

*Introduction:*

*The National Energy Efficiency and Renewable Energy Action (NEEREA) is a national financing mechanism dedicated to the financing of loans in energy efficiency, renewable energy, and green buildings. NEEREA is a joint initiative between the Central Bank of Lebanon (BDL) and the Ministry of Energy and Water (MEW). NEEREA receives the technical support of the United Nations Development Program (UNDP) through funding by the Global Environment Facility (GEF).*

*The Technical Support Unit to the Central Bank of Lebanon (BDL) at LCEC is dedicated to offer BDL technical assistance to evaluate the eligibility of submitted loans to benefit from the EU-funded subsidy. This task is financed by the European Union (EU).*

*Important Notes:*

1. ***All sentences written in italic format in this template are for instructional purposes only. These sentences should be removed from the project proposal.***
2. *This project proposal guideline is designed to help potential beneficiaries, consultants, and contractors in preparing comprehensive technical reports and proposals about Non-Certified High Energy Performance Building*
3. *For certified buildings, the Red Template about energy efficiency and renewable energy projects implementation in a New Certified Facility is the reference for project proposal.*
4. *This project proposal template is a mandatory requirement towards facilitating the green loan application process through the national financing mechanism NEEREA.*
5. *This project proposal template is prepared by the Lebanese Center for Energy Conservation- Technical Support Unit to the Central Bank of Lebanon, and is available for public use.*
6. *The Technical Support Unit to the Central Bank of Lebanon at the Lebanese Center for Energy Conservation (LCEC) is supported by the European Union (EU).*
7. *This guideline will be updated constantly, kindly always refer to the latest version.*
8. *For questions, clarifications, or suggestions, please contact the LCEC: 01-569101 or by email:* [*energy@lcec.org.lb*](mailto:energy@lcec.org.lb)

|  |
| --- |
| ***Evaluation of projects requesting financing of Non-Certified High Energy Performance Buildings under NEEREA will be based on these issued Guidelines. Contractors are entailed to abide by the requirements set in these guidelines and must submit the technical reports following the steps and regulations clearly identified.*** |

**Non-Certified High Energy Performance Buildings Criteria**

1. MED-ENEC has conducted a study in July 2013 on ‘A Roadmap for developing Energy Indicators for Buildings in Lebanon’ [1]. The study showed the energy demand for some building types in Beirut including heating, cooling, ventilation, lighting and Domestic Hot Water (DHW).They used conditions for a Business As Usual (BAU) case under Beirut Climate.

The results are detailed in the table 1 below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Table 1: Composition of the specific energy demand for each building type (BAU case) for Beirut [1]* | | | | | |
|  | Residential  Standard  kWh.m-2.y-1 | Residential  Seasonal  kWh.m-2.y-1 | Hotel  kWh.m-2.y-1 | Office  kWh.m-2.y-1 | Retail  kWh.m-2.y-1 |
| Heating | 3 | 6 | 4 | 0 | 1 |
| Cooling +Humidification+ Dehumidification | 115 | 97 | 152 | 107 | 259 |
| Ventilation | 7 | 7 | 12 | 5 | 8 |
| Lighting | 13 | 3 | 21 | 17 | 125 |
| DHW | 10 | 2 | 46 | 0 | 0 |
| Total | 148 | 115 | 235 | 129 | 393 |

1. In order to find the specific energy demand in the different Lebanese climatic zones, calculations were done by assuming that the same building (having the same envelope and operating conditions) was placed in the other climatic zones.

Using Heating Degree Days (HDD) and Cooling Degree Days (CDD) values from [2], the specific final energy consumption for Lebanese zones could be calculated based on Beirut data shown in table 1.

Table 2 shows the degree day threshold for the four Lebanese climatic zones.

|  |  |  |  |
| --- | --- | --- | --- |
| *Table 2:Approximate Altitude and Degree-Day Threshold for four zones [2]* | | | |
|  | Approximate Altitude Range | HDD | CDD |
| *Zone 1-Coastal* | 0-700 m | 300-1200 | 120-1050 |
| *Zone 2 -Western Mid-Mountain* | 700-1400 m | 1200-2000 | 0-120 |
| *Zone 3-Inland Plateau* | 700-1150 m | 1200-1800 | 120-600 |
| *Zone 4-High Mountain* | **>1150 m** | **>1800** | **0-120** |
| Littoral side +1400m | > 2000 | 0 |
| Inland side +1150 m | > 1800 | 0 - 120 |

The specific energy demand calculated for the different zones are shown in the table 3 below for the BAU building used in Beirut data.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Table 3: Composition of the specific energy demand for each building type (BAU case)*  *For the four Lebanese climatic zones* | | | | | | |
|  | *Residential*  *Standard*  *kWh.m-2.a-1* | *Residential*  *Seasonal*  *kWh.m-2.a-1* | *Hotel*  *kWh.m-2.a-1* | *Office*  *kWh.m-2.a-1* | *Retail*  *kWh.m-2.a-1* | *Hospitals*  *kWh. m-2.a-1* |
| *Zone 1-Coastal* | 148.00 | 115.00 | 235.00 | 129.00 | 393.00 | 265 |
| *Zone 2 -Western Mid-Mountain* | 87.91 | 76.31 | 162.86 | 56.37 | 225.06 | 228 |
| *Zone 3-Inland Plateau* | 157.00 | 133.00 | 247.00 | 129.00 | 396.00 | 300 |
| *Zone 4-High Mountain* | 93.91 | 88.31 | 170.86 | 56.37 | 227.06 | 250 |

1. In order to construct High Energy Performance Buildings, LCEC suggested a reduction of 30% in the specific energy demand compared to the BAU case. This reduction of 30% in Beirut for example would mean that the building performance should be less than 103.6 kWh.m-2.y-1.
2. In order to unify the data, the reference building performance is chosen as Final Energy Consumption (FEC) =100 kWh.m-2.y-1.
3. Depending on the climatic zone and the building type, the specific FEC (αFEC) should be FEC multiplied by a coefficient α. Coefficients αi are shown in table 4.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Table 4 : Coefficients αi depending on the climatic zone and the building type* | | | | | | |
|  | **Residential**  **Standard** | **Residential**  **Seasonal** | **Hotel** | **Office** | **Retail** | **Hospital** |
| Zone 1 | 1.0 | 0.8 | 1.6 | 0.9 | 2.7 | 1.8 |
| Zone 2 | 0.6 | 0.5 | 1.1 | 0.4 | 1.5 | 1.5 |
| Zone 3 | 1.1 | 0.9 | 1.7 | 0.9 | 2.7 | 2.0 |
| Zone 4 | 0.6 | 0.6 | 1.2 | 0.4 | 1.5 | 1.7 |

Note that Schools should be treated as office buildings in the choice of the reference Final Energy Consumption.

Refer to Annex for the choice of the climatic zone.

1. The building performance should be calculated using the tools and steps as recommended by LCEC guideline. The tools should be hourly basis load calculations. LCEC recommends the use of HAP and COMFIE- Pleiades**.**

When the project proposal is presented based on HAP simulation, the ASHRAE Standards should be respected especially the ones related to:

* Ventilation and infiltration rates [3, 4].
* Occupancy, lighting and equipment [5, 6].

If COMFIE-Pleiades is used for thermally simulating the building, LCEC recommendations should be used. These recommendations are shown throughout the guideline.

1. **The building performance should not exceed αFEC values in order for the project to be eligible for NEEREA loan.**
2. Note that the energy consumption cited in this document is a final energy consumption contrary to international standard where labels are based on primary energy consumption. Official primary energy factors for the different energy carriers are not available (could just be estimated), this makes it complicated to derive any reliable primary energy data for the building sector [1].
3. References

[1] A Roadmap for developing Energy Indicators for Buildings in Lebanon, MED-ENEC Energy Efficiency in the Construction Sector in the Mediterranean,2013.

[2] Climatic Zoning For buildings in Lebanon, 2005.

[3] ASHRAE Standard 62.1 -Ventilation for Acceptable indoor Air Quality.

[4] ASHRAE Standard 62.2 -Ventilation for Acceptable indoor Air Quality in Low-Rise Residential Building.

[5] ASHRAE Standard 90.1-Energy Standard for Buildings Except Low-Rise Residential Buildings.

[6] ASHRAE Standard 90.2-Energy-Efficient Design of Low-Rise Residential Buildings.

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# General Description of the Non-Certified High Energy Performance Building

*[This section should offer a short description of the facility (residential building, commercial building, industry, house, etc.) including location, architecture, number of floors, and other useful information]*

*[This Section contains basic information about the condition of the premises at the time of contract execution. Such information would include facility area, construction type, use, occupancy, estimated future hours of operation, and any special conditions that may exist]*

*[Include photos and drawings if needed]*

# Narrative Description of the Proposed Project

## Rationale and Objective

*[This section of the proposal is dedicated to present the main objective of the targeted measure as energy efficiency or energy conservation project in the context of climate change and sustainable development]*

*[This section should present the overall building consumption of final energy (kWh.m-2.y-1) including energy consumed to ensure heating, cooling, ventilation, lighting and domestic hot water]*

*[This section should also include the specific objectives of the project proposal]*

|  |  |  |
| --- | --- | --- |
| **Building type** | |  |
| **Region** | |  |
| **Zone** | |  |
| **αFEC of this building type in the zone (kWh FE.m-2.y-1)** | |  |
| **Floor Area (m2)** | |  |
| **Overall building Performance (kWh FE.m-2.y-1)** | |  |
| **Consumption**  **(kWh FE.m-2.y-1)** | **Heating** |  |
| **Cooling** |  |
| **Ventilation** |  |
| **Domestic Hot Water** |  |
| **Lighting** |  |
|  | |  |
| **Construction Cost (USD)** | |  |
| **Loan Amount Requested as % of Construction Cost** | |  |
| **Loan Amount (USD)** | |  |

\*FE: Final energy is a form of energy available for the user following the conversion from primary energy (PE). Final forms of energy include gasoline or diesel oil, purified coal, purified natural gas, electricity, mechanical energy, etc…

PE: Primary energy is the energy available in the environment and used directly without conversion. Given the energy losses at each stage of processing, storage and transportation, the amount of primary energy is always greater than the final energy available.

## Presentation of the Proposed Project

*[This section is also dedicated to inform about the focus of the project, the adopted steps and the projected on-site actions]*

*[For example, to achieve the project objectives, the following approaches will be used: adequate envelope, high building performance, on-site record of energy consumption, energy production and energy fed-in to the grid; solar water heaters or LED lights will be installed etc…]*

*[This section should include project planning and scheduling, as well as demonstrate the protection of owner’s sensitivity to quality, safety, and environmental factors]*

## Design Features

*[This sub-section should include details about the project’s character and identity]*

*[The sustainable development features targeted by all considered resource management schemes of the project in terms of building/planning/design and in terms of social schemes must be mentioned here.]*

*[Architectural Features must be presented as well as sufficient information about operational and project management]*

# Loan Request Summary Sheet

*[The provisional cost estimate of the project must be clearly presented. A detailed bill of quantities (BOQ) of the proposed project is to be provided in this section]*

*[The total amount of loan request as per the percentage corresponding to building performance as per LCEC recommendations must be clearly presented in this section]*

*[Name of the Project] [Client’s Signature]*

|  |  |
| --- | --- |
| Region |  |
| Reference building performance (kWh FE.m-2.y-1) |  |
| Building performance (kWh FE.m-2.y-1) |  |
| Construction cost USD |  |
| Loan requested USD |  |

*[The description of the proposed solution or measure should be meaningful without being exhaustive]*

# Technical Report

*[This section should include the detailed technical sustainability report including the technical details of the proposed measures, the different development specifications and actions required and projected for the whole project. This report must be describing the strategy to achieve the targeted building performance.]*

*[Several sections describing the technical aspects of the project will present the most important information as presented below.]*

*[The building performance (%αFEC) should be calculated by thermally simulating the building using one of the following tool: HAP (Hourly Analysis Program) or COMFIE-Pleiades.]*

*[Thermal simulation allows to study the evolving demand of heating and Air Conditioning of the building over a given period. The principle of the simulation is based on heat balances applied to each cell: the heat capacity of the cell during a time step while considering building orientation, solar irradiation, occupants, ventilation, envelope infiltration…]*

*[The following sections detail the tool input and the minimum requirements for the simulation.]*

## Building dimensions

*[Building type (residential, offices…) and dimensions should be specified. Building Orientation is mandatory. The number and sizes of windows and walls in each façade are required. Kindly refer to the table below in citing them.]*

*[The ceiling height of each floor should be specified. Suspended ceilings identification is mandatory. Kindly specify whether the floor is above conditioned or unconditioned space and whether the slab floor is on grade or below grade.]*

*[Building plans should be provided in attachment to the project proposal]*

*[Zoning is possible in HAP and COMFIE-Pleiades. Several rooms can be grouped within a single zone, zones should also be defined in this section]*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Floor** | **Room** | **Area (m2)** | **Usage** | **Exposure** | **Windows quantity** | **Doors quantity** | **Zone** |
| **1** | 1 |  | Bedroom | South | 1 | 1 | 1 |
|  | 2 |  | Living room | Partition | 0 |  | 2 |
|  | 3 |  | … | … |  |  | … |
| **2** | 1 |  | … | … |  |  | … |
| **…** | … |  |  | … |  |  | … |
|  |  |  |  |  |  |  |  |

*[Basements should also be studied especially in the case of slab floor below grade, its walls thermal transmittance should be detailed in the section 5.3.]*

## Climatic Zone

*[The choice of the Lebanese climatic zone depending on the Annex lead to the choice of climatic file in each simulation tool.]*

|  |  |  |
| --- | --- | --- |
|  | *HAP files* | *COMFIE- Pleiades files* |
| *Zone 1* | *Jacksonville,Florida, USA* | *Nice, France* |
| *Zone 2* | *Atlanta, Georgia,USA* | *Carpentras, France* |
| *Zone 3 Baalbeck/ Hermel* | *Madrid, Spain* | *Macon, France* |
| *Zone 3 Zahle/West Bekaa* | *Longrono, Spain* | *Macon, France* |
| *Zone 4* | *Agen, France* | *Agen, France* |

*[The orientation of the building should be noted (define the north or south facades).]*

## Envelope

*[In this section, wall and floor assemblies, windows types and doors should be detailed.]*

*[Note that in both tools, HAP and COMFIE- Pleiades, you can create your own assemblies.]*

### Walls

*[The required characteristics of the material are: ρ (density), Cp (specific heat capacity), λ (Thermal conductivity), R (thermal resistance), U (thermal transmittance)].*

*[The table below is an example of how the material properties should be presented.]*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Wall, roof and slab assemblies** | | | | | | | | |
| **Type** | **Material** | **thick**  **(m)** | **ρ**  **(kg.m-3)** | **Cp**  **(J.kg-1.K-1)** | **λ**  **(W.m-1.K-1)** | **R material**  **(m2.K1 .W-1)** | **U**  **(W.m-2.K-1)** | **R**  **(m2.K1 .W-1)** |
| External wall | **indoor** |  |  | **\*hi** | **7.69** | **0.13** | 0.274 | 3.6 |
| Plasterboard | 0.01 | 850 | 800 | 0.35 | 0.03 |
| Insulator XPS | 0.1 | 35 | 1200 | 0.03 | 3.33 |
| Solid concrete | 0.2 | 2300 | 920 | 1.75 | 0.11 |
| **outdoor** |  |  | **\*he** | **25.00** | **0.04** |
| Partition | **indoor** |  |  |  |  |  |  |  |
|  | … |  |  |  |  |  |  |  |
|  | … |  |  |  |  |  |  |  |
|  | … |  |  |  |  |  |  |  |
|  | …. |  |  |  |  |  |  |  |
| Roof |  |  |  |  |  |  |  |  |
| Floor |  |  |  |  |  |  |  |  |
| Ceiling |  |  |  |  |  |  |  |  |

*\*h: convective heat transfer coefficient W.m-2.K-1 (hi for indoor and ho for outdoor).*

*[Skylights should be cited in the table above in the roof section]*

*[It is required to provide the exposed perimeter and the temperature ranges for conditioned and unconditioned spaces in case of wall partition, ceiling partition, exposed or non-exposed floor and slab floor conditions.]*

*[For more accuracy in load calculation, thermal bridges should be included. HAP software do not take this option into consideration. For COMFIE- Pleiades users, thermal bridge type can be defined and used in simulations.]*

*[Recommendation:*

*In order to have a low energy building, the table below shows the recommended values for each type of assembly.*

|  |  |
| --- | --- |
| ***Type*** | ***U recommended***  *(W.m-2.K-1)* |
| *External wall* | *0.1818-0.3125* |
| *Floor* | *Exposed :0.25- 0.416*  *Semi-exposed:0.2- 0.294* |
| *Ceiling* | *0.1-0.153* |

*The overall building transmittance Ubuilding can be calculated*

*Where Ui is the thermal transmittance of each wall type and Ai is the corresponding area. The ideal Ubuilding for a low energy building would be in the range of 0.2 W.m-2.K-1 and 0.4 W.m-2.K-1]*

### Windows and Doors

*[The choice of windows and doors is up to the applicant, the effect of the choice will be seen in the simulation]*

*[Note: Using double glazing is not always the best solution.]*

*[Windows and doors characteristics should be details as per the table below.]*

*[Glazing #3 could be added to the table below in case of need]*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Type*** | ***Height (m)*** | ***Width (m)*** | ***Frame*** | | ***Outer glazing*** | | | | ***Glazing #2*** | | | | ***Gap*** | | ***Overall***  ***Uvalue***  **(W.m-2.K-1)** |
| ***Material*** | **λ**  **(W.m-1.K-1)** | ***δ (mm)*** | ***Type*** | ***SC\**** | ***e\*\**** | ***δ (mm)*** | ***Type*** | ***SC*** | ***e*** | ***δ (mm)*** | ***Type*** |
| ***Window 1*** |  |  |  |  | *3* | *Clear* |  |  | *3* | *Clear* |  |  | *6* | *Air space* |  |
| ***Window 2*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ***Door*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*\*SC: Shading Coefficient-The ratio of solar heat gain that will pass through glazing*

*\*\*e: Emissivity*

*[Architectural Shading types should also be provided. Kindly refer to the table below]*

*[In COMFIE- Pleiades, it is possible to add shading plantation if there is any.]*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Shade Type*** |  | ***Projection from surface (mm)*** | ***Height above window***  ***(mm)*** | ***Distance from edge of window***  ***(mm)*** |
| *1* | *Overhang* |  |  |  |
|  | *Fin* |  |  |  |
|  |  |  |  |  |
| *2* | *…* |  |  |  |

*[Windows and doors should be attributed to each façade of the building as per the table below]*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Wall number*** | ***Wall gross area (m2)*** | ***Shade type*** | ***Exposure*** | ***WWR\****  ***%*** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

*\*WWR: Window to Wall Ratio is the ratio of the window area to the gross wall area of a building. The gross wall area includes the windows area.*

*Note: In the table above you can add the effective fenestration ratio.*

*The effective fenestration ratio provides a global evaluation of the exposure of the building to solar radiation. This factor takes into consideration the orientation of windows and skylights, the shading coefficient of the glazing as well as architectural shading.*

### Infiltration

*[Infiltration is the unintentional or accidental introduction of outside air into a building, typically through cracks in the building envelope and through use of doors for passage.*

*Infiltration will only apply to spaces having a perimeter exposure. The same infiltration value will be used for cooling design, heating design and energy simulation conditions.]*

*[Infiltration rates should be provided.]*

*[For HAP users, kindly refer to ASHRAE Standards 62.1 (Ventilation for Acceptable indoor Air Quality) and 62.2 (Ventilation for Acceptable indoor Air Quality in Low-Rise Residential Building).]*

*[For COMFIE- Pleiades users, kindly use the French standard\* and the French Method of calculation\*\*. Infiltration represents the air leakage and is expressed in m3.h-1m-2 under a pressure difference of 4 Pa. The considered surface is the surface of wasteful walls where the lower floor is excluded.*

*Kindly refer to table below to choose the corresponding infiltration rate. The third column is the most exigent rate where it refers to the new French label Effinergie. A building certified by Effinergie Label presents a performance lower than 40 kWhPE.m-2y-1]*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Building Type*** | ***Infiltration rate (m3.h-1m-2)*** | | |
|  | *Default Values* | *Justified with the process of building airtightness quality* | *Effinergie* |
| *Detached House* | *1.3* | *0.8* | *0.4* |
| *Apartment Building, Office building, hotel, restaurant, schools, small retail* | *1.7* | *1.2* | *0.8* |
| *Other usages* | *3.0* | *2.5* | *1.2* |

*\*Arrêté du 24 mai 2006 relatif aux caractéristiques thermiques des bâtiments**nouveaux et des parties nouvelles de bâtiments, Chapitre IV-Perméabilité à l’air*.

\*\**Method Th-C-E 2005 related to the reference \**

*[Simulations should be done by fixing the set temperatures as per the table below]*

|  |  |  |
| --- | --- | --- |
| ***Temperature required for simulation °C*** | | |
|  | ***Occupied space*** | ***Unoccupied Space*** |
| *Cooling* | *24* | *27* |
| *Heating* | *20* | *18* |

*[The required internal humidity should correspond to the temperature set as per the figure below for summer and winter]*

|  |
| --- |
|  |
| ***ASHRAE Summer and Winter Comfort Zones*** |

## Ventilation

*[Ventilation could be natural or forced, the ventilation rates should be provided. Climatic conditions may affect choice of ventilation option chosen.]*

*[For HAP users, ventilation rates depending on each type of room are detailed in ASHRAE Standards 62.1 (Ventilation for Acceptable indoor Air Quality) and 62.2 (Ventilation for Acceptable indoor Air Quality in Low-Rise Residential Building).]*

*[For COMFIE- Pleiades users, the French standard refers to the airflow rate extracted depending on the room type.*

*The air extracted from kitchens, bathrooms, and toilet may utilize air supplied through adjacent living areas to compensate for the air exhausted. The air supplied shall meet the requirements of exhaust systems and be of sufficient quantities to meet the requirements of the table below.]*

*[The table shows the minimum ventilation rates required for an acceptable indoor air quality\*\*\*]*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***Minimum flow rates of extracted air in Residential Facilities(m3.h-1)*** | | | | | | | |
| *Number of main rooms* | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| *Total* | *35* | *60* | *75* | *90* | *105* | *120* | *135* |
| *Kitchen* | *20* | *30* | *45* | *45* | *45* | *45* | *45* |
| *Bathroom* | *15* | *15* | *30* | *30* | *30* | *30* | *30* |
| *Other bathrooms* | *15* | *15* | *15* | *15* | *15* | *15* | *15* |

*\*\*\*Arrêté du 24 mars 1982 relatif à l'aération des logements*

*[For instance, if the studied house consists of five main rooms, the air flow rate has to be equal to 105 m3.h-1. To avoid disturbance to the balance of air distribution and to avoid unwanted drafts in the house, the required fresh air is assumed to be equal to the air extracted from technical rooms which is in this case 105 m3.h-1.]*

*[When ventilation is provided by a mechanical device that automatically adjusts the air flow rate, so that the rate of indoor air pollution pose no danger to health and can avoid the condensations, except transiently, flow rates defined by the table above can be reduced.]*

*[If the fresh air renewal is mechanical, filtration of fresh air is required with efficiency> 90% and> 95% for air recycling.]*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***Minimum flow rates of extracted air in Residential Facilities(m3.h-1)*** | | | | | | | |
| *Number of main rooms* | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
| *Total* | *10* | *10* | *15* | *20* | *25* | *30* | *35* |

*[The table below shows the minimal rates of air change for Nonresidential buildings]*

|  |  |
| --- | --- |
| ***Minimum flow of fresh air per occupant (m3.h-1) for nonresidential buildings*** | |
| *Offices, premises without physical effort* | *25* |
| *Premises of restoration, sales, meetings* | *30* |
| *Workshops, premises with slight physical effort* | *45* |
| *Other premises and workshops* | *60* |
| *Kindergartens and elementary classroom* | *15* |
| *High schools classroom, library, meeting room* | *18* |
| *Pools* | *20* |
| *Sport premises* | *25* |

*[For other types of facilities please refer to “Ventilation et Infiltrations-Guide d’Audit énergétique”.]*

*[Internal air current should be considered in the simulation. Air convection between two spaces can be integrated in both simulation tools.]*

*[In summer, a night ventilation could be considered by using free cooling airflow rates.]*

## Internal Heat Gains

*[In this section, it is required to provide the following information.]*

|  |  |
| --- | --- |
| ***Occupants*** | |
| *Number* | *1* |
| *Activity level* |  |
| *Sensible heat* |  |
| *Latent Heat* |  |

|  |  |  |
| --- | --- | --- |
| ***Lighting*** | ***Type*** | ***Wattage (W/m2)*** |
| *Overhead* |  |  |
| *Task* |  |  |

*[Sensible and latent miscellaneous loads (W) should be also provided.]*

*[Electrical equipment wattage (W) could be provided.]*

*[For COMFIE- Pleiades users, LCEC recommends using the table below for Occupancy internal heat gain.]*

|  |  |  |  |
| --- | --- | --- | --- |
| *Occupancy Internal Heat Gain* | | | |
| *Usage Type* | ***Occupancy Schedule*** | ***W. m-2*** | ***kg .h-1. m-2*** |
| *Institutions with accommodation* | *Long* | *5* | *0.006* |
| *Residential* | *Long* | *5* | *0.002* |
| *Hotels* | *Long* | *3* | *0.004* |
| *Health establishment without lodging* | *Medium* | *7* | *0.004* |
| *Education* | *Medium* | *7* | *0.004* |
| *Office* | *Medium* | *14* | *0.006* |

## Schedules

*[Schedules should be provided for*

* *Occupancy*
* *Ventilation*
* *Infiltration*
* *Temperature for cooling and heating.*
* *Lighting*
* *Domestic hot water*
* *Schedule for Electrical equipment could be added in this section but it is not mandatory for the moment.]*

*[Schedules should be provided for hourly functions as per the table below.]*

*[This table shows three type of occupancy schedules. For instance the Long type corresponds to a single-family detached house.]*

|  |  |  |
| --- | --- | --- |
| ***Occupancy Schedule*** | | |
| ***Type*** | ***Hours per day*** | ***Days per week*** |
| *Long* | *16 (0h00 - 10h00 and*  *18h00-24h00)* | *5 (Monday to Friday)* |
| *24* | *Saturday and Sunday* |
| *Medium* | *10 (8h00- 18h00)* | *5 (Monday to Friday)* |
| *Short* | *5 (9h00 - 14h00)* | *5 (Monday to Friday)* |

|  |  |  |
| --- | --- | --- |
| ***Thermostat schedule*** | | |
| ***Type*** | ***Hours per day*** | ***Days per week*** |
|  | *…* | *…* |
| *…* | *…* |
|  | *…* | *…* |
|  |  |  |

## Simulation

*[After filling all the above information into the software, simulations should be run for a whole year. Simulations consider the hourly change in outdoor conditions (temperature, humidity, solar irradiation… It considers also the inertia of the envelope that can help reducing sometimes the peak loads in cooling or heating. The results should be presented similar to the following tables.]*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***Zones*** | ***Heating Load***  ***kWh*** | ***Heating Load***  ***kWh/m²*** | ***Cooling Load***  ***kWh*** | ***Cooling Load***  ***kWh/m²*** | ***Lighting***  ***Load***  ***kWh/m2*** | ***DHW***  ***load***  ***kWh/m2*** | ***Ventilation***  ***Load***  ***kWh/m2*** |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| … |  |  |  |  |  |  |  |
| … |  |  |  |  |  |  |  |
| ***Total*** | ***218*** | ***2*** | ***1911*** | ***20*** |  |  |  |

*[For additional information about ventilation load calculations, kindly refer to ASHRAE Handbook-Fundamentals 2013-Chapter 16 Ventilation and Infiltration.]*

*[Hot water demand should also be provided. It can be achieved by the simulation tool or calculated separately.]*

*[If calculated separately, the below table must be filled while clearly stating all made assumptions.]*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Hot Water Demand*** | | | |
| ***Hot Water Use*** | ***Average Liters per Usage/person*** | ***Number of persons*** | ***Estimation of daily hot water use (Liters)*** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| ***Total daily Demand (Liters)*** | | |  |
| ***Energy needed to heat water (kWhPE.m-2.y-1)*** | | |  |
| ***Energy needed to heat water (kWhFE.m-2.y-1)*** | | |  |

*[Add additional rows for additional uses as needed.]*

*[The calculation of the Energy needed to heat water should be provided, as well as the type of primary or final energy used to accomplish it.]*

*[The lighting load can be achieved by the simulation tool or calculated separately.]*

*[If calculated separately, kindly fill the table below, and show the calculation method.]*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Lighting*** | | | |
| ***Type*** | ***Quantity*** | ***Power*** | ***Effective Lumens*** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

*[The table below must be filled according to the proposed replacement or installation of the lighting system.]*

|  |  |
| --- | --- |
| ***Lighting System*** | |
| ***Total lighting load (kW)*** |  |
| ***Total lighting Load (kWhFE.m-2.y-1)*** |  |

*[In the table below, the solar heat gain, the overheating hours and Energy losses must be provided.]*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Zones*** | ***Solar heat gains kWh*** | ***Number of hours overheating*** | ***Energy losses***  ***kWh*** | ***Space T° Min***  ***°C*** | ***Space T° Max***  ***°C*** |
| 1 |  |  |  |  |  |
| … |  |  |  |  |  |
| … |  |  |  |  |  |

*[The hourly heating and cooling demand all over the year should be presented as per the following figure. The start date of the simulation should be specified]*



*[By adding heating, cooling, ventilation, lighting and domestic hot water demand, the building performance is calculated kWh.m-2.y-1.]*

***[Attention: Make sure of adding Final Energy for heating, cooling, ventilation, lighting and domestic hot water in kWhFE.m-2.y-1.]***

*[This calculated building performance must be compared to the zone correspondent αFEC.]*

|  |  |  |
| --- | --- | --- |
| **Building type** | |  |
| **Zone** | |  |
| **αFEC of this building type in the zone (kWh FE.m-2.y-1)** | |  |
| **Floor Area (m2)** | |  |
| **Overall building Performance (kWh FE.m-2.y-1)** | |  |
| **Consumption**  **(kWh FE.m-2.y-1)** | **Heating** |  |
| **Cooling** |  |
| **Ventilation** |  |
| **Domestic Hot Water** |  |
| **Lighting** |  |
|  | |  |

*[A soft copy of building simulation should be provided when submitting the project]*

# Annex: Lebanese Climatic Zones

## Climatic Zone 1: Coastal

|  |  |  |
| --- | --- | --- |
| **Mohafaza** | **Qadaa** | **Real-estate District** |
| Beirut | Beirut | All |
| Mount Leb | Baabda | Chiyah; Furn Ech-Chebbak; Haret Hreik; Laylaki; Bourj El-Brajneh; Tahouitat El Ghadir; Baabda; Hadath Beyrouth; Boutchay; Merdache; zire; Kfar Chima; Ouadi Chahrour Es-Souf; Ouadi Chahrour El Aaou; Haret Es-Sit; Bsaba Baabda; Chouit; Aaraiya |
| Mount Leb | El Metn | Bourj Hammoud; Sinn El-Fil; Jdaidet El-Matn; Baouchariat ; Deir mar Roukoz; Dekouanet; Mkalles; Antelias; Menqlet Mezher; Jall Ed-Did; Naqqach; Aamaret Chalhoub; Zalqa; Byaqout; Mazraat El-Hdaira; dbaye; Haret El-Ballane; Mazraat Deir Aaoukar; Mansouriyet El-Matn; El-Dechouniyeh; Fanar; kafra ain saade; Roumieh; Bqennaya; Majzoub; Bsalim; Nabay; Mtayleb; Beit El-Kekko; Qornet Chehouane; Beit Ech-Chaar; Dik El-Mehdi; Zouk El-Kharab; Aain Aar; Mazraat Yachouaa; Deir Tamich; Zakrit; Deir Mar Aabda el Mcha; Beit Chabab; bherzoq; frayke; Hbous; Qornet El-Hamra; Jouret El-Ballout; Qennabet Broummana; Beit Meri |
| Mount Leb | Chouf | Damour; Naamat; Mechref; Chhim; mazboud; Dalhoun; Chammis Ech-Chouf; Ketermaya; El-Maaniyeh; Ouadi Abou Youssef; Sibline; Bourjein; Barja; Bkechtine Ouel Mcheiaa;Baassir;Debbiyeh; Benouati Ech-Chouf; El Jiyeh; Jadra; Chmaarine; Dahr Ech-Chouf; Aalmane Ech-Chouf; Jmeiliyeh; Rmeilet Ech-Chouf; Majdalouna; El-Wardaniyeh; Joun; mghayriye ech chouf; Deir El-Moukhalles; reiaa; Bkifa Ech-Chouf; Mazmoura; Kfar Faqoud; Deir Baba; Sirjbal; GHabet Jaafar; Kfar Him; Ouadi Ed-Deir; Dmit; Bqaiaa Ech-Chouf; Moughayret Ech-Chouf; Deir Dourit; Ouadi bnehlay; El-Jahliyeh |
| Mount Leb | Aley | Chouaifat Amroussyat; Chouaifat Qobbat; Choueifat El-Oumara; Deir Qoubel; Aaramoun Aaley; Aain Drafil; Sirhmoul; Baaouerta; Bchamoun; Daqqoun; Aain Aanoub; Blaybel; Houmal; Bdadoun; Bsous; rjoum; Aaytat; Aaley Bsatine; Aabey; Kfar Matta |
| Mount Leb | Kasrouane | jounieh kaslik; Zouk Mkayel; Jounie Ghadir; Zouk Mousbeh; Jounie Haret Sakhr; Sahel Aalma; Ouata Sillam; Kfar Yassine; Tabarja; Adma Oua Dafine; Safra Kesrouane; Bouar; kfar shihham; Bqaq Ed-Dine; Kharayeb Nahr Ibrahim; Balloune; Souhailet El; Faouka; Aain Er-Rihane; Jaaita; Aintoura Kesrouane; Mazraat Er-Ras; Ghazir; Bourj El-Ftouh; Chnanaair; Batha; Ghidras; Deir Baqlouch; Harissa Kesrouane; Nammoura; Kesrouane; Daraaoun; Maaysra Kesrouane; Bizhel; Zaitoun |
| Mount Leb | Jubail | Jbayl; Mastita; Qartaboun; Blat Jbeil; edde jbail; Aamchit; Halate; Hasrayel; Rihanet Jbayl; Jeoddayel Jbayl; Nahr Ibrahim; Mounsef; Berbara Jbayl; kfar kidde; Aalita; Bchille Jbayl; Zibdine Jbayl; Brayj Jbayl; Behdaydat; Ramout; Saqiet El-Khayt; Kfar Qouas; Fatre; Kfoun; Bintaael; Beit Habbaq; kafr; jlisse; mhammara bejje; Ghalboun; Chamate; Hbaline; Bmehrayn; Hboub; Hsarat; Kfar Mashoun; Aain Kfaa; Ghofrine; Maad; Gharzouz; Chikhane; Chmout; Bekhaaz; Fghal |
| North | Tripoli | All |
| North | Koura | All |
| North | Zgharta | Zgharta; Aardat; Kfardlaqous; Rachaaine; Qarah Bach; Kfarhata Zgharta; Arde; Asnoun; Mazraat Ajbeaa; Mejdlaiya Zgharta; Hariq Zgharta; Aalma; Mazraat Jnaid; Deir Jdeide; khaldiye; Iaal; Kfarhoura; Kfarzaina; Kfarchakhna; Bsebaal; Sakhra; Houakir; Kfaryachit; Morh Kfarsghab; Bchannine; Bnechaai; Aarjis; Daraiya Zgharta; Kfarfou; Ras Kifa; karm sadde; Tallet Zgharta; Sebaal Zgharta; Danha; Aachach; Miriata; Hailan; Boussit; Mzraat Kefraya; Hraiqis |
| North | Batroun | Litige; Batroun; Rachana; Thoum; Kfar Aabida; Koubba; Selaata; Heri; Chikka;  Dahr Abi Yaghi; Toula El-Batroun; Daraya El-Batroun; AAbdelli; Jrabta El-Batroun; Chibtine; Deir Kfifane; Sghar; Deir Mar Youssef Jrabt; Mrah Ez Ziyat; Ghouma; Kfifane; Jrane El-Batroun; Smar Jbayl; Kfar Hatna; Zane; Ftahat El-Batroun; Kour; Basbina; Aartiz; Harbouna; Mrah Chdid; Kfarb Shlaimane; Edde El-Batroun; Sourat El-Batroun; Bijdarfil; Ijdabra; Helta; Aabrine; Kfar Hay; Jebla; Rachkida; Boqsmaiya; Daael; Kfar Khollos; Qatnaaoun; Ras Nahhach; Ouajh El-Hajjar; Hamat |
| North | Akkar | Litige; Halba; Cheikh Mohammad; nfisse; Idbil; Kroum El-Aarab; Cheikh Taba  Es-Sahl; Cheikh Taba; Jdidet Ej-Joumeh; Zouarib; Majdel Akkar Minyara; Hakour; Karm Aasfour; Mazraat Beit Ghattas; Qantarat Aakkar; Machha; Hayzouq; Aarqa; Souaisset Aakkar; Ilat; Bqerzla; Deir Dalloum; Zouk-El-Hosmieh; Zouq El-Hbalsa; Dahr Laissine; Kfar Harra; balde; Zouq El-Hadara; Zouq El-Moqachrine; Jebrayel; Mar Touma; Hedd; Tikrit; Tallet Chattaha; Beit Mellat; Beino; Aayoun Aakkar; Qboula; Chaqdouf; Borj Aakkar; Tall Aabbas El-Gharbi; Tall Aabbas Ech-Charqi; Koueikhat; Khreibet Ej-Jindi; Saadine; Haouchab; Hayssa; Hokr Etti; Chir mairine; Darine; sammouniye; massaoudiye; Tall Meaayan Tall Kiri; Qaabrine; Kfar Melki Aakkar; tall bireh; Tall Hmayra; Hokr Jouret Srar; Barcha; Qleiaat Aakkar; Kneisset Aakkar; Tall Sebaal; aabboudiye; Mighraq Aakkar; Hokr Ed-Dahri; Marlaya; Melhem; Kharnoubet Aakkar; Semmaqli; Mqaiteaa; Janine; Aamaret Aakkar; Cheikh Zennad; Qoubber Chamra; sammaqiye; AAridet Cheikh Zennad; Bebnine; Mhammaret; Rmoul; Sayssouq; Berqayel; Bzal; Kloud El-Bakia; Dinbou; Chane; Houaich; Sfaynet El-Qaitaa; Qabaait; Habchit; Homeira; Qardaf; Jdeidet El-Qaitaa;  Aayoun El-Ghizlane; Majdala; rahbe; Ouadi El-Jamous; Beit El-Haouch; Fraydes Aakkar; Khirbet Daoud Aakkar; daghle; Aamriyet Aakkar; Kafr; Bsatine Aakkar; Aain Ez-Zeit; Kouachra; Khirbet Char; dibbabiye; Berbara Aakkar; Aain Tinta; Baghdadi; Deir Jannine; douair aadouiye; Noura Et-Tahta; Sfinet Ed-Draib; Aamaret El-Baykat; Msalla; Qachlaq; Ouadi El-Haour; Charbila; Tleil; mzeihme; Haytla; knisse; Rihaniyet Aakkar; Saidnaya; Hmaiss Aakkar; Srar; El-Ghozaili; El-Armeh |
| North | Minieh-Danie | Beddaoui; Deir Aammar; bourj el yahoudieh; Nabi Youcheaa; Minie; rihaniet-minieh; Zouq Bhannine; Btermaz; Harf Es-Sayad; Harf Es-Sayad; Beit Zoud; Mrah Es-Srayj; Debaael; Qarhaiya; Aazqai; Aasaymout; Kfar Chellane; Kfar Habou; Deir Nbouh; Merkebta; Raouda-Aadoua; Tourbol; Bakhaaoun |
| South | Saida | All |
| South | Sour | All |
| South | Jezzine | Kfar Falous; A'ain El-Mir; Mrah El-Hbasse; Bayssour Jezzine; haytoule ; Lebaa ;  mharbiye; Ouadi El-Laymoun; Sfaray; hassaniye; Karkha; Choualiq Jezzine;  Ouadi Baanqoudaine; Mjaydel Jezzine; Dahr Ed-Deir; Jensnaya; Rimat; Kfar Jarra; Anane; baanoub; Jernaya |
| Nabatiye | Nabatiye | All |
| Nabatiye | Bint Jubail | All |
| Nabatiye | Marjaayoun | All |

## Climatic Zone 2: Western Mid-Mountain

|  |  |  |
| --- | --- | --- |
| **Mohafaza** | **Qadaa** | **Real-estate District** |
| Mount Lebanon | Baabda | Baalchmay; Aain Mouaffaq; Rouaysset El-Ballout; Mzairaa Baabda; El Halaliyeh haret hamze, kahlounieh; Qtale baabda, deir mar youhanna; Ras El-Href; Deir Khouna; El-Abadiyeh; Qrayet Baabda; Chmeisset Baabda; Ras El Matn; Qobbayaa; Qordata; El-Ksaibeh; Deir El-harf; Zandouqa; Kneisset Baabda; El-Erbaniyeh; dlaybeh; Salima Baabda; Hasbaiya El-Matn; Qalaat Baabda; chbaniyeh; Khreibet Baabda; Bmaryam; Btekhnay; Btibyat; Qornayel; Jouar El-Haouz; Bzebdine; Arsoun; Jouret Arsoun |
| Mount Lebanon | El Metn | Bikfaya; Mhaidset Matn; Ouadi Chahine; Aain El-Qach; Mar Boutros Karm; Bhersaf; mayassa; ain el kharroubeh; Himlaya; aain Aalaq; aatchaneh; Aain Et-Teffaha; Sfeilet Bikfaya; Abou Mizane; Deir Chamra; Jouar El-Matn; Chrine; Broummana El-Matn; Masqa; Aayoun El-Matn; Mar Chaya et Mzakki; Baabdat; Dahr Es-Souane El-Matn; Qannebet; Salima; Bsifrine; aain ezzeitouneh; Khillet El-Mtain; Bnabil; Aain es-Sofsaf El-Matn; Ouata El-Mrouj; Mrouj; Marjaba; Aain Es-Sindiane; Zaraaoun; Qaaqour; Khinchara; Choueir; Bteghrine; Douar El-Matn; Chouaya El-Matn; Aayroun; Zighrine El-Matn; Aain El-Qabu; Kfar Aaqab; Mar Moussa Ed-Douar; Machraah El-Matn; Ouadi El-Karm El-Matn; Zabbougha; Kfar Tay El-Matn |
| Mount Lebanon | Chouf | Daraiya Ech-Chouf; Aanout; Debbiyeh; mtallet ech chouf, bzina; Mazraat Es-Dahr; Khirbet Bisri; El-Jleiliyeh; Zaarouriyeh; Bsaba Ech-Chouf; Beit Ed-Dine; Deir El-Qamar; Kfar Hamal; El-Samkanieh; Kfar Qatra; Maasser Beit Ed-Dine; Bchtfine; Kneisset Ech-Chouf; Aammiq Ech-Chouf; deir koucheh; Mazraat Ed-Douair; Ouadi Es-Sitt; Majdel El-Meouch; Faouarat Jaafar; Biret Ech-Chouf; Chourit; Kfar hay; Kfar Niss; Brih; El-Werhaniyeh; Fraudis Ech-Chouf; Aain Zhalta; Baaqline; Aainbal; Aathrine; gharifeh Hasrout; Moukhtara; botmeh; Aain Qania; Jdeidet Ech-Chouf; Niha El-Chouf; Aain Ouzain; Baadarane; Khereibet Ech-Chouf; Aammatour; Kahlouniet Ech-Chouf; Haret Jandal; Mazraat Ech-Chouf; Kfar Nabrakh; Mristi; Batloun; Maasser Ech-Chouf; Jbaa Ech-Chouf; Bater; Barouk; Bayqoun |
| Mount Lebanon | Aley | Aaley; El-Kamatiyeh; aain erroumaneh aaley; Bmakine; Bkhichtay; Ghaboune; aain el jdideh aaley; Behouara; Souq El-Gharb; Bteezanieh; El-Rejmeh; Keyfoun; Chimlane; Kfar Aamay; Bayssour Aaley; Douair El-Roummane; Rouayssat En-Naamane; Mejdlaiya; Aaynab; Chartoun; bou zrideh; Dfoun; Richmaiya; Aain Traz; Selfaya; Rimhala; Binnay; Aain Ksour; Jisr El Qadi; Bhamdoun El-Mhatta; Bhamdoun Ed-Dayaa; Chanay; Btalloun; Majdel Baana; Saoufar; Aain El Halazoun; Bedghan Oua Ouadi Bedg Bedghan Oua Ouadi Bedg; Homs Oua Hama; Mansouriyet Bhamdoun; Mchekhti; Charoun; Btater; Ighmid; EL-Azouniyeh; El-Mechrefeh; Habramoun; Bserrine; El-Ramliyeh; Maasrati; Mazraat En-Nahr Aaley; Mrayjat Aaley |
| Mount Lebanon | Kasrouane | Litige; Aajaltoun; Daraiya Kesrouane; Jdaidet Ghazir; Ghosta; Maarab; Dlebta; Aaramoun Kesrouane; Kfour Kesrouane; Ghidras; Harharaya; Bzoummar; souhoum el ghineh, aain abeaal; Hsayn; Hayata; Chahtoul; zaaitre; Jouret E-Tourmos; Jouret Mhad; Aazra ouel Aazr; jaayel ghbaleh, mashhat; Jouret Bedrane; El-Mradiyeh; Nahr Ed-Dahab; yahchouch; Eghbeh; Rayfoun; Qleiaat Kesrouane; Mazraat Mrah El-Mir; Aachqout; Faytroun; Beqaata Aachqout; Raachine; Kfar Dibiane; Beqaata Kanaan; Kfar Tay Kesrouane; Kfar Tay Kesrouane; Bqaatouta; Ouata El-Jaouz; Mayrouba; aain el delbeh kesrwan; Mghayer; Chouane |
| Mount Lebanon | Jubail | Ehmej; Almate El-Chemaliat; Mazraat El-Maaden; Almate El-Jenoubiat; Tourzaiya; Ferhet; Michmich Jbayl; Souanet Jbayl; aain el delbeh jbeil; Frat; Kfar Baal; Hjoula; Aain Jrain; Hsoun; Mechane; Lehfed; Habil; Jouret El-Qattine; Birket Hjoula; Adonis Jbayl; Ras Osta; Bichtlida; Haqel; Kharbet Jbayl; Qottara Jbayl; Sebrine; Aabaydat; Mayfouq; Bayzoun; Qartaba; janneh; Lassa; Qorqraiya; Boulhos; Qahmez; Saqi Richmaya; Jaj; Tartij |
| North | Zgharta | Beslouqit; Aintourine; Aarbet Qozhaiya; Toula Zgharta ; Mazraat Et-Teffah ; Bhairet Toula; Ayto; Miziara; Seraal; Ijbaa |
| North | Batroun | Masrah; Douq; Mar Mama; Mehmarch; Aalali; Racha; Mrah El-Hajj; Assia; Nahla; Douma; Bcheaali; Beit Chlala; Deir Mar Youhanna; Bechtoudar; Kfar Hilda; Kfour El-Aarbi; Ram El-Batroun; Hadtoun; Tannourine Et-Tahta; Hardine; Beit Kassab; Deir Billa; Niha El-Batroun |
| North | Akkar | Daouret Aakkar; Aaiyat; Aain Yaaqoub; Bezbina; Aakkar El-Aatiqa; Beit Younes; Sadaqa Hrar; Khreibet Aakkar; Qraiyat; Beit Ayoub; Michmich Aakkar; Qornet Aakkar; Fnaydeq; Tshea; Menneaa; Cheikhlar; Rmah; Kfar Noun; bardeh, beit jaalouk; Khirbet Er Remmane; Sindianet Zeidane; Mounjez; Qsair Aakkar; Biret Aakkar; Aaouaainat Aakkar; Khalsa; Machta Hammoud; Mazraet-El-Nahrieh; Qbaiyat Aakkar; Aandqet; Dayret Nahr El-Kabir; Aamayer; Hnaider; Kneisset Hnaider; Mazareaa Jabal Akroum; Qarha Aakkar |
| North | Bcharre | Qnayouer; Billa; Aabdine; Tourza; Qnat; Mazraat Bani Saab; Berhalioun; Ouadi Qannoubine; Mazraat Aassaf; Blaouza; Moghr El-Ahoual; Metrit; Beit Menzer |
| North | Minieh-Danieh | Sir; Aassoun; Mazraat Ketrane; qattine-md; Bqarsouna; El-Hazmieh; tarane; Mimrine; haql el aazimeh; Beit El-Faqs; Mrah Es-Sfire; aain ettineh-md; Kharnoub; sfireh; Qarsaita; Izal; Qemmamine; Karm El-Mohr; Qraine; Hawara; Beit Haouik; Jayroun; Aaymar; Zaghartaghrine; Behouaita; Kahf El-Malloul; Jarjour; Bechehhara; Qarne; Mazraat El-Kreme; Kfar Bibnine |
| South | Jezzine | Jezzine; Wadi Jezzine; Qabaa Jezzine; qaytouleh, mrah bou chdid, tayoun; Bkassine; homsiyeh; Aaray; Sabbah; Haytoura; El-Ghabbatieh; Benouati Jezzine; Maknounet Jezzine; Btedine El-Leqch; Roummanet; machmoucheh; Midane Jezzine; Jabal Toura; kfar houne, mazrat btediniye, mza; Harf Jezzine; Baba; Zhilta; Bhannine; Aazour; Taaid; Bisri; Mazraat Er-Rouhbane; Saydoun; Roum; Hidab; Deir El Qattine; Sanaya; Mazraat El-Mathane; Srayri; Aaramta; Mlikh; Rihane Jezzine; Mazraat; Qatrani; Louayzet Jezzine; Mazraat Khallet Khazen; Mazraat Qrouh; Mazraat Zighrine Jezzi; Chbail; mazrat louzid (awzieh); Soujoud; aaychiyeh, mazrat souwairi; mazrat wazaiyyeh; wardiyeh; Mazraat El-Aarqoub; El-Mahmoudiyeh; Jarmaq; Mazraat Daraya; El-Demachkiyeh; Mazraat Tamra; Bouslaya |
| Nabatiye | Hasbaiya | Hasbaiya; Abou Qamha; Aain Jarfa; Fardis Hasbaiya; Rachaiya El-Foukhar; Kfar Hamam; hebbarieh; Chouaya Hasbaiya; Aain Qinia; Meimes; Chebaa; marj ezzouhour (hawsh qinnabe); Kaoukaba Hasbaiya; Salaiyeb; Bourghos; Meri; Kfar Chouba; Khalouet Hasbaiya; Kfayr Ez-Zait; majidieh, khirbet doueir hasbayya; dellafeh; Khreibet Hasbaiya |

## Climatic Zone 3: Inland

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| **Mohafaza** | **Qadaa** | **Real-estate District** |
| Bekaa | Zahle | All |
| Bekaa | West Bekaa | All |
| Bekaa | Baalbek | Baalbek; Aain Bourday; Douris; Iaat; Aadous; Haouche El-Tal Safyat; Taibet Baalbek; Majdaloun; Haouche Barada; maqneh; haouch El-Dehab; saaideh; Jebaa; Kfar Dane; Hadath Baalbek; Ras Baalbek Es-Sahel; Fekehe; Aain Baalbek; Bajjaje; Nabi Osmane; Ras Baalbek Ech-Charqi; Al-Labouat; Zabboud; Qaa Baalbek; Deir Mar Maroun Baalbek; Moqraq; Qaa Wadi El-Khanzir; Qaa Baayoun; Sbouba; Al-Qa Jouar Mekie; Chaat; Qarha Baalbek; Ram Baalbek; Youmine; Deir El-Ahmar; Kneisset Baalbek; Bechouat; Riha; Dar El-Ouassaa; Btedaai; Bednayel Baalbak; Qsarnaba; Temnine El-Faouqa; Beit Chama; Haouch Er-Rafqa; Misraya; Slouqi; Temnine Et-Tahta; Kfar Dabach; Chmistar; Haouch En-Nabi Chite; Haouch Snaid; Taraiya; Serraaine Et-Tahta; Talia; Hizzine; Khodr Baalbek; Nabi Chit; Jenta; Kharayeb El-Hermel; Yahfoufa; Haour Taala; Brital; Khreibet Baalbek; Bouday; Chlifa |
| Bekaa | Hermel | Hermel; Ras Baalbek Wadi Faara |
| Bekaa | Rachiaya | Rachaiya el wadi; Aaqabet Rachaya; Bakkifac Rachaya; Dahr El-Ahmar; Beit Lahia; Tannoura; Kfar Denis; mhaydseh rachaya; Kaoukaba Bou Arab; Aain Rouha; Khirbet Rouha; Kfar Lichki; Rafid Rachaiya; hawsh qinnabe, mazraat jaafar; Biret Rachaiya; Aain Aarab Rachaiya; Aain Aata; Majdel Balhis; Mdoukha; Yanta; Aayta El-Foukhar Nabi Safa |

## Climatic Zone 4: High Mountain

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| **Mohafaza** | **Qadaa** | **Real-estate District** |
| Mount Lebanon | Baabda | Hammana; Khalouat Baabda; Falougha; Kfar Selouane; Tarchich |
| Mount Lebanon | El Metn | Mtain; Mchikha; Aintoura El-Matn; Majdel tarchich; Baskinta; Kfar Tay El-Matn |
| Mount Lebanon | Aley | Aain Dara; Bmahray |
| Mount Lebanon | Kasrouane | Hrajel; Faraya; Mchaa Kfar Dibiane; Mchaa Faraya; Mchaa El Ftouh |
| Mount Lebanon | Jubail | Mar Sarkis; aain el ghouaybe; Mazraat Es Siyad; Hdeine; Seraaiita; Ghabat; mghayre jbayl; Yanouh Jbayl; Majdel El-Aqoura; Laqlouq; Afqa Jbayl; Aaqoura; Aarab El-Lahib; Hema Mar Maroun Aannaya; Hema Er-Rehban; Aarasta |
| North | Zgharta | Ehden; Kfarsghab |
| North | Batroun | Chatine; Ouata Houb; Tannourine El-Faouqa |
| North | Bcharre | mchaa ej jibbeh; bcharre; hadath ej jebbeh; Bane; Breissat; Dimane; Hasroun; Hadchit; Bazaaoun; Bqerqacha; Bqaa Kafra |
| North | Minieh-Danieh | Bqaa Sefrine; Bechnnata; Mrebbine |
| Bekaa | Baalbek | Aamchki; nahleh baalbek; Aain Es-Siyaa Chadoura; Aarsal; Halbata; Harabta; Nabha Ed-Damdoum; Barqa; Aaynata Baalbek; yammoune; Mazraat beit Mchaik; Maaraboun; Ham; Aain El-Barnaya; chaaibe; Nabi Chbay; Aain Ej-Jaouz Baalbek; Tfail; Ouadi El-Aaoss |
| Bekaa | Hermel | mchaa marjhine, saaidiy; Zighrine; Charbine El-Hermel; Ras Baalbek El Gharbi; Ouadi Faara; Hermel Jbab; Maaysra El-Hermel |
| Bekaa | Rachiaya | Rachaiya el wadi; Aayha; Kfar Qouq; Bakka; Yanta; Deir El-Aachayer; Selsata; Helouet Rachaiya |