

# DEKWANEH WAREHOUSE

## DESIGN & EXECUTION REQUIREMENTS

Sites Build Department  
Projects Studies

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## Table of Contents

1	GENERAL	3
1.1	SUMMARY	3
1.2	DOCUMENTS and DRAWINGS PROVIDED by MIC1	3
2	DESIGN REQUIREMENTS	3
2.1	CIVIL / ARCHITECTURAL REQUIREMENTS	3
2.2	ELECTRICAL REQUIREMENTS	6
2.3	PHYSICAL SECURITY REQUIREMENTS	9
2.4	LIGHTING REQUIREMENTS	9
2.5	AIR-CONDITIONING REQUIREMENTS	9
2.6	FIRE REQUIREMENTS	10
3	DELIVERABLES	11
3.1	DESIGN AND TECHNICAL FILE	11

# 1 GENERAL

## 1.1 SUMMARY

- A. The purpose of this article is to provide a detailed description of the services expected from the bidder regarding MIC1 Warehouse design and execution at MoT plot in Dekwaneh.

## 1.2 DOCUMENTS and DRAWINGS PROVIDED by MIC1

- A. Topographic survey of the plot #1668 (Annex 01).
- B. REC of the plot #1668 (Annex 02).
- C. Drawing showing the designated area for MIC1 use (Annex 03).
- D. Guideline drawings for the warehouse including Hangar.

# 2 DESIGN REQUIREMENTS

## 2.1 CIVIL / ARCHITECTURAL REQUIREMENTS

- A. Standards

Issues of the following documents, in effect at the time of solicitation for bids, form a part of this specification. In the event of conflict between this specification and the codes, standards, and specifications in this document, the most stringent and/or current requirement shall govern.

1. There should be conformity among the chosen code. Either French codes or American codes shall be adopted for all the design and calculations.
2. American Institute of Steel Construction (AISC) Manual of Steel Construction OR French code for steel construction (CM66).
3. American Welding Society (AWS) OR (CM66): Structural Welding Code.
4. American Institute of Steel Construction (AISC) OR (CM66): Specification for Structural Joints using ASTM A325 or A490 Bolts.
5. American Concrete Institute (ACI) OR French Concrete code (BAEL): Building Code Requirements for Reinforced Concrete.
6. American Uniform Building Code UBC97, International Building Code IBC2009 and French Neige et Vent NV2009 are the approved codes for wind loads calculations.
7. American Uniform Building Code UBC97, International Building Code IBC2009 and French PS92 code are the approved codes for seismic loads calculations.
8. Wind design shall be in accordance with Lebanese standard LIBNOR NL137:2020: Calculation of Wind Loads on Structures.
9. Seismic design shall be in accordance with Lebanese standard LIBNOR NL135:2013: Protection from earthquakes: General rules.
10. *Technical Report 34 - Concrete Industrial Ground Floors – A guide to design and construction, as general guideline.*
11. *Best Practice in Steel Construction INDUSTRIAL BUILDINGS – Guidance for*



*architects, Designers and Constructors, as general guideline.*

## B. General Design

1. The total area of MIC1 area within plot #1668 is estimated at around 6770m<sup>2</sup>.  
The area is split as follows:
  - (a) Outdoor area: 3970m<sup>2</sup> (including storage areas, passageways and a new outdoor building that shall be constructed of 2 stories, which is referred to as Outdoor Offices Building in this document.)
  - (b) Indoor area: 2800m<sup>2</sup>, which is referred to as Hangar in this document
2. Designer is responsible for the geotechnical studies/tests leading to the adoption of the adequate soil parameters.
3. Designer is responsible for the wind and seismic design of the hangar and the outdoor offices buildings.

## C. Hangar Design Considerations

1. The hangar design shall include all the required customer loading conditions.
2. The design shall hold the structure within the critical twist, sway, and displacement limits of the adopted standard.
3. The designer must provide the detailed drawings, the assembly plans, the bolts, the welding if any, etc.
4. The hangar floor (slab on grade) should be able to support the requested loads for an industrial warehouse according to the used standards (static, dynamic, moving, point loads ...). A minimum static uniform load of 3T/m<sup>2</sup> shall be considered.
5. Designer is also responsible for the design of the hangar foundation system and slab on grade floor.
6. The hangar ground floor top should be elevated from external outdoor area by a minimum of 20cm.
7. Designer is responsible for considering loading and unloading of equipment as well as safe and adequate access for a forklift from indoor (hangar) to the outdoor part (ramp, etc.)
8. The hangar shall be self-supported of 70mx40m (2800m<sup>2</sup>) horizontal footprint size.
9. The hangar facades should be vertical.
10. The hangar roof shall be sloped at the middle all along the length/bigger dimension (Gable roof shape or dual pitch).
11. The hangar roof shall offset 50cm all around the hangar footprint on all sides.
12. For safety/security purposes, the hangar facades should be constructed of concrete masonry walls at 3m clear height (measured from the outside). The masonry walls should respect known standards and execution practices (need for concrete columns, lintel, span, etc.).
13. It is preferable that concrete columns support the main hangar columns for up to the masonry wall height (~3m clear from ground).



A minimum clear internal height of 6m is needed on the edges of the hangar (lowest point) unless higher elevation is allowed according to the Lebanese laws and the current situation at hand. Designer to inform MIC1 and its management to decide upon.

14. The hangar structure should account for solar panels installation on the roof as well as maintenance personnel. A structure within/on the hangar roof (same slope) should be provided to host the solar panels' structure.
  15. Control joints and movement joints should be suitably provided, if needed, to minimize drying and shrinkage cracks in the concrete floor.
  16. The hangar roof should prevent:
    - (a) any rain leakage (waterproof)
    - (b) any dust leakage (dustproof)
    - (c) and should be designed to resist the required wind loads as well as additional DL or LL, solar panels, ...
  17. The masonry wall surrounding the hangar (mentioned above) shall be cement rendered and painted.
  18. The hangar walls and roof should be all white.
  19. Two main doors should be provided with dimensions 5m W x 5m H, equipped with key operated electrical motor system.
  20. Adequate drainage is required inside the hangar in case of an emergency.
  21. Water gutters to be installed on the 2 long sides of the roof leading to multiple drainage pipes routed to reach the nearest draining zone/s.
  22. A handrail of 1m high should be installed all around half of the roof (on the side hosting the solar panels) for safety purposes.
- D. Outdoor Offices Design Considerations
1. The hangar design shall include all the required customer loading conditions.
  2. The offices building design shall hold the structure within the critical twist, sway, and displacement limits of the adopted standard.
  3. The designer must provide the detailed drawings, the assembly plans, the bolts, the welding if any, etc.
  4. The building shall be made of metallic structure and sandwich panels walls.
  5. Designer to provide best way for floor and roof finishing, in addition to mechanical and electrical installations (designs taking into consideration the bathrooms and the kitchen).
  6. The building consists of 2 stories:
    - (a) ground story consisting of only a storage area and 2 access doors.
    - (b) upper story should account for an open space area accommodating 15 persons, 1 private office for 1 person, a kitchen, separate toilets for men and women, an electrical room as well as another storage room
    - (c) The area of each story shall be around 150m<sup>2</sup>.

(d) The elevation of each story shall be around 3m.

7. The slab on grade shall be able to withstand the live loads of a storage area of  $2T/m^2$ .
8. The first-floor slab structure shall be able to withstand live loads of  $500kg/m^2$ .
9. The roof slab structure shall be able to withstand live loads of  $200kg/m^2$ .
10. A suitable septic tank shall also be designed with all the needed mechanical equipment.
11. Provision of a metallic support for a 60cm microwave link shall be considered on roof or façade of the last story.

#### E. Outdoor Area Design Considerations

1. Outdoor area will be kept, if possible, as it is. If not, the finishing will be similar to existing, i.e. asphalt surface.
2. Excavation and ground leveling design where needed as per topographic survey results, if necessary.
3. Slope and drain design for the outdoor part (preferably using existing drainage trenches system), if necessary.
4. A fence constructed of a masonry wall  $h=2m$  with  $45^\circ$  wired metallic fence above it will surround the whole warehouse area.
5. Two main gates reaching MIC1 area are provisioned.
6. Two guardhouses (security rooms)  $(2.5 \times 2.5m)$  to be installed outdoors are provisioned.

## 2.2 ELECTRICAL REQUIREMENTS

#### A. Standards

1. IEC 60364 - Electrical Installations for Buildings
2. EC 60287-1-1 - Electric cables - Calculation of the current rating - Current rating equations (100% load factor) and calculation of losses - General
3. IEC 60364-1 - Low-voltage electrical installations - Fundamental principles, assessment of general characteristics, definitions
4. IEC 60364-4-41 - Low-voltage electrical installations - Protection for safety - Protection against electric shock
5. IEC 60364-4-42 - Low-voltage electrical installations - Protection for safety - Protection against thermal effects
6. IEC 60364-4-43 - Low-voltage electrical installations - Protection for safety - Protection against overcurrent
7. IEC 60364-4-44 - Low-voltage electrical installations - Protection for safety - Protection against voltage disturbances and electromagnetic disturbances
8. IEC 60364-5-51 - Low-voltage electrical installations - Selection and erection of electrical equipment - Common rules
9. IEC 60364-5-52 - Low-voltage electrical installations - Selection and erection of electrical equipment - Wiring systems



10. IEC 60364-5-53 - Low-voltage electrical installations - Selection and erection of electrical equipment - Isolation, switching and control.
11. IEC 60364-5-54 - Low-voltage electrical installations - Selection and erection of electrical equipment - Earthing arrangements and protective conductors
12. IEC 60364-5-56 - Low-voltage electrical installations - Selection and erection of electrical equipment - Safety services
13. IEC 60364-6 - Low-voltage electrical installations - Verification
14. IEC 60364-7-712 - Low-voltage electrical installations - Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems
15. IEC 60364-7-714 - Low-voltage electrical installations - Requirements for special installations or locations - External lighting installations
16. IEC 60755 - General requirements for residual current operated protective devices
17. IEC 60947-1 - Low-voltage switchgear and control gear - General rules
18. IEC 60947-2 - Low-voltage switchgear and control gear - Circuit-breakers
19. IEC 60947-3 - Low-voltage switchgear and control gear - Switches, disconnectors, switch-disconnectors, and fuse-combination units
20. IEC 60947-4-1 - Low-voltage switchgear and control gear - Contactors and motor-starters - Electromechanical contactors and motor-starters
21. IEC 60947-6-1 - Low-voltage switchgear and control gear - Multiple function equipment - Transfer switching equipment
22. IEC 61140 - Protection against electric shocks - common aspects for installation and equipment
23. IEC 61439-1 - Low-voltage switchgear and control gear assemblies - general rules
24. IEC 61439-2 - Low-voltage switchgear and control gear assemblies - power switchgear and control gear assemblies
25. IEC 61439-3 - Low-voltage switchgear and control gear assemblies - distribution boards intended to be operated by ordinary persons (DBO)
26. IEC 61439-4 - Low-voltage switchgear and control gear assemblies - Particular requirements for assemblies for construction sites (ACS)
27. IEC 61439-5 - Low-voltage switchgear and control gear assemblies - Assemblies for power distribution in public networks
28. IEC 61439-6 - Low-voltage switchgear and control gear assemblies - Busbar trunking systems (busways)
29. IEC 61643-11 - Low-voltage surge protective devices - Surge protective devices connected to low-voltage power systems - Requirements and test methods.
30. IEC 61643-12 - Low-voltage surge protective devices - Surge protective devices connected to low-voltage power distribution systems - Selection and application principles.
31. IEC 61643-21 - Low voltage surge protective devices - Surge protective devices connected to telecommunications and signaling networks - Performance requirements and testing methods.



32. IEC 61643-22 Low-voltage surge protective devices - Surge protective devices connected to telecommunications and signaling networks - Selection and application principles.
33. IEC 62305-1 - Protection against lightning - Part 1: General principles
34. IEC 62305-2 - Protection against lightning - Part 2: Risk management
35. IEC 62305-3 - Protection against lightning - Part 3: Physical damage to structures and life hazard
36. IEC 62305-4 - Protection against lightning - Part 4: Electrical and electronic systems within structures

#### B. Design Considerations

1. Facility shall be powered by four (4) electrical sources: EDL, Local Diesel Generator, Parallel Towers Generator, and PV solar system.
2. Electrical room shall be located inside the offices building. It is dedicated for the electrical boards, UPS system, data networking, and telco equipment (1000W consumption).
3. Fully automated power source transfer with electrical input protection shall be provided with remote mimic panel.
4. All electrical distribution panels shall be equipped with power meter remotely monitored.
5. Generator to be provided with forced start option in case of control failure.
6. Lightning and surge protection shall be provided.
7. EDL & Parallel Towers generator electrical network is TT.
8. Local diesel generator electrical network is TN-S.
9. EDL cable length is ~ 100m.
10. Parallel Towers generator cable length is ~550m.
11. Local diesel generator shall be sized to run at an average of 75%.
12. Local diesel generator to be housed in a soundproof box and installed outdoors.
13. Diesel fuel tanks total volume shall be minimum 4000 Liters.
14. Provision of fuel tank level meter and alarm signal monitored remotely
15. PV solar system should be grid-tie, 3-phase, sinewave, without backup batteries.
16. PV panels to be installed on the rooftop of the hangar.
17. PV solar inverters to be installed outside the hangar.
18. Charging station for one forklift
19. Online UPS for personal computers and critical loads with backup time for two (2) hours at full load. UPS batteries should be VRLA.
20. Ethernet network for all offices and inside the hangar and guard stations.
21. Doors for technical rooms shall be fire rated for 1 hour
22. Time attendance system to be also provided in the office building.
23. Sliding access doors shall be motorized and remotely controlled



## 2.3 PHYSICAL SECURITY REQUIREMENTS

### A. Standards

1. UFC 3-530-01 Interior and Exterior Lighting Systems, with Change 1
2. UFC 4-021-02 Electronic Security Systems, with Change 1
3. UFC 4-022-03 Security Fences and Gates

### B. Design Considerations

1. Security system including access control, intrusion detection, CCTV with remote monitoring.
2. Security cameras, inside and outside, the facility buildings.
3. Doors shall be equipped with fingerprint access system.

## 2.4 LIGHTING REQUIREMENTS

### A. Standards

1. IES LP-4-20 - Lighting Practice: Electric Light Sources – Properties, Selection, and Specification
2. IES LP-1-20 - Lighting Practice: Designing Quality Lighting for People and Buildings
3. IES RP-8-21 - Recommended Practice: Lighting Roadway and Parking Facilities
4. IES LP-11-20 - Lighting Practice: Environmental Considerations for Outdoor Lighting

### B. Design Considerations

1. LED lamps are recommended.
2. Lighting is required for the hangar indoor, offices, and outdoor area.
3. High poles to be provided for flood lights and security cameras outdoors

## 2.5 AIR-CONDITIONING REQUIREMENTS

### A. Standards

4. Standard 55-2023 -- Thermal Environmental Conditions for Human Occupancy
5. Standard 62.1-2019 -- Ventilation for Acceptable Indoor Air Quality

### B. Design Considerations

1. All offices and electrical room to be equipped with comfort air-conditioning split units.
2. Storerooms to be equipped with precision air-conditioning units controlling temperature and humidity.
3. Air-conditioning units shall have high energy efficiency.
4. Passive ventilation for the hangar: adequate minimal natural cooling should be aimed for, considering there's no heat producing equipment inside of the hangar:
  - a. Extra roof ridge to allow hot air exhaust at the peak/middle of the hangar roof. (Adopt something like "REIDsteel ridge vent with cowl and bird mesh" to suppress the effect of the external wind on the ventilation, and forbid rain

- entering).
- b. Louvered sidings to allow fresh air intake shall be created on all 4 sides of the hangar (at high heights for security reasons).
- c. Steel nets should be installed along the louvers to prevent birds, rodents and other animals from entering the warehouse area.

## 2.6 FIRE REQUIREMENTS

### A. Standards

1. NFPA 1 – Fire Code
2. NFPA 3 – Standard for Commissioning of Fire Protection and Life Safety Systems
3. NFPA 10 – Standard for Portable Fire Extinguishers
4. NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems
5. NFPA 13 – Standard for the Installation of Sprinkler Systems
6. NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection
7. NFPA 22 – Standard for Water Tanks for Private Fire Protection
8. NFPA 25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
9. NFPA 30 – Flammable and Combustible Liquids Code
10. NFPA 70E – Standard for Electrical Safety in the Workplace
11. NFPA 72 – National Fire Alarm and Signaling Code
12. NFPA 75 – Standard for the Fire Protection of Information Technology Equipment
13. NFPA 76 – Standard for the Fire Protection of Telecommunications Facilities
14. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
15. NFPA 80A – Recommended Practice for Protection of Buildings from Exterior Fire Exposures
16. NFPA 101 – Life Safety Code
17. NFPA 105 – Standard for Smoke Door Assemblies and Other Opening Protectives
18. NFPA 111 – Standard on Stored Electrical Energy Emergency and Standby Power Systems
19. NFPA 230 – Standard for the Fire Protection of Storage
20. NFPA 231 – Standard for General Storage
21. NFPA 231C – Standard for Rack Storage of Materials
22. NFPA 251 – Standard Methods of Tests of Fire Resistance of Building Construction and Materials
23. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies
24. NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems
25. NFPA 2001 – Standard on Clean Agent Fire Extinguishing Systems

### B. Design Considerations

1. Hangar to be protected with water sprinklers automatically activated by fire detectors.



2. Fire hose reels to be provided inside the hangar.
3. Storerooms to be protected with FM200 automatically activated by fire detectors.
4. Offices to be equipped with fire detectors.
5. Evacuation plan.
6. Mimic panel inside office building with remote alarm monitoring.

### 3 DELIVERABLES

#### 3.1 DESIGN AND TECHNICAL FILE

- A. The winner is expected to perform a **full design** of the Hangar and the outdoor offices building, including architectural, structural/civil, geotechnical, mechanical, and electrical aspects.

Also, the winner is expected to review and optimize the proposed design and drawings presented by MIC1, if needed, for the outdoor area.

- B. The following documents shall be provided by the designer, among others:
1. Design criteria
  2. Calculation notes
  3. Electrical single line diagrams of all systems
  4. Electrical schematics of all electrical panels
  5. Construction drawings
  6. Bill of quantities
  7. Tender documents
  8. Drawings and details reflecting the engineering aspects/branches mentioned above. The drawings must show all the necessary pieces, their part section sizes.
  9. The designer shall submit an elevation of the warehouse hangar as well as multiple sections showing all the members (columns, truss system, bracing, diagonals, struts, bolts, connections, foundations, openings, ...), dimensions, grades, and distances.
  10. An assembly detailed plan is required showing the connection between different members of the hangar along with bolts and plates section and grade.
  11. Drawings showing the hangar concrete columns and concrete foundations reinforcement.
  12. The designer shall provide the hangar detailed calculation notes for the engineering disciplines mentioned above, including but not limited to:
    - a. The calculation note shall consist of the design hypothesis and criteria, the wind loads and seismic loads as well as other loads, the calculation, and the results (sway, stresses in members, ...).
    - b. It is also required to provide the hangar concrete columns foundations calculation note, according to the results of the geotechnical studies.

- c. The calculation note must include the calculation of the stability, dimensions, main steel, vertical steel and stirrups around anchoring bolts, anchoring bolts design, foundations, soil reactions...
- d. The calculation notes of the natural cooling solution proposed.
- e. The calculation notes regarding water drainage systems on roof and inside warehouse in case of an emergency.

END OF SECTION

MIC1