N/A
Plant Room	SSAA	SSAA	SSAA	SSAA
All Other Areas	SSAA	SSAA	SSAA	SSAA

Note - The minimum sound insulation requirement depends on the activities in adjacent spaces. The levels specified above must be checked against the relevant documents (ADE, BB93, HTM 08-01 and BS8233)

Buildings should be designed such that internal floors achieve the following minimum in-situ performance criteria:

Table 403.01(5) –Internal Impact Sound Pressure Levels (Maximum)

Location	Residential	Educational	Hospital	Commercial
	L'_{nTw}	L'_{nTw}	L'_{nTw}	L'_{nTw}
Habitable Rooms	62	N/A	N/A	N/A
Non Habitable Rooms	62	N/A	N/A	N/A
Office (Cellular)	N/A	65	65	65
Office (Open Plan)	N/A	65	65	65
Teaching Room (Standard)	N/A	60	65	65
Meeting Room (Small)	N/A	60	65	65
Meeting Room (Large)	N/A	60	65	65
Board Room	N/A	55	65	65
Hospital Ward (Single Bed)	N/A	N/A	65	N/A
Hospital Ward (Multiple Bed)	N/A	N/A	65	N/A
Operating Theatres	N/A	N/A	SSAA	N/A
Plant Room	SSAA	SSAA	SSAA	SSAA
All Other Areas	62	N/A	N/A	N/A

Note - The maximum impact sound pressure level requirement depends on the activities in adjacent spaces. The levels specified above must be checked against the relevant documents listed in Table 403.01(1)

It should be noted that “habitable rooms” include: bedrooms, living rooms, dining rooms, hotel guestrooms, student accommodation, nursing accommodation and all rooms intended for residential purposes.

Non-habitable rooms include: toilets (WC’s), corridors, kitchen spaces, public and private circulation spaces.

The requirements specified have been selected for application in Dubai because they are the most common specifications being used in the Emirate at present and are commonly understood by local acoustical designers, and others familiar with acoustical control measures.

The maximum indoor ambient noise levels apply when the space is unoccupied. The figures have been chosen as suitable for Dubai and have been based on a combination of British Standards in order to achieve reasonable acoustical conditions for various uses.

Due to the need for buildings in Dubai to meet the minimum thermal comfort requirements of Administrative Resolution N0 30 – 2007, Article 63 (which in turn implements the performance requirements of Local Order 11 – 2003, Chapter 9, Article 54), the exterior walls of many buildings will also meet the acoustical insulation requirements in many cases without additional measures. However, meeting these thermal comfort requirements does not provide a guarantee of complying with the acoustic requirements.

In addition, any proposed item of fixed building services plant shall meet the specified noise limits as detailed in Dubai Municipality (DM) Local Order No. 61 of 1991 on the Environment Protection Regulations in the Emirate of Dubai, Article (75), which states:

“It shall be the duty of the occupier of any premises or persons operating mechanical devices or drivers of public or private transportation vehicles, houses owners, or supervisors of worshipping place, to adopt the best practicable means of ensuring that the emission of noise from those premises does not exceed a reasonable level. The level is considered reasonable if it does not exceed 55 decibel during the period 7 am, to 8 pm, and 45 dB during the period 8 pm to 7 am.”

In addition to the above criteria, the limits that apply to fixed building services shall be determined as an equivalent continuous A-weighted sound pressure level, determined or calculated over a time interval of one hour ($L_{Aeq,1hr}$) during standard operating conditions. These limits apply externally at the nearest noise-sensitive receptor (existing or proposed). A correction of 3dB to 52 or 42dB should be made if the nearest noise-sensitive receptor is identified as a glazed façade.

6.2 Technical Data and Specifications

All acoustical insulation materials must meet the requirements of Regulation 701.01, Thermal and Acoustical Insulation Materials, which includes the requirement that the materials must be certified by DM or by a third party testing laboratory approved by DM.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			✓
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Acoustic specifications and calculations*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials

Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

Many countries specify acoustical performance requirements for building elements and Dubai will now join them.

9.0 References.

Dubai Municipality (DM) Local Order No. 61 of 1991on the Environment Protection Regulations in the Emirate of Dubai, Article (75)

British Standard BS 8233: 1999, “Sound Insulation and Noise Reduction for Buildings – Code of Practice”.

UK Building Regulations Approved Document E (revised 2003).

Health Technical Memorandum 08-01: Acoustics (2008). Department of Health Gateway Review, Estates & Facilities Division, The Stationery Office, UK.

Building Bulletin 93: Acoustic Design of Schools – A Design Guide (2003). Department of Education and Skills, The Stationery Office, UK.

Department of Health Gateway Review, Estates & Facilities Division (Formerly National Health Service Estates), 1994. Health Building Note 12 Supplement 3: ENT and audiology clinics; Hearing aid centre. London, The Stationery Office (Formerly Her Majesties Stationery Office), UK.

British Council for Offices, 2005. British Council for Offices Guide 2005: Best practice in the specification for offices. East Grinstead, British Council for Offices, UK.

American Society for Testing and Materials (ASTM) ASTM E90 - 04 “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements” and ASTM E413 - 04 “Classification for Rating Sound Insulation” This document is only likely to be used by the manufacturers of acoustic materials or testing laboratories.

Definitions

Definitions of symbols, descriptors and terminology of acoustic prose can be found within
British Standard 8233:1999 “Sound insulation and noise reduction for buildings – code of practice”.

The following are definitions of the main elements of terminology and abbreviations commonly used in discussions related to acoustics. These are not directly related to this regulation but are included to help the understanding of acoustical matters.

403.01(6) Glossary of relevant acoustic terminology and abbreviations

Term	Definition
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20mPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by 20 $\log_{10}$ (s_1 / s_2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20mPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
Noise rating (NR)	A graphical method for assigning a single number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application. Defined in ISO R 1996.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969 (superseded).
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near (LAeq,T).
Standardised Weighted Level Difference (DnTw)	A single-number quantity, which characterizes the airborne sound insulation between rooms band, normalized to a reverberation time of 0.5 s. This measure takes into account all sound transmission paths between two rooms. DnTw measurement and rating is defined in ISO 140 Part 4 and ISO 717 Part 1.
Spectrum Adaption Term (Ctr)	A value, in decibels, to be added to the single-number rating (e.g. DnTw) to take account of the characteristics of particular sound spectra.
Weighted standardized impact sound pressure level(L'nTw)	A single number quantity used to characterize the impact sound insulation of floors over a range of frequencies. L'nTw measurement and rating is defined in ISO 140 Part 7 and ISO 717 Part 2.

1.0	Low Emitting Materials: Paints and Coatings	404.01
	For all buildings, including new applications in existing buildings, all paints and coatings used in the building should not exceed allowed limits of Volatile Organic Compound (VOC), these paints and coatings must be accredited / certified from Dubai Central Lab or any source approved by Dubai Municipality.	Villas Residential/ Commercial Public Buildings Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Hazardous Materials**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Good indoor air quality can have a positive effect on construction workers' and building occupants' comfort, health, and productivity. Many building products and materials include compounds that have an adverse impact on indoor air quality as well as contributing to outdoor pollution. The most prominent of these compounds are Volatile Organic Compounds (VOCs).

Volatile organic chemicals form vapours at normal temperature and pressure, some of which can cause odour and health problems. VOCs are typically used as or included in certain paint additives, aerosol spray can propellants, fuels (such as gasoline, and kerosene), petroleum distillates, dry cleaning products and many other industrial and consumer products ranging from office supplies to building materials.

The use of paints and coatings with high VOC components can expose building users to contaminants that are emitted from these products. The use of low-emitting materials minimise the impacts on indoor air quality. While the harm caused by the use of products with high levels of VOC will affect the final users of the building, the greatest potential harm is often to those who install or apply these products during construction.

As awareness of the negative health impacts of VOCs grows, there are international moves to restrict the use of building and furnishing materials which emit these harmful compounds. The availability of low emitting products in Dubai is growing rapidly and local manufacturers and suppliers are now producing and stocking such products.

Some major building developers in Dubai are already imposing restrictions on what products can be used. These restrictions are also driving the increased availability and use of low VOC materials in Dubai.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓	✓			
Residential/Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓

Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

The use of low-VOC materials will help provide satisfactory indoor air quality. Minimising the amount of indoor air contaminants resulting from the construction and fit-out of buildings will reduce impacts to the health and well-being of building occupants. Healthy building occupants are more productive and have less illness-related absenteeism.

6.0 Guidance

6.1 General

Many countries are starting to impose maximum levels of VOC for the materials which can be used in buildings. Many major building developers in Dubai are also imposing restrictions on what products can be used. These moves are driving the increased availability and use of low VOC materials in Dubai. The supply chain has developed to the extent that a total restriction on VOC emitting paints and coatings can be applied for new and existing buildings in Dubai. Should it be considered that paints or coatings which have a higher VOC content than allowed by this regulation must be used for special applications in a building, approval for their use must be obtained from Dubai Municipality before they can be used. It is important that if high VOC products are used, all health and safety precautions be taken.

This regulation does not apply to paints and coatings used on the exterior of a building.

The VOC limits detailed in this regulation are similar to those that are already being required by major Dubai building developers and compliant paint products are being manufactured or are available in the UAE.

Paint and coating manufacturers should supply material specification data sheets which specify the VOC levels of these products.

The VOC limits are for paints and coatings as supplied, before the addition of any water.

6.2 Technical Data and Specifications

All paints and coatings used in the interior of the building must comply with the maximum Volatile Organic Compound (VOC) limits indicated in Dubai Municipality Standard DMS 20-Specification for Paints and Varnishes.

Note: Regulation 401.06 requires indoor air quality testing must be carried out, and compliance with the maximum levels of contaminants identified in the table below achieved, before a new building can receive a completion certificate and be occupied. In order not to exceed the TVOC limit, only low VOC materials will be able to be used.

Sampling Schedule	Type of Samples	Maximum Acceptable	Sampling Duration
Pre-Occupancy	Formaldehyde	< 0.08 parts per million (ppm)	8- hour continuous monitoring (8 hour time-weighted average [TWA])
	Total Volatile Organic Compound (TVOC)	< 300 micrograms/m^3	
	Suspended Particulates (<10 microns)	< 150 micrograms/m^3	

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Technical specifications and drawings*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8. Common Practices/ Solutions

For 'flat' and 'gloss" paints LEED credits grams per litre (g/L) levels less than 50 and 150, Singapore credits 50 & 200, UK requires 75 & 150 but will reduce these to 30 & 100 in 2010.

9. References.

Dubai Municipality Standard DMS 20:2005—Specification for Paints and Varnishes

Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.

Green Seal Standard GS-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.

South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, January 1, 2004.

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1.0	Low Emitting Materials: Adhesives and Sealants	404.02
	For all buildings, including new applications in existing buildings, all adhesives, adhesive bonding primers, adhesive primers, sealants and sealant primers used in the building should not exceed allowed limits of Volatile Organic Compound (VOC), these materials must be accredited / certified from Dubai Central Lab or any source approved by Dubai Municipality	**Villas** **Residential/ Commercial** **Public Buildings** **Industrial**

2.0 Intent/Goal

- ☒ Ecology and Planning
- ☑ **Building Vitality – Hazardous Materials**
- ☒ Resource Effectiveness: Energy
- ☒ Resource Effectiveness: Water
- ☒ Resource Effectiveness: Materials and Waste

3.0 Background

Good indoor air quality can have a positive effect on construction workers' and building occupants' comfort, health, and productivity. Many building products and materials include compounds that have an adverse impact on indoor air quality as well as contributing to outdoor pollution. The most prominent of these compounds are Volatile Organic Compounds (VOCs).

Volatile organic chemicals form vapours at normal temperature and pressure, some of which can cause odour and health problems. VOCs are typically used as or included in certain paint additives, aerosol spray can propellants, fuels (such as gasoline, and kerosene), petroleum distillates, dry cleaning products and many other industrial and consumer products ranging from office supplies to building materials.

The use of adhesives and sealants with high VOC components can expose building users to contaminants that are emitted from these products. The use of low-emitting materials minimise the impacts on indoor air quality. While the harm caused by the use of products with high levels of VOC will affect the final users of the building, the greatest harm is often to those who install or apply these products during construction.

As awareness of the negative health impacts of VOCs grows, there are international moves to restrict the use of building and furnishing materials which emit these harmful compounds. The availability of low emitting products in Dubai is growing rapidly and local manufacturers and suppliers are now producing and stocking such products.

4.0 Applicability

4.1 Type

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓	✓			
Residential/Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓

	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

The use of low-VOC materials will help provide satisfactory indoor air quality. Minimising the amount of indoor air contaminants resulting from the construction and fit-out of buildings will reduce impacts to the health and well-being of building occupants. Healthy building occupants are more productive and have less illness-related absenteeism.

6.0 Guidance

6.1 General

Many countries are starting to impose maximum levels of VOC for the materials which can be used in buildings. Many major building developers in Dubai are also imposing restrictions on what products can be used.

Should it be considered that adhesives and sealants which have a higher VOC content than allowed by this regulation must be used for special applications in a building, approval for their use must be obtained from Dubai Municipality before they can be used. It is important that if high VOC products are used, all health and safety precautions be taken.

Some major building developers in Dubai are already imposing restrictions on what products can be used. These restrictions are also driving the increased availability and use of low VOC materials in Dubai.

This regulation does not apply to adhesives and sealants used on the exterior of a building.

The VOC limits are for adhesives and sealants as supplied, before the addition of any water.

Adhesives and sealants manufacturers should supply material specification data sheets which specify the VOC levels of these products.

6.2 Technical Data and Specifications

All adhesives, adhesive bonding primers, adhesive primers, sealants and sealant primers used in the interior of a building must comply with the maximum Volatile Organic Compound (VOC) limits listed in Table 404.02(1).

Table: 404.02 (1) - Maximum VOC Limits of Adhesives and Sealants

Maximum VOC Limits - Grams per litre (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
VCR & Asphalt Adhesives	50	Special Purpose Contact Adhesive	250
Drywall & Panel Adhesives	50	Structural Wood Member Adhesive	140
Cove Base Adhesives	50	Sheet Applied Rubber Lining Operations	850
Multipurpose Construction Adhesives	70	Top & 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	Single-Ply Roof Membrane	450

Fiberglass	80	Other	420
		Sealant Primers	
		Architectural Non-Porous	250
		Architectural Porous	775
		Other	750

Note: Regulation 401.06 requires indoor air quality testing must be carried out, and compliance with the maximum levels of contaminants identified in the table below achieved, before a new building can receive a completion certificate and be occupied. In order not to exceed the TVOC limit, only low VOC materials will be able to be used.

Table 404.02(2)

Sampling Schedule	Type of Samples	Maximum Acceptable	Sampling Duration
Pre-Occupancy	Formaldehyde	< 0.08 parts per million (ppm)	8- hour continuous monitoring (8 hour time-weighted average [TWA])
	Total Volatile Organic Compound (TVOC)	< 300 micrograms/m^3	
	Suspended Particulates (<10 microns)	< 150 micrograms/m^3	

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Technical specifications and drawings*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

A number of countries around the world are developing standards and regulatory requirements for the VOC content of a range of materials. LEED credits for the use of low VOC products. BREEAM does not address adhesives and sealants. Singapore and BREEAM only address carpet adhesive and use the same value as LEED

9.0 References.

South Coast Air Quality Management District (SCAQMD) Rule 1168, rule amendment date January 7, 2005, effective July 1, 2005.

1.0 Carpet Systems

404.03

Villas

Residential/ Commercial

Public Buildings

Industrial

For all new and existing public and commercial buildings, each new carpet system used must be certified / accredited from Dubai Central Lab or any other source approved by Dubai Municipality (DM).

Carpet are not allowed to be used in labor accommodation, educational facilities or any other places determined by DM

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Hazardous Materials**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Good indoor air quality can have a positive effect on the heath and wellbeing of construction workers and building occupants. A number of building products, such as carpet systems (consisting of the carpet, carpet cushion, and carpet adhesive) include compounds that have an adverse impact on indoor air quality. The most prominent of these compounds are Volatile Organic Compounds (VOCs). This regulation seeks to minimise the use of carpet systems that contain certain levels of VOCs.

The installation of some carpet systems can expose building users to contaminants that may be off-gassed from the carpet system materials. The use of carpet systems made of low-emitting materials can minimise the adverse impacts on air quality.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓	✓			
Residential/Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome / Benefit

The use of low-VOC materials will help to minimise air quality problems in buildings. Minimising the amount of indoor air contaminants resulting from the carpets installed in buildings will reduce adverse impacts on the health and well-being of building occupants. Healthy building occupants are more productive and have less illness-related absenteeism.

6.0 Guidance

6.1 General

This regulation covers carpet systems permanently installed in buildings and does not apply to loose fitted rugs and mats.

Many new carpet systems are high emitters of VOCs, and it is important to ensure that high emitting carpet systems are not used in building interiors in Dubai.

Carpets installed in new buildings which meet the requirements of one of the following programs will be considered to have met the requirements of this regulation as it relates to carpets:

- *Carpet and Rug Institute's Green Label/Green Label Plus* Indoor Air Quality Test Program for testing of emissions in carpet; or
- *GuT Carpet Eco-Level* (European scheme); or
- Environmental Certification Scheme of the Carpet Institute of Australia; or
- Dubai Municipality recognised equivalent certification scheme.

Carpet cushions installed in new buildings which meet the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program for testing of emissions in carpet cushions or Dubai Municipality recognised equivalent will be considered to have met the requirements of this regulation as it relates to carpet cushions.

All carpet adhesives must meet the requirements included in Regulation 404.01 Low Emitting Materials: Adhesives and Sealants.

6.2 Technical Data and Specifications

Carpet and Rug Institute's (CRI) Green Label program tests carpet, cushions and adhesives to help specifiers identify products with very low emissions of VOCs. Thirteen chemicals are measured during testing of carpets and 15 chemicals for adhesives. CRI has recently launched its next series of improvements called Green Label Plus for carpet and adhesives.

The European carpet industry has taken the lead by creating GUT. In cooperation with officially recognised test houses across Europe, GUT continuously tests products against the highest standards and promotes environmentally friendly solutions for carpet installation as well as recycling projects. GUT certification addresses pollutant, emissions and odour testing. The following are considered:

- Environmentally compatible production
- The absence of any contaminants
- Minimal emissions and odours in new carpet
- Recycling of scrapped carpet and production waste.

The Australian Carpet Classification Scheme (ACCS) classifies carpet systems according to their durability and appearance retention.

- The yellow and blue labels identify carpets that have been graded for residential use. Residential ratings can have a maximum of six stars.
- The gold and black labels identify carpets graded for contract or commercial use.
- The Environmental Certification Scheme (ECS) for carpet is an extension of the Australian Carpet Classification Scheme (ACCS). The ECS has three technical criteria covering Volatile Organic Compound (VOC) emissions, noise reduction and thermal insulation properties that relate to environmental performance. ECS VOC emission limits have been set at, or lower than, the equivalent Green Label Plus limits, and additional VOC's have been added to the CRI list of 13 'chemicals of concern.'

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Technical specifications and drawings*
Construction	*Green Building Site File* with orders and delivery notes for the correctly specified materials
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

There are many internationally recognised certification schemes which identify suitable carpets.

9.0 References.

Carpet and Rug Institute (C&RI) Green Label and Green Label Plus Testing Program, accessed at www.carpet-rug.com

Gemeinschaft umweltfreundlicher Teppichboden (GuT) Carpet Eco-Level, accessed at www.centexbel.be/Eng/product_service_certif_gut.htm

Carpet Institute of Australia (CIAL) Environmental Certification Scheme (ECS), accessed at www.carpetinstitute.com.au/environment/index.htm

1.0 Provision of Natural Daylight

405.01

For all new buildings, other than industrial buildings, provision for adequate natural daylight must be made in order to reduce their reliance on electrical lighting and to improve conditions for the building occupants and provide lighting openings in accordance with Dubai municipality building regulations and specification.

Villas

Residential/ Commercial

Public Buildings

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Daylight & Visual Comfort**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Glazed elements that allow natural light into the interior of buildings have become one of the most important architectural features of the modern buildings of Dubai. This trend has often led to over glazed facades which result in higher cooling loads and unnecessary increased energy consumption. At the same time, large glazed surfaces in buildings can cause visual discomfort to occupants due to the excessive brightness contrast between the perimeter and the deeper areas of the building. In order to reduce the brightness contrast, occupants tend to reduce the amount of light entering the building by dropping the internal blinds and then switching on the lights. For this reason the use of tinted glass is increasingly common in new buildings in Dubai. However, heavily tinted glazing reduces the amount of light transmitted to an extent that often the interior requires electrical lighting permanently.

A well considered daylighting approach in buildings will not only reduce the incidence of glare and discomfort but also reduce the need for electrical lighting if part of an integrated daylight strategy with lighting controls. A successful daylight design can represent energy savings of 15-20%. The factors affecting the design and control of daylight in buildings include: required internal illumination, size of the windows or glazed elements, properties of the glass, surrounding obstructions, colour of the internal surfaces, and sky conditions over the year. All these factors therefore should be brought together and be considered early during the conceptual design stages. Architectural elements can also be used to divert daylight into the building.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/Commercial	**Residential**	✓		**Commercial**	✓	
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	

	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories	✓	
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops					
	Factories					
	Warehouses					

5.0 Outcome/ Benefit

Provision of daylight can reduce energy use for artificial lighting, therefore contributing to the reduction of carbon emissions and energy expenditure.

As a main contributor to a healthy environment and the wellbeing of occupants, the provision of natural light in commercial buildings can also help reduce absenteeism and increase productivity of workers. Natural light also provides occupants with a connection to the outdoor environment by allowing them to adapt to natural changes of daylight levels through the day.

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6.0 Guidance

6.1 General

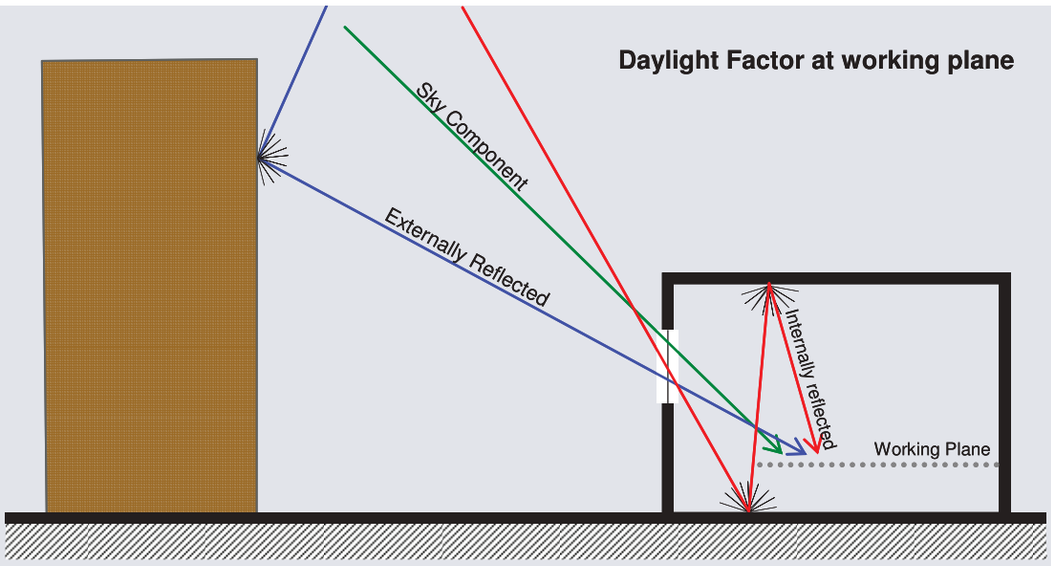
Multi-use building: For the purpose of this regulation each portion of the building with a different usage shall meet the compliance requirements for that usage type.

Daylight Factor

The Daylight Factor (DF) is the proportion of the total illumination falling at a given point in a room that comes from external illumination from an unobstructed sky. The Daylight Factor is expressed as a percentage.

The Daylight Factor is composed of three components which relate to the three possible light paths from the sky: the *Sky Component*: the amount of light coming directly from the sky based on the CIE Standard Overcast Sky; the *Externally Reflected Component*: the light from the sky that is reflected off the outside surfaces and subsequently directed into the room, and the *Internally Reflected Component* which is the proportion of light reflected from surfaces within the room.

Figure 405.01 (1): Components for Daylight Factor.



DF = Sky Component + Externally Reflected Component + Internally Reflected Component

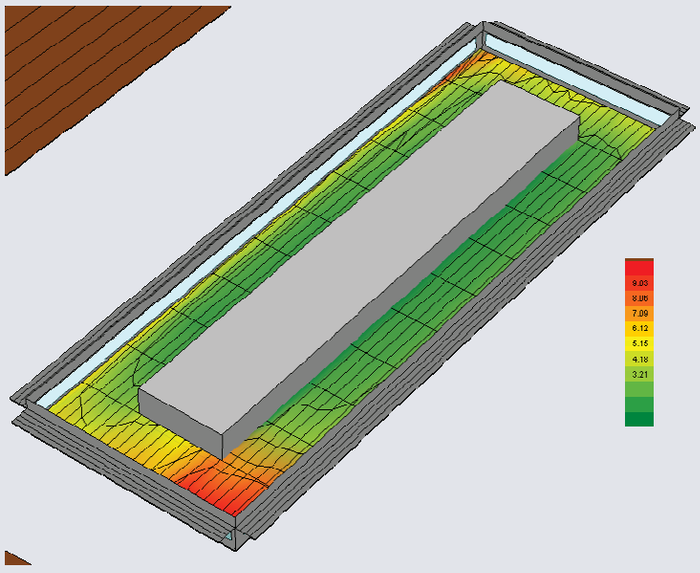
The Daylight Factor is defined as:

$$DF = \left(\frac{E_{in}}{E_{out}} \right) \times 100\%$$

Where:

E_{in} is the average interior illuminance
E_{out} is the unobstructed horizontal outdoor illuminance

Figure 405.01 (2): Use of computer modelling for the calculation of Daylight Factors.



Average Daylight Factor (ADF)

The Average Daylight Factor is the average value of the Daylight Factor within a room and can be used as an indicator of the overall daylight levels in a room. However the ADF is a single average value and does not assess whether the daylight is evenly distributed throughout the room. This can be addressed through the Brightness Contrast or the Uniformity Ratio.

The ADF within a space is a function of the size of each window, the type of glazing, the amount of sky visible from each window and the overall reflectance of the internal surfaces.

The following formula can be used to calculate the ADF:

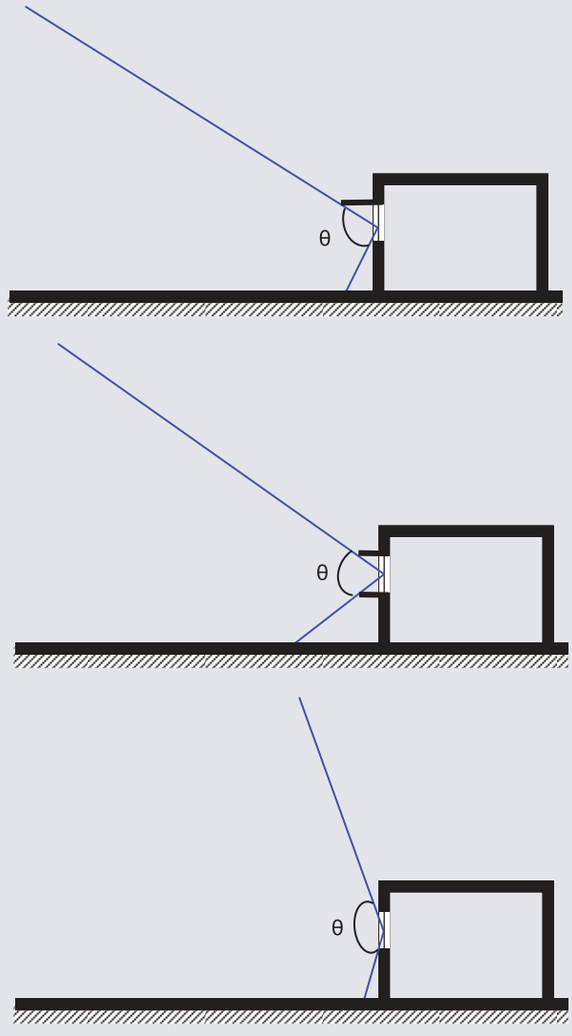
$$DF_{avg} = \sum \frac{T \times W \times \theta}{A \times (1 - R^2)}\%$$

Where:

T = Transmission of glazing (0-1). Includes corrections for dirt on glass and any blinds/curtains;
W = Net glazed area of the window (m^2);
θ = Angle of vertical view from the centre of the window (degrees),
A = Total internal surface area, wall, floors ceilings and glazing (m2), and
R = Average reflectance of surfaces (0-1).

The Angle of vertical view from the centre of the window is measured as shown in the figure below:

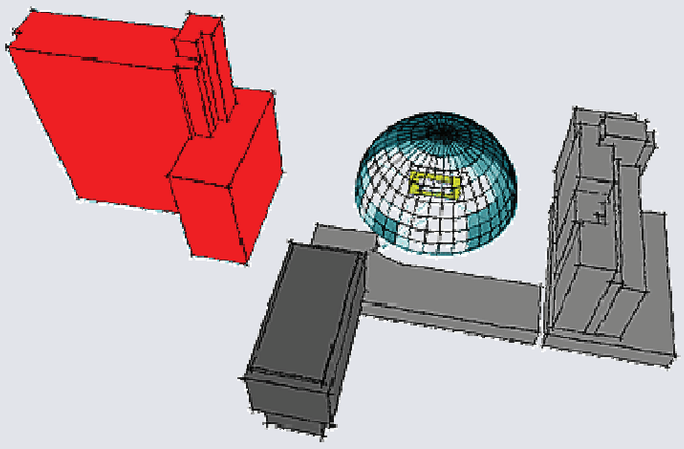
Figure 405.01 (3): θ is the angle subtended, in the vertical plane normal to the window, by sky visible from the centre of the window.



This approach can be effectively applied for hand-calculations. However greater accuracy, design efficiency, speed and flexibility can be obtained through computer modelling.

The illustration below produced by computer modelling shows a shading mask mapped over a dome. It clearly shows how the surrounding buildings produce areas of obstruction over the dome. The computer model can take into account the geometry of the zone of interest, the glazing properties, the reflectance of materials and the shape and size of external obstructions.

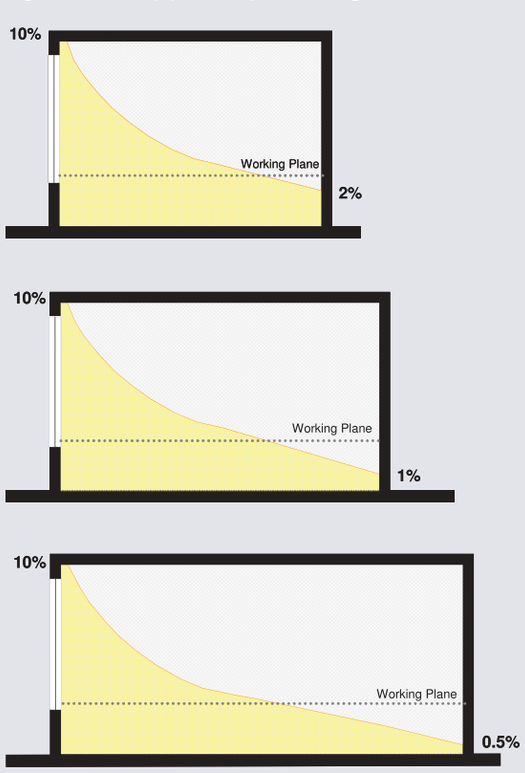
Figure 405.01 (4): Angle of visible sky modelled in a computer software. Image taken from Square1 – Ecotect v5.5



Brightness Contrast Ratio

As the distance from the window increases the Daylight Factors decrease. Consequently, the back of deep narrow rooms would be darker than at the perimeter, even if the Average Daylight Factor meets the required level. The brightness contrast ratio is defined as the ratio of the level of daylight at the back of the room to that at the front of it. The following images illustrate this concept.

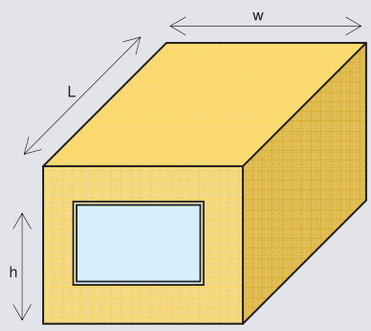
Figure 405.01 (5): Examples of brightness contrast ratio



If the room is lit from one side the following rule should apply:

The depth (L) of the room would not exceed the value given by the equation on Figure 405.01 below.

Figure 405.01 (6): The Limiting Depth Rule



$$\frac{L}{w}+\frac{L}{h}\leq\frac{2}{(1-R_b)}$$ where,

L = Depth of room (from window to back wall)
w = Width of room (across window wall)
h = height from the top of the window to the floor
R_b = Area weighted average reflectance in the back half of the room

6.2 Technical Data and Specifications

This regulation requires that the applicant undertakes daylight calculations using the principles described above. The use of computer software is encouraged because it allows easy data processing and testing of options.

Technical data for daylight calculations and guidance for interior daylighting can be found in CIBSE Application Manual, The British standard for daylighting and the other technical guidance documents listed in section 9.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* Window schedule and calculations
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

The main building rating systems all encourage the use of natural light within buildings. For example, LEED credits a minimum glazing factor of 2% for a minimum of 75% of occupied areas. BREEAM credits for daylight factor of 2% for 80% of work spaces.

9.0 References.

Dubai municipality building regulations and specification

The Chartered Institution of Building Services Engineers (CIBSE) Daylight and Window Design. Lighting Guide LG10: 1999.

British Standards Institution. Code of practice for daylighting. British Standard BS 8206 Part 2

Towards Green Buildings: Glass as a Building Element – The Use and Misuse in the Gulf Region. Aboulnaga M. 2005.

Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice, BRE 1995.

Environmental Design Guide for Naturally Ventilated and Daylit Offices. Rennie D. & Parand F. BRE

The Chartered Institution of Building Services Engineers (CIBSE) Guide A Environmental Design, August 2001.

Daylighting in Buildings, Energy Research Group, University College of Dublin for the European Commission, Directorate-General for Energy, 1994.

1.0 Views

405.02

All new office, residential and public buildings must provide direct line of sight (views) to the outdoor environment in accordance with Dubai municipality building regulation and specification.

Residential/ Commercial

Public Buildings

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Daylight & Visual Comfort**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

The use of natural light and the access to outdoor views creates a stimulating environment for building occupants reduces eyestrain and has been shown to improve productivity in the workplace.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓				
Residential/Commercial	**Residential**			**Commercial**		
	Apartments	✓		Hotels	✓	
	Offices	✓		Resorts	✓	
	Labour Accommodation	✓		Restaurants/Food Outlets	✓	
	Student Accommodation	✓		Laboratories		
Public Buildings	Healthcare Facilities	✓		Retail Outlets	✓	
	Educational Facilities	✓		Post Offices	✓	
	Government Buildings	✓		Banks	✓	
	Worship Houses	✓		Museums	✓	
	Petrol Stations	✓		Cinema/theatres	✓	
	Shopping Mall	✓		Historical/heritage Buildings*	✓	
Industrial	Workshops					
	Factories					
	Warehouses					

5.0 Outcome/ Benefit

Regularly occupied areas of the building will have access to views of the outside. The provision of views can substantially contribute to energy conservation due to the increased natural light reducing the need for electrical lighting. The provision of views to the outside allows building occupants to connect with the outdoor environment and is known to increase building occupants' productivity and reduce eyestrain and other health problems.

6.0 Guidance

6.1 General

The following considerations should be taken into account when calculating the areas of offices from which views are provided:

- Interior office spaces. The entire area of interior office spaces may be included in the calculation if at least 75% of each area has direct line of sight to perimeter vision glazing.
- Multi-occupant spaces. The calculation shall only include the square metres with direct line of sight to perimeter vision glazing.

Regularly occupied areas in a building exclude copy/printing rooms, storage areas, mechanical spaces, restrooms, auditoria, and other intermittently or infrequently occupied spaces or spaces where daylight would interfere with the use of the space.

The following consideration should be taken into account for residential buildings:

- Areas which may be excluded from the definition of habitable spaces include interior bathrooms, laundry rooms or other service areas;
- The 90% line of sight criteria is for habitable spaces only.

The calculations must consider that line of sight can pass through interior glazing, but not through doorways with solid doors.

Views that are obstructed from the room due to interior walls, other obstructions or views through a roof or high level window are not considered "views" for the purpose of the calculations for this requirement.

6.2 Technical Data and Specifications

A direct line of sight is required through vision glazing. A line of sight may be drawn through internal glazing.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction	✓		✓			
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment* *Technical specifications and drawings*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	n/a
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

A number of building rating systems encourage the provision of views of the outside environment. For example, LEED awards credits for views from 90% of occupied areas. Similarly, BREEAM awards credits if workstations or desks are within 7 metres of a window.

9.0 References.

No documents referenced.

1.0	Legionella Bacteria and Building Water Systems	406.01

For all new and existing buildings must apply the technical guidelines issued by Dubai Municipality which includes:

A. **All water systems and networks which creates a water spray or aerosol including but not limited to cooling towers, evaporative condensers, hot and cold water systems, showers, evaporative air coolers, spas, fountains, misters, ..etc must be periodically maintained, cleaned, disinfected and checked periodically to minimize the risk of Legionella bacteria or germs contamination in accordance with the technical guidelines issued by Dubai Municipality regarding the control of Legionella bacteria in water systems.**

B. **All water systems equipments and accessories including but not limited to potable water network, hot and cold water systems, water tanks, pumps, pipes and fittings, must be maintained, cleaned and disinfected.**

C. **Sampling and testing must be carried out for the presence of bacteria / germs and Legionella bacteria**

D. **All equipments and devices of swimming pools, spa pools, whirlpool baths, hydrotherapy pools and Jacuzzi must be maintained, cleaned, disinfected and checked periodically.**

E. **All equipments and devices of irrigation system must be maintained, cleaned, disinfected and checked periodically.**

Specialized companies approved by Dubai Municipality must do water tests and sampling. All test results must be recorded and kept along with the records of maintenance and remedial works at site to be checked by Dubai Municipality

Villas

Residential/ Commercial

Public Buildings

Industrial

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Water Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

Legionnaires' disease is a potentially fatal form of pneumonia which can affect anybody, but which principally affects those who are susceptible because of age, illness, immunosuppression, smoking etc. It is caused by the bacterium *Legionella pneumophila* and related bacteria. Legionella bacteria can also cause less serious illnesses which are not fatal or permanently debilitating. The collective term used to cover the group of diseases caused by legionella bacteria is legionellosis.

Legionella bacteria are common and can be found naturally in environmental water sources such as rivers, lakes and reservoirs, usually in low numbers. Legionella bacteria can survive under a wide variety of environmental conditions and have been found in water at temperatures between 6°C and 60°C. Water temperatures in the range 20°C to 45°C seem to favour their growth.

As legionella bacteria are commonly encountered in environmental sources they may eventually colonise manufactured water systems and be found in cooling tower systems, hot and cold water systems and other plant which use or store water. To reduce the possibility of creating conditions in which the risk from exposure to legionella bacteria is increased, it is important to control the risk by introducing measures which:

(a) do not allow proliferation of the organisms in the water system; and
(b) reduce, so far as is reasonably practicable, exposure to water droplets and aerosol

Legionella bacteria also require a supply of nutrients to multiply. This can include, for example, commonly

encountered organisms within the water system itself such as algae, amoebae and other bacteria. The presence of sediment, sludge, scale and other material within the system, together with biofilms, is also thought to play an important role in harbouring and providing favourable conditions in which the legionella bacteria may grow. A biofilm is a thin layer of micro-organisms which may form as a slime on the surfaces in contact with water. Such biofilms, sludge and scale can protect legionella bacteria from temperatures and concentrations of biocide that would otherwise kill or inhibit these organisms if they were freely suspended in the water.

A number of measures can be taken to prevent disease. These activities can be influenced by good engineering and maintenance practices. A variety of aerosol-producing devices have been associated with outbreaks of Legionnaires' disease including: cooling towers, evaporative condensers, showers, whirlpool spas, humidifiers, decorative fountains, and misters. Transmission via cooling towers and evaporative condensers have been the most commonly documented. This regulation focuses on two key aspects of prevention for cooling water towers: system treatment and maintenance.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓	✓			
Residential/Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome/ Benefit

This regulation focuses on methods to minimise the Legionella bacteria contamination in building water systems, specifically in cooling towers. It provides specific environmental and operational guidelines that will contribute to the safe operation of building water systems relative to cooling towers with the intent of minimising the risk of occurrence of Legionnaires' disease.

6.0 Guidance

6.1 General

Experience has shown that cooling towers, evaporative condensers and hot and cold water systems in a wide variety of workplaces present a risk of exposure to legionella bacteria. Other systems, such as humidifiers and air washers, spa baths and pools, car/bus washes, wet scrubbers, indoor fountains and water features also present a risk.

A water system includes all plant/equipment and components associated with that system, e.g. all associated pipe-work, pumps, feed tanks, valves, showers, heat exchangers, quench tanks, chillers etc. It is important that the system is considered as a whole and not, for example, the cooling tower in isolation. Deadlegs and parts of the system used intermittently, e.g. test loops in engineering factories, injection moulding machines, also need to be included as part of the system since they can create particular problems with microbial growth going unnoticed. Once brought back on-line they can cause heavy contamination, which could disrupt the efficacy of the water treatment regime.

The key aspects of this regulation are that the water system be kept clean and that a biocidal treatment program be used.

Maintenance

Keeping the system clean reduces the nutrients available for Legionella growth. Regular visual inspections by the maintenance staff should be made. To avoid the build-up of dirt, organic matter or other debris, the cold water basin of the cooling unit should be cleaned regularly. Mechanical filtration can be used to help reduce this debris.

Operations and maintenance records should include the following information:

- System schematic;
- System water volume, with date and method of determination;
- Manufacturer's instructions for equipment operation;
- Regular water treatment procedures;
- Material Safety Data Sheets for Chemicals used (MSDS);
- Names of persons responsible for system operation and shutdown;
- Dates of inspections and results of inspections;
- Dates of routine maintenance and activities accomplished; and
- Dates of equipment repairs or modifications of work done.

Treatment

A complete water treatment programme based on the physical and operating parameters for the cooling system and a thorough analysis of the make-up water should be established. The components of the water treatment programme should be environmentally acceptable and comply with any local discharge requirements.

It is important to ensure that water treatment programmes have sufficient range of adjustment to cope with any potential variations in make-up water supply quality. This enables control to be maintained. Failure to take account of variations in quality may lead to the rapid development of uncontrolled microbiological conditions within the cooling system.

There are a number of factors which will influence the effectiveness of any treatment programme:

(a) corrosion;
(b) scale formation;
(c) fouling; and
(d) microbiological activity.

They are interrelated and failure to control any one may lead to all occurring simultaneously, resulting in an environment that encourages the growth of legionella. In setting up an effective monitoring and control system, it should be remembered that corrosion, scale formation and fouling are continuous physico-chemical processes and inhibitors to control such processes should be added on a continuous basis.

All components of the treatment programme should be preferably be dosed by pump or eductor (sometimes referred to as an ejector) systems or by a suitable halogen dosing system such as a brominator. This will minimise health and safety risks to operators and ensure that frequencies and rates of application are maintained as recommended.

Microbiological Activity

The operating conditions of a cooling system provide an environment in which micro-organisms can proliferate. The water temperatures, pH conditions, concentration of nutrients, presence of dissolved oxygen, carbon dioxide, sunlight, together with large surface areas all favour the growth of micro-organisms such protozoa, algae, fungi and bacteria, including legionella.

Problems arise when micro-organisms are allowed to grow or flourish to excess. This can result in the formation of biofilms on system surfaces which can:

(a) cause a reduction in heat transfer;
(b) harbour legionella and provide an environment for their growth;
(c) induce highly localised microbial corrosion;
(d) interfere with the effectiveness of corrosion inhibitors;
(e) trap particulate matter, increasing the problem of fouling; and
(f) disrupt water distribution within the tower.

Biocides are used to control microbiological activity. They should prevent the proliferation of micro-organisms but are not required to disinfect systems. Biocides can be oxidising or non-oxidising. Controlling biocide levels, i.e. the frequency and quantity of additions, will depend on the microbiological activity of the system.

Biocides, when correctly selected, applied and controlled, as part of a comprehensive water treatment programme, have been shown to be effective in preventing the proliferation of legionella. Many factors will influence the selection of chemicals required for the treatment programme. However, the success of the treatment programme is dependent on:

(a) compatibility of all chemical components used; and
(b) adherence at all times, to the recommended application, monitoring and control procedures.

Biocides are routinely applied at the tower sump or the suction side of the recirculating water pump but should be dosed so that the biocide will circulate throughout the cooling system. However, in air-conditioning systems, where the tower can be bypassed, the biocide needs to be added to the suction side of the recirculating pump.

It is also recommended that the services of a qualified water treatment specialist be used to define and oversee the treatment programme. If a sample of water taken from the cooling tower has a heterotrophic colony count exceeding 100,000 colony forming units per millilitre, the water of the system must be manually treated with additional quantities of biocide (or an alternative biocide). Further, the water treatment program, tower operation and maintenance program of the system must be reviewed. Any faults must be corrected and changes be made to prevent a re-occurrence of those faults. If Legionella is further detected, the responsible person must ensure the water of the cooling tower system is disinfected, cleaned and re-disinfected.

Testing is not a substitute replacement for sound maintenance practices and water treatment.

6.2 Technical Data and Specifications

For further information on the subject of water treatment, see:

Dubai Municipality technical guidelines regarding the control of Legionella bacteria in water systems>

The “Water Treatment” chapter in the Applications volume of the ASHRAE Handbook,

The American Society for Testing and Materials “Standard Guide for Inspecting Water Systems for Legionella, and Investigating Possible Outbreaks for Legionellosis (Legionnaires’ Disease or Pontiac Fever)”, or

Legionnaires’ disease – The control of Legionella bacteria in water systems, Approved Code of Practice and Guidance, (L8) Health and Safety Commission, England

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application	✓		✓			
Construction						
Commissioning/Completion	✓		✓			
Operation						
Refurbishment	✓		✓			
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	*Green Building Declaration* *Completed Self Assessment*
Construction	n/a
Commissioning/Completion	Completed *Green Building Site File*
Operation	Legionella testing record
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

Legionnaires' disease is recognised internationally as a serious potential health hazard. Requirements for the control of this bacterium are stricter in some countries is based on an overall risk management programme.

9.0 References.

Dubai Municipality technical guidelines regarding the control of Legionella bacteria in water systems.

ASHRAE Guideline -- Minimizing the Risk of Legionellosis Associated with Building Water Systems

American Society for Testing and Materials (ASTM) Standard Guide for Inspecting Water Systems for Legionellae, and Investigating Possible Outbreaks for Legionellosis (Legionnaires' Disease or Pontiac Fever)

Legionnaires' disease – The control of Legionella bacteria in water systems, Approved Code of Practice and Guidance, (L8) Health and Safety Commission, England

1.0	Water Quality of Water Features	406.02
	For all new and existing buildings, all Water Features with a water storage volume of over 1,000 liters and which creates a water spray or aerosol including but not limited to waterfalls, ponds, streams, ...etc must be maintained, cleaned, disinfected and checked periodically to minimize the risk of Legionella bacteria or germs contamination and not exceed the maximum limits outlined in the technical guidelines issued by Dubai Municipality	**Villas** **Residential/ Commercial** **Public Buildings** **Industrial**

2.0 Intent/Goal

- ☐ Ecology and Planning
- ☑ **Building Vitality – Water Quality**
- ☐ Resource Effectiveness: Energy
- ☐ Resource Effectiveness: Water
- ☐ Resource Effectiveness: Materials and Waste

3.0 Background

The water in water features is prone to contamination from the surrounding environment or from contact with people or animals. Regular maintenance and testing of the water is required to ensure that any contamination does not become a general health hazard.

The ambient temperatures in Dubai are within the range that encourages growth of Legionella bacteria and therefore the maintenance and testing measures required by Regulation 406.01 must also be carried out for water features covered by this regulation.

4.0 Applicability

Main Typology Criteria	Typology Subdivisions	New	Existing	Typology Subdivisions	New	Existing
Villa		✓	✓			
Residential/ Commercial	**Residential**	✓	✓	**Commercial**	✓	✓
	Apartments	✓	✓	Hotels	✓	✓
	Offices	✓	✓	Resorts	✓	✓
	Labour Accommodation	✓	✓	Restaurants/Food Outlets	✓	✓
	Student Accommodation	✓	✓	Laboratories	✓	✓
Public Buildings	Healthcare Facilities	✓	✓	Retail Outlets	✓	✓
	Educational Facilities	✓	✓	Post Offices	✓	✓
	Government Buildings	✓	✓	Banks	✓	✓
	Worship Houses	✓	✓	Museums	✓	✓
	Petrol Stations	✓	✓	Cinema/theatres	✓	✓
	Shopping Mall	✓	✓	Historical/heritage Buildings*	✓	✓
Industrial	Workshops	✓	✓			
	Factories	✓	✓			
	Warehouses	✓	✓			

5.0 Outcome / Benefit

This regulation focuses on methods to control contamination in building water features. It provides specific environmental and operational guidelines that will contribute to the safe operation of building water features relative to cooling towers with the intent of minimising the risk of occurrence of Legionnaires' disease.

6.0 Guidance

6.1 General

The key aspects of this regulation are that the water features be maintained clean and that a regular regime of testing be in place.

Keeping the system clean reduces the nutrients available for bacteria growth. Regular visual inspections should be made. To avoid the build-up of dirt, organic matter or other debris, the water basin of the water feature should be cleaned. Mechanical filtration can be used to help reduce this debris.

The need for testing is only as a check whether these actions have been performed adequately. Should non-compliant test results be obtained, the inspection, cleaning and maintenance regimes must be revised.

The test parameters have been selected as those which impact most on the quality of water in Dubai and which could indicate a potential treat to public health.

Total Chemical Oxygen Demand (TCOD) may be used to indirectly measure the amount of organic compounds in water. Monitoring levels of COD determines the amount of organic pollutants found in surface water, making COD a useful measure of water quality. It is expressed in milligrams per liter (mg/L), which indicates the mass of oxygen consumed per litre of solution.

Total Biochemical Oxygen Demand (TBOD) is a measure of the oxygen used by microorganisms including the

bacteria responsible for decomposing organic waste. If there is a large quantity of organic waste in the water, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for oxygen will be high (due to all the bacteria) so the BOD level will be high. As the waste is consumed BOD levels will begin to decline.

Coliform is a family of bacteria common in soils, plants and animals. The coliform family is made up of several groups, one of which is the fecal coliform group, which is found in the intestinal tracts of warm-blooded animals including humans. The presence of fecal coliform in drinking water or at swimming sites is evidence that human or animal waste has been or is present. This may be cause for concern because many diseases can be spread through fecal transmission.

- The presence of some fecal material in lakes, ponds and rivers is to be expected as part of the environment in which we live. As long as the level of fecal coliform bacteria is low, human contact is relatively safe.
- In drinking water, however, any fecal coliform presence is a warning sign that action should be taken.

A water feature includes all plant/equipment and components associated with that system, e.g. all associated pipe-work, pumps, feed tanks, valves etc. It is important that the system is considered as a whole and not, for example, the visible feature in isolation. Deadlegs and parts of the system used intermittently also need to be included as part of the system, since they can create particular problems with microbial growth going unnoticed. Once brought back on-line they can cause heavy contamination, which could disrupt the efficacy of the water treatment regime.

6.2 Technical Data and Specifications

The requirements of Regulation 406.01 must be met.

Testing must be carried out using methods or laboratories approved by Dubai Municipality.

7.0 Compliance

7.1 Responsibilities Matrix

	Consultant or Contractor	User / Operator	DM	DEWA	Other Government Department	3rd party
Design/permit application						
Construction						
Commissioning/Completion						
Operation		✓	✓			
Refurbishment						
Demolition						

7.2 Consultant Document Requirements

Lifecycle Stage	Document Requirements
Design/permit application	Green Building Declaration Completed Self Assessment
Construction	n/a
Commissioning/Completion	Completed Green Building Site File
Operation	Records of water testing and records of mitigation action
Refurbishment	Any works requiring a building permit from DM are required to comply with the Green Buildings Regulations for Dubai.
Demolition	n/a

8.0 Common Practices / Solutions

Water features where the water may come into contact with people are recognised as being potential health hazards. Legionnaires' disease is recognised internationally as a serious health risk.

9.0 References.

Dubai Municipality technical guidelines regarding the control of Legionella bacteria in water systems.

ASHRAE Guideline 12-2000 Minimizing the Risk of Legionellosis Associated with Building Water Systems

American Society for Testing and Materials (ASTM) Standard Guide for Inspecting Water Systems for Legionella, and Investigating Possible Outbreaks for Legionellosis (Legionnaires' Disease or Pontiac Fever)

Legionnaires' disease – The control of Legionella bacteria in water systems, Approved Code of Practice and Guidance, (L8) Health and Safety Commission, England

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